Skills, Migration, and Urban Amenities over the Life Cycle

David Albouy
University of Illinois and NBER

R. Jason Faberman[1]
Federal Reserve Bank of Chicago

February 2018

Keywords: urban amenities, sorting, migration, life-cycle dynamics
JEL Codes: J30, J61, R23

Extended Abstract

In the standard model of spatial equilibrium, urban amenities drive up rents and generate a negative compensating wage differential for workers (Rosen, 1979; Roback, 1982). Workers remain willing to pay more in costs of living and accept less in wages to live somewhere with a higher quality of life. Recent work by Diamond (2016) on urban sorting finds that higher-educated individuals choose to locate in higher-wage, higher rent areas, and that the quality of amenities in these areas tend to increase as a result. The literature, however has not delved deeply into the direct relationship between worker sorting based on skill and the quality of urban amenities at the time of the move. Recent research (Combes et al. 2010) has claimed that non-random worker sorting into metropolitan areas can account for a sizeable fraction of observed wage variation across cities. Yet, so far, relatively little—aside from cursory attention by Glaeser and Mare (2001)—examines how underlying skills are distributed across space, change over the life cycle, or influence our understanding of income mobility.

In this paper, we explore how much sorting based on worker skill, both observed and typically unobserved, is driven by a desire to live in high-amenity cities. If higher-skill individuals sort into urban areas with higher wages, this will exaggerate observed wage differences across cities. If they sort into places with better amenities, it would lead to an underestimate of the compensating wage differential attributed to these amenities, since high-skill individuals tend to earn higher wages. Furthermore, it is well known that migration rates decline with age and that consumption expenditures are hump-shaped over the life cycle. If urban amenities are normal (or luxury) goods that drive migration decisions then sorting based on urban amenities may have a life cycle component. To our knowledge, with limited exceptions (Chen and Rosenthal, 2008), there is scant research on the life-cycle behavior of urban amenity consumption.

[1] Email: Albouy, albouy@illinois.edu; Faberman: jfaberman@frbchi.org. We are grateful to Dan Wilson for thoughtful comments and Bill Kluender for excellent research assistance. The views expressed here are our own and do not necessarily reflect those of the Federal Reserve Bank of Chicago, or those of the Federal Reserve System.

We use data from the restricted-access geocode files of the National Longitudinal Surveys of Youth (NLSY) for 1979 and 1997, including data on the children of the 1979 survey respondents. The NLSY surveys are longitudinal data, each for a single cohort of individuals. The data include detailed information on many aspects of an individual's life. We match the geographic data to quality of life measures constructed by Albouy (2012, 2016) and aggregated to the metropolitan-area level. These quality of life measures generally capture the degree of local amenities within a metropolitan area and are constructed to account for geographic variation in taxes, non-housing costs, and non-labor income.

We find that, like consumption expenditures, the average quality of life of an individual's metropolitan area is hump-shaped over the life cycle. Because the quality of life index is fixed for metropolitan areas over time, changes in average quality of life are driven entirely by migration. The quality of life index has two components: a wage index, which captures geographic differences in labor productivity, and a housing price index, which captures geographic differences in productivity as well as urban amenities. We find that most of the life cycle variation is driven by the housing price index. In fact, the housing price component varies more than twice as much as the wage component over the life cycle, suggesting that urban amenities are the predominant driver of migration decisions over the life cycle.

Consumption expenditures generally peak during the mid-40s of one's life (Attanasio and Weber, 1993; among others). We find, however, that average quality of life peaks during one's early 30s and declines slightly thereafter. Furthermore, when we break the data out by skill (either by educational attainment or AFQT score—a proxy for unobserved ability), we find that life-cycle movements in average quality of life, and its components, are most pronounced for the highest-skilled individuals. There is almost no rise in average quality of life for the lowest-skilled individuals. In fact, most of the rise in quality of life early in the life cycle is driven by the highest-skilled individuals and most of the fall in quality of life during one's 30s and 40s is driven by the lowest-skilled individuals.

We argue that the observed patterns reflect the interaction between worker skill, wages, urban amenities, and child rearing. Higher-skilled workers tend to earn higher wages. Much of the literature on worker sorting across cities focuses on the selection of high-skilled workers into more productive cities. High wages also allow individuals to consume more goods and services, including paying higher rents to consume more urban amenities. At the same time, the literature on life-cycle consumption finds that the hump-shape in consumption expenditures is driven in large part by the presence of household children (Browning, Deaton, and Irish, 1985; Browning, 1992; among others). If urban amenities require both income *and time* to enjoy, then the presence of household children will affect their consumption as well. Since individuals tend to work more during child rearing years, and since having household children tends to require more home production (Aguiar and Hurst, 2013), high-amenity, high-rent cities, all else equal, should be less attractive during child rearing simply because individuals will have less time to enjoy the local amenities.

This argument implies that the presence of household children should generate a U-shape in urban amenity consumption (and hence, a U-shape in our average quality of life measure) over the life-cycle because amenity demand should be higher when children are not present—i.e., early in life and during retirement. Furthermore, to the extent that higher-skilled individuals have high earnings, they

should consume more urban amenities throughout. Depending on the elasticity of their amenity demand, higher-skilled individuals may also be more responsive to the presence of household children.

We use data from the American Time Use Survey (ATUS) and the Current Expenditure Survey (CEX) to show that the patterns of time use and expenditures on local amenities (e.g., restaurants, museums, sporting events, local recreation) confirm our predictions. Those with at least a college degree spend the most time and have the highest expenditure shares on local amenities. Their time spent on local amenities also follow a U-shaped pattern over the life cycle. In contrast, those with a high school degree or less spend the least amount of time and income on local amenities, and their local amenity consumption is essentially constant over the life cycle. Instead, those with a high school degree or less spend the most time and highest expenditure shares on what we classify as leisure activities at home (e.g., eating in, watching television, listening to music).

In ongoing work, we develop a model of life-cycle consumption and labor supply that incorporates key features of our findings. Individuals differ in their skills, which affects the wages that they earn. They gain utility from consumption goods and the amenities in their city. Cities differ in the amenities offered and their local productivity. Finally, shocks to preferences over the life cycle, which capture the presence of household children, affect the minimum amounts of consumption required. We match the model to the data to evaluate several aspects of amenity demand, including the effect of household children and how its elasticity varies by skill.

Data

We use data from the National Longitudinal Surveys of Youth (NLSY) for 1979 and 1997, as well as the Young Adult survey of children of respondents from the NLSY79. Each survey follows a cohort annually (then, eventually, bi-annually) starting in their teenage years, providing a longitudinal profile for all individuals within each cohort. The data include a wide range of information on demographics, education, employment, household composition, and other aspects of an individual's life. We use survey data that runs through 2014 for each cohort. We also have access to the NLSY geocode data for each cohort. These include the state and county of residence during each survey interview and during the respondent's teenage years. We use the geocode data to match individuals to one of 318 Metropolitan Statistical Areas (MSAs) or the non-metropolitan portion of their state. We then match each individual to a quality-of-life estimate estimated using the methodology of Albouy (2012, 2016) at the county level. We take a population-weighted average of these estimates for each MSA or non-metropolitan portion of each state. Currently, we use 2000 data on housing prices, wages, and other inputs to the quality of life index.

We also use data from the American Time Use Survey (ATUS) and Consumer Expenditure Survey (CEX). The ATUS is an annual survey of the time-use behavior of its respondents. Individuals fill out a detailed time diary of all of their activities for a single day. The ATUS also includes demographic and labor force information for its respondents that is nearly identical to the information collected for the Current Population Survey. We pool individuals across the 2003 through 2014 survey years and estimate their average time use patterns by age. The CEX is an annual survey that collects detailed information on

household expenditures from its survey respondents for each quarter of the year. The survey has additional information on household demographics, composition, and income. We pool all data between 1996 and 2014 and estimate average household expenditures (converted to 2014 dollars using the Consumer Price Index) by age.

Evidence

Figure 1 presents the behavior of our estimates for average MSA quality of life over the life cycle, along with its component estimates, for the 1979 cohort of the NLSY. These individuals were aged 14 to 22 in 1979. We focus on the NLSY79 because it provides the longest series of life-cycle behavior among the three NLSY cohorts, with its respondents aged 49 to 57 in 2014.[2] We group individuals into two-year age bins to improve the precision of our estimates. Within each bin, we calculate the mean quality of life of one's current MSA across all individuals. We repeat the calculation for the housing price and wage components of the quality-of-life index. Since the value of the quality-of-life index is fixed over time for each geographic area, changes in average quality of life over the life cycle reflect migration by individuals across geographic areas. Increases in average quality of life reflect migration towards higher-amenity geographic areas.

Figure 1 shows that average quality of life exhibits a hump-shaped pattern over the life cycle, peaking just before age 30 and then gradually declining thereafter. The wage and housing price components exhibit analogous patterns, but the housing price index exhibits twice as much variability as the wage index over the life cycle. Thus, changes in the value of local amenities matter more than changes in local labor productivity for the behavior of the quality-of-life index over the life cycle.

Figure 2 estimates average quality of life over the life cycle separately for three education groups: those with a college degree or more, those with some college, and those with a high school degree or less. There are substantial differences across the education groups.[3] Most of the rise in average quality of life during the 20s occurs among those with at least a college degree and most of the decline in average quality of life during the 30s and 40s occurs among those with some college or less. In addition, the average quality of life for those with a high school degree or less never do not really increase during their adult lives. For them, the average estimate is essentially flat between ages 18 and 30, then begins to steadily decline. The net result is a gap in the quality of life of their residences between the college educated and those with a high school degree of less. At age 18, the difference in their average quality of life index is about 0.004, but the difference quickly rises to 0.016 by age 28 and remains at 0.017 by age 50. In comparison, the average quality of life for all individuals only varies over a range of 0.005 between ages 18 and 50. Figure 3 shows that much of this gap is driven by differences in the housing price component of the quality-of-life index over the life cycle. At age 18, the college-high school difference in their average housing price component is 0.033. It increases to 0.110 at age 28 and

[2] In unreported results, we find that the MSA quality of life estimates from the 1997 and 1979 Young Adult cohorts follow similar patterns to the 1979 cohort during their overlapping ages.

[3] In unreported results, we also find substantial differences when we group individuals by quartiles of their AFQT score distribution.

is 0.117 at age 50. In contrast, the corresponding gaps in their wage components are 0.017 at age 18, 0.040 at age 28, and 0.039 at age 50. Thus, the college-educated tend to move to higher-amenity locations early in their life cycle while the high school-educated do not. In fact, the high school-educated tend to move to lower quality-of-life locations as they age. Over time, this leads to a large gap in the average quality of life enjoyed by the two education groups.

We argue that the rapid increase in average quality of life among the college educated (and to a lesser extent, among those with some college) reflects a bunching of urban amenity consumption in response to the anticipation of having household children later in the life cycle. In ongoing work, we formalize our argument with a model of life-cycle consumption and labor supply that incorporates a role for household children and complementarity between leisure and amenity consumption. Figure 4 shows the motivation behind this hypothesis. The top panel shows that the fraction of households with any children present peaks in one's mid to late 30s, with the peak occurring later for more educated individuals. Consequently, the time spent on child and adult care (driven almost entirely by child care) follows a similar pattern across the three education groups, as the estimates from the ATUS data in the bottom panel of Figure 4 shows. While our evidence thus far is consistent with a bunching of amenity consumption early in the life cycle, it only shows that there is migration towards higher-amenity cities and does not speak to whether higher-skilled individuals physically consume local amenities more in their early adult years. We also do not have evidence on migration and amenity consumption behavior during retirement for our NLSY cohorts, but Chen and Rosenthal (2008) present evidence that individuals tend to move to higher-amenity locations during retirement. This behavior is also consistent with the notion of higher amenity consumption outside of the child-rearing years but it, too, only provides evidence of migration and not direct consumption of the local amenity.

To examine whether the migration patterns we observe in the NLSY and the migration patterns documented by Chen and Rosenthal (2008) are consistent with a higher consumption of local amenities, we appeal to the ATUS and the CEX data to estimate time use and expenditure shares for activities, goods, and services that we can plausibly identify as local amenities. For time use, these include time spent on eating and drinking, time spent shopping for things besides groceries and other home goods, socializing, attending social events, arts and entertainment activities, sporting activities, and traveling for leisure. For expenditures, these include income spent on eating and drinking outside of the home, fees and admissions for arts, entertainment, sporting, and recreation activities, and public transportation. We pool all individuals within each survey by age and estimate their mean time spent and their mean expenditure shares (percentage of total expenditures) on these activities over the life cycle. For comparison, we calculate the same statistics for time spent and expenditure shares on leisure spent at home.[4] The idea is that this is leisure whose value, unlike the value of urban amenities, is independent of one's location. For these activities, we include time spent and expenditures related to eating and drinking at home, clothing, personal care, home, vehicle, or pet care, watching television, using one's computer, playing games, listening to music, and playing with children.

[4] Specifically for expenditures, these are expenditures on nondurable home goods and services.

Figure 5 presents our results. The top two panels show the time use and expenditure shares on what we identify as local amenities by education group, and the bottom two panels show the time use and expenditure shares on what we identify as leisure activities at home by education group. Two patterns stand out for the behavior of time and expenditures spent on local amenities. First, there is a clear U-shaped pattern for the time use spent on local amenities for all education groups. The pattern is most pronounced for the college educated. Time spent on local amenities is lowest during one's 30s through early 50s. To a lesser extent, there is a U-shaped pattern in expenditure shares, though the rise in expenditures later in life is weaker than the rise observed for time use. Much of the observed change in expenditures shares is observed during one's 20s and early 30s. Second, the college educated devote the most time and the highest share of their total expenditures on local amenities. Those with a high school degree or less spend the least time and lowest share of their expenditures on local amenities.

The patterns by education are essentially reversed when looking at time use and expenditures on leisure activities at home. Those with a high school education or less have the most time spent and highest expenditure shares on leisure at home. Those with at least a college degree have the least amount of time spent and lowest expenditure shares on leisure on home. In addition, time and expenditures spent on leisure at home are essentially constant over the life cycle. The notable exception is the rise in time use during retirement years for all education groups. The rise in time spent on these activities (including time spent on local amenities) without a commensurate rise in expenditures late in life likely relates to the substitution between time and expenditures late in life documented by Aguiar and Hurst (2005). Overall, though, the data support the notion that individuals, particularly high-skill individuals, have a higher demand for urban amenities outside of their child-rearing years. Coupled with our earlier evidence from the NLSY, the results suggest that child rearing affects migration choices and migration timing over the life cycle.

References

Aguiar, Mark, and Erik Hurst, 2005. "Consumption versus expenditure." *Journal of political Economy* 113(5): 919-948.

Aguiar, Mark, and Erik Hurst, 2013. "Deconstructing life cycle expenditure." *Journal of Political Economy* 121(3): 437-492.

Albouy, David, 2012. "Are Big Cities Bad Places to Live? Estimating Quality of Life across Metropolitan Areas," mimeo.

Albouy, David, 2016. "What are Cities Worth? Land Rents, Local Productivity, and the Total Value of Amenities," *Review of Economics and Statistics*, 98(3): 477–487.

Attanasio, Orazio P., and Weber, Gugliemo, 1993. "Is Consumption Growth Consistent with Intertemporal Optimization? Evidence from the Consumer Expenditure Survey," *Journal of Political Economy,* 103(6): 1121-57.

Browning, Martin, 1992. "Children and Household Economic Behavior." *Journal of Economic Literature* 30(3): 1434-475.

Browning, Martin, Angus Deaton, and Margaret Irish, 1985. "A Profitable Approach to Labor Supply and Commodity Demands over the Life-Cycle." *Econometrica* 53(3): 503-43.

Chen, Yong, and Stuart S. Rosenthal, 2008. "Local amenities and life-cycle migration: Do people move for jobs or fun?" *Journal of Urban Economics* 64(3): 519-537.

Combes, Pierre-Philippe, Gilles Duranton, Laurent Gobillon, and Sébastien Roux, 2010. "Estimating Agglomeration Economies with History, Geology, and Worker Effects," in *Agglomeration Economics*, pp. 15-66. University of Chicago Press.

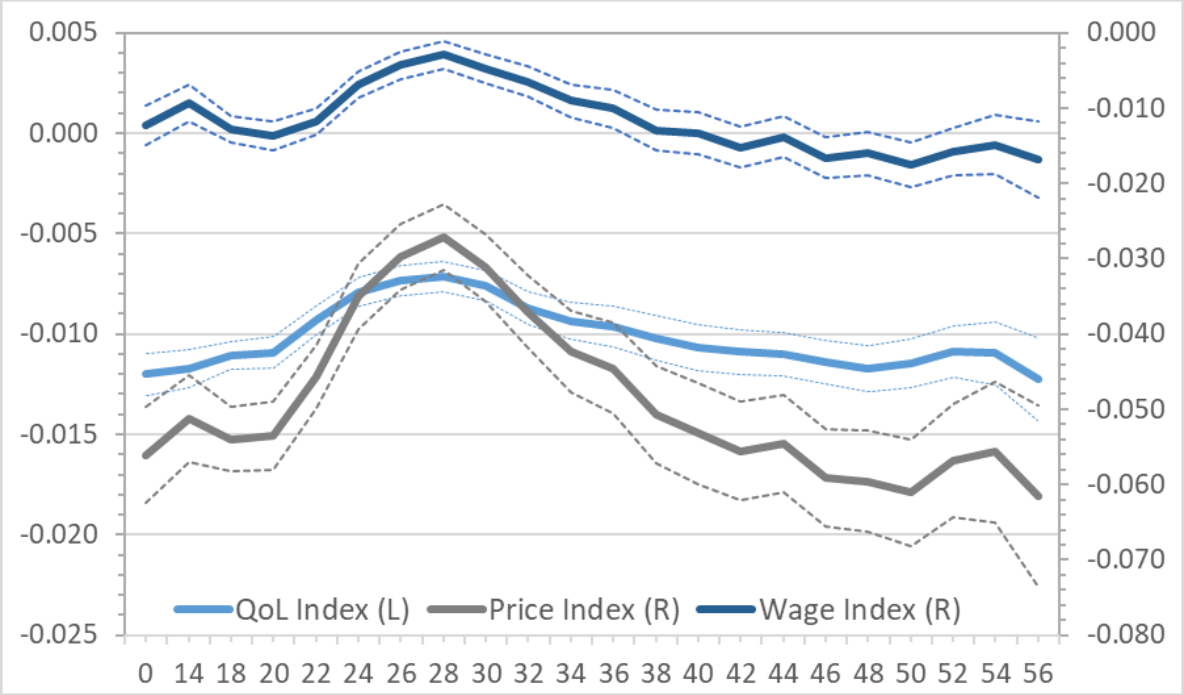
Diamond, Rebecca, 2016. "The Determinants and Welfare Implications of US Workers' Diverging Location Choices by Skill: 1980–2000." *The American Economic Review,* 106(3): 479-524.

Glaeser, Edward L., and David C. Mare, 2001. "Cities and Skills," *Journal of Labor Economics*, 19(2): 316-342.

Roback, Jennifer, 1982. "Wages, rents and the quality of life," *Journal of Political Economy* 90: 1257-1278.

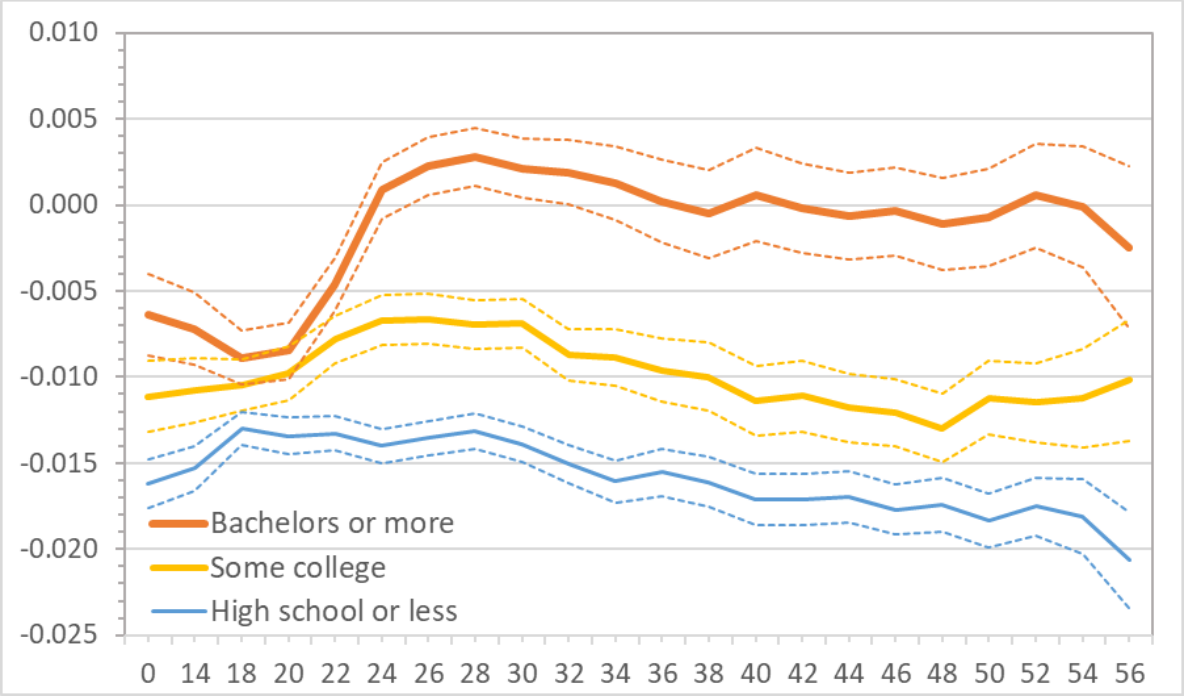
Rosen, Sherwin, 1979. "Hedonic prices and implicit markets: Product differentiation and pure competition," *Journal of Political Economy*, 82: 34-55.

Figure 1. Average Quality of Life Estimates over the Life Cycle



Notes: Estimates from authors' calculations using the NLSY79 matched to quality-of-life estimates calculated using the methodology from Albouy (2012, 2016). Estimates represent the sample-weighted mean quality of life for each age group, where ages are pooled into two-year intervals. Dashed lines represent 95 percent confidence intervals.

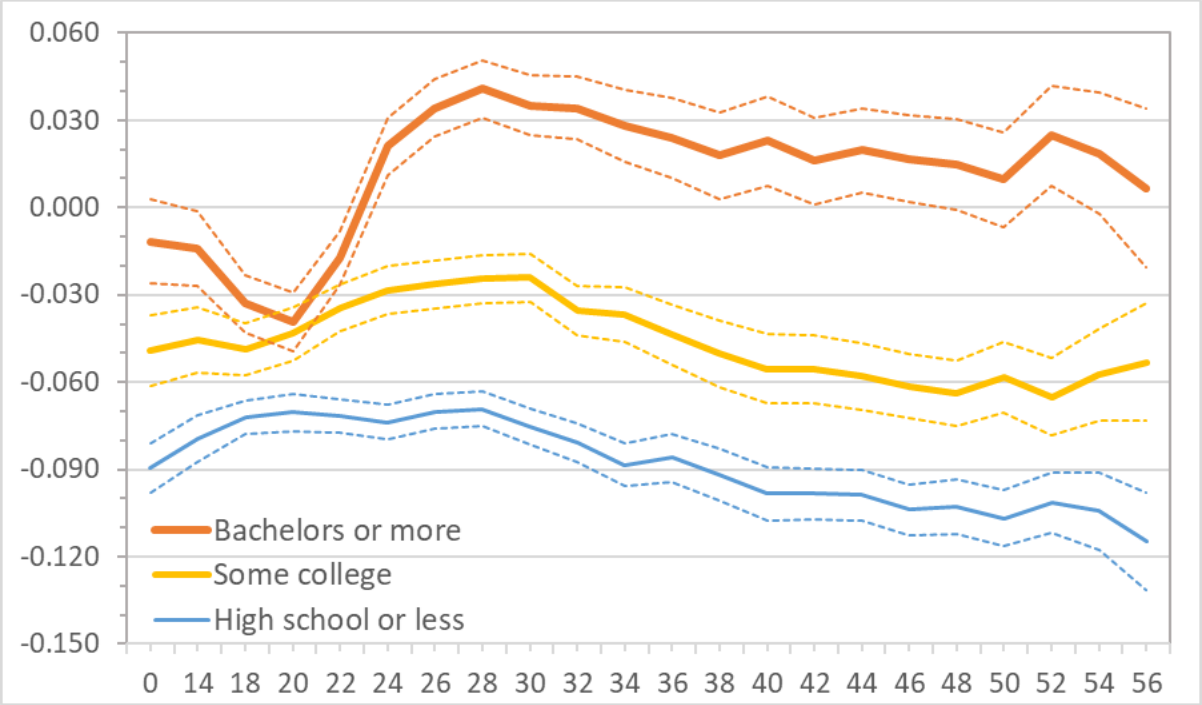
Figure 2. Average Quality of Life Estimates over the Life Cycle and by Education



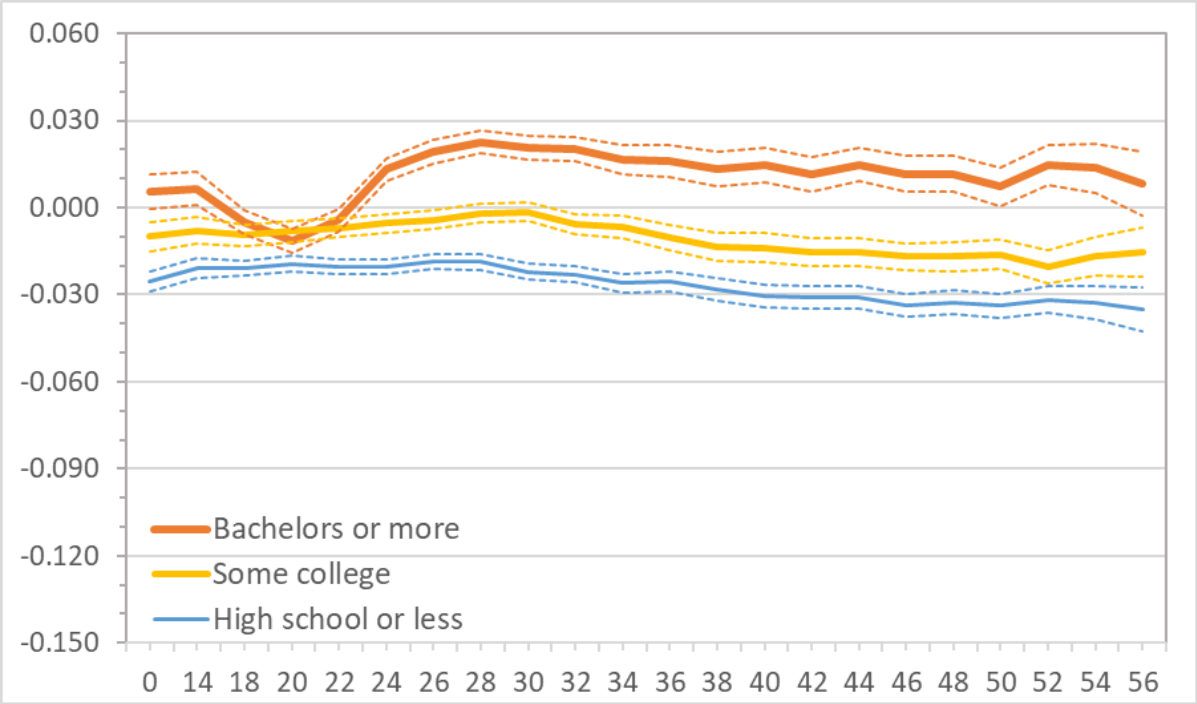
Notes: Estimates from authors' calculations using the NLSY79 matched to quality-of-life estimates calculated using the methodology from Albouy (2012, 2016). Estimates represent the sample-weighted mean quality of life for each age group and education category, where ages are pooled into two-year intervals. Dashed lines represent 95 percent confidence intervals.

Figure 3. Average Quality of Life Component Estimates over the Life Cycle and by Education

(a) Housing Price Component



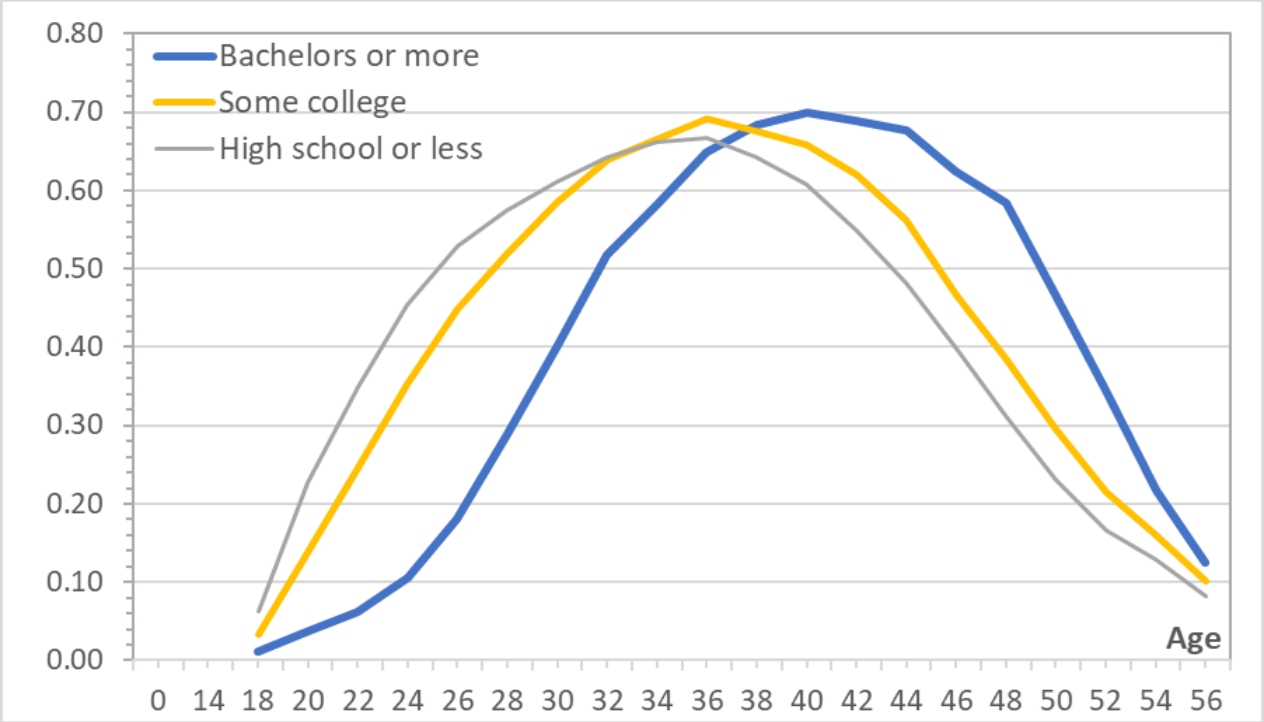
(b) Wage Component



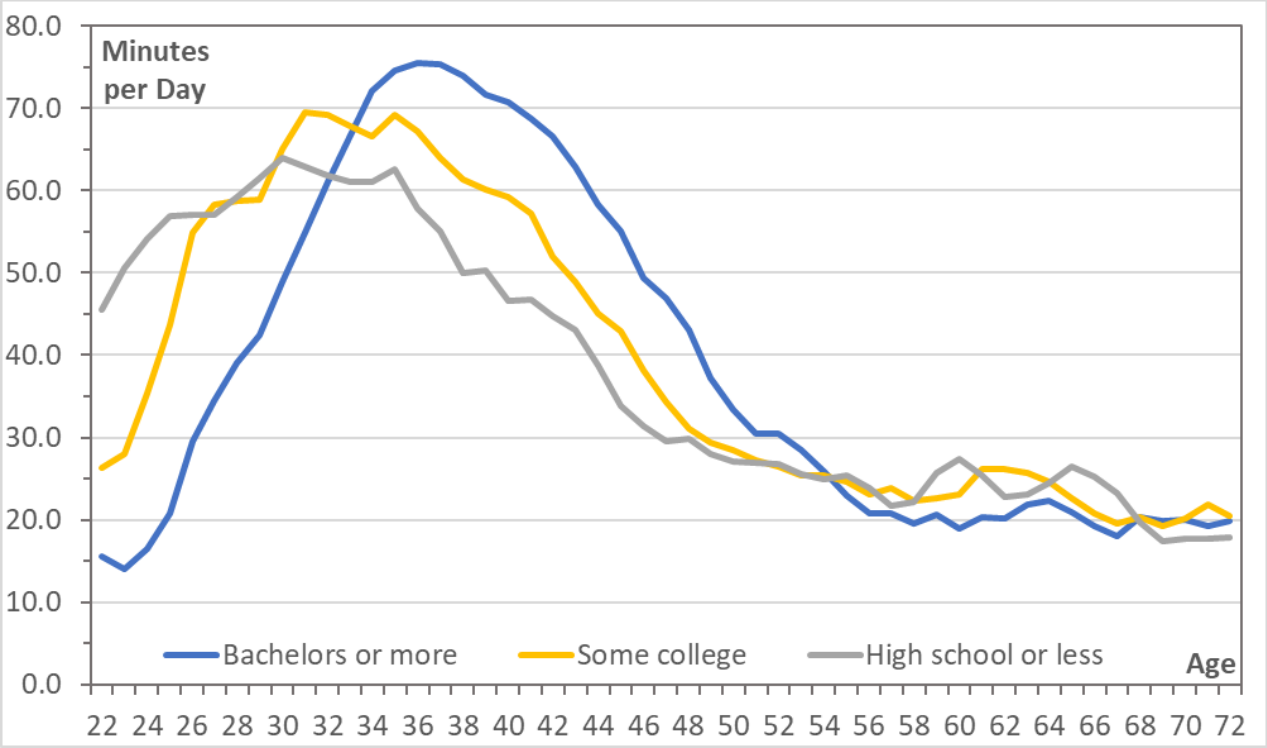
Notes: Estimates from authors' calculations using the NLSY79 matched to quality-of-life estimates calculated using the methodology from Albouy (2012, 2016). Estimates represent the sample-weighted mean quality of life for each age group, where ages are pooled into two-year intervals. Dashed lines represent 95 percent confidence intervals.

Figure 4. Changes in Household Composition and Time Use over the Life Cycle and by Education

(a) Fraction of Individuals with any Household Children (NLSY Data)



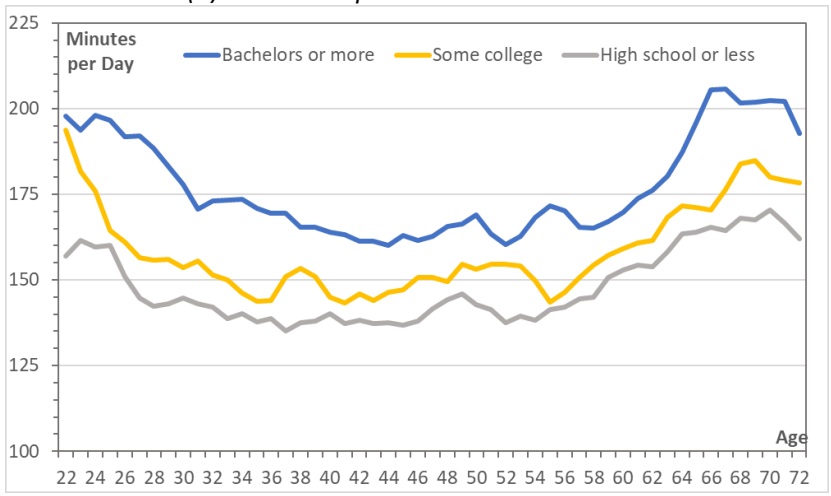
(b) Average Time Spent on Child and Adult Care (ATUS Data)



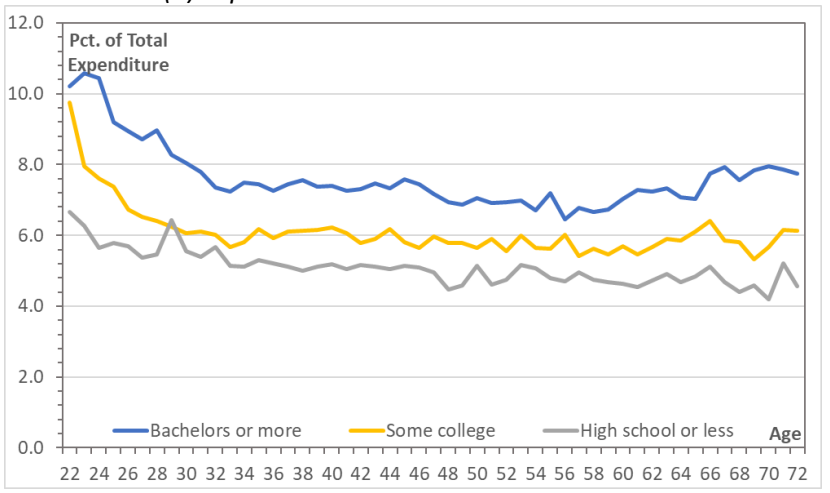
Notes: Estimates from authors' calculations using the NLSY79 and ATUS. Estimates represent the sample-weighted fractions (top panel) and means (bottom panel) for each age group, where ages are pooled into two-year intervals.

Figure 5. Time Use and Expenditure Shares on Local Amenities and Leisure at Home by Education Group

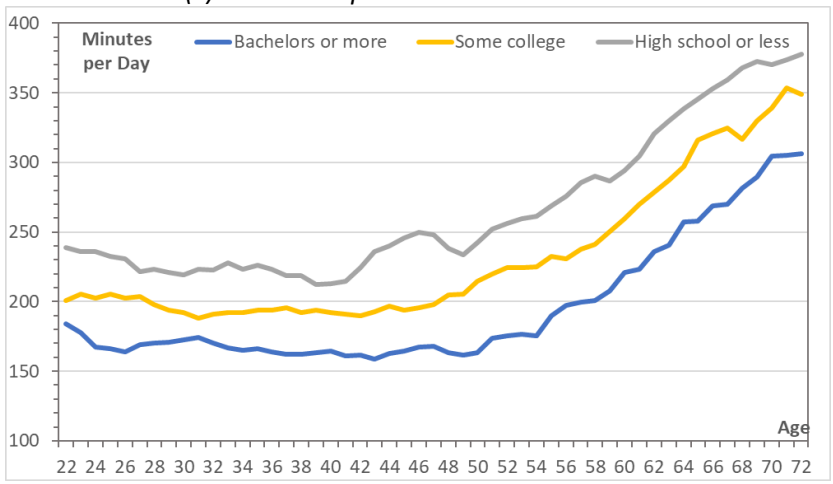
(a) Time Use Spent on Local Amenities



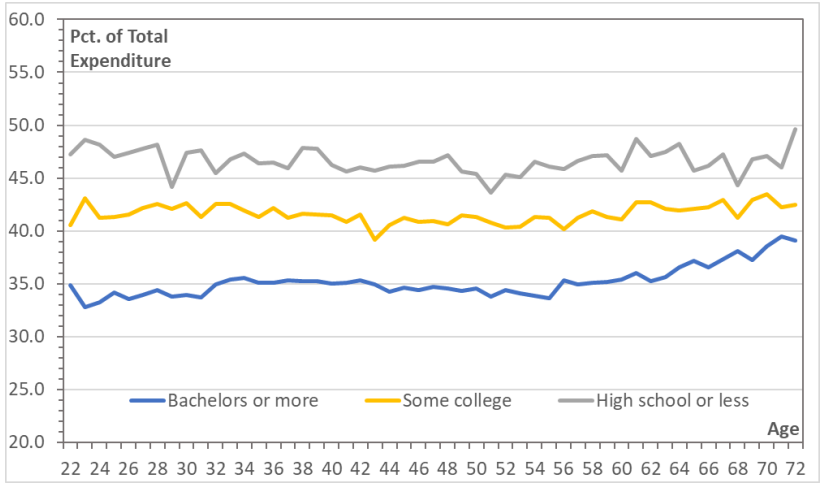
(b) Expenditure Shares on Local Amenities



(c) Time Use Spent on Leisure at Home



(d) Expenditure Shares on Leisure at Home



Notes: Estimates from authors' calculations using the ATUS for time use estimates and the CEX for expenditure share estimates. Estimates represent the sample-weighted mean time spent on the listed activities by age and education category. See text for details on the activities and expenditures included in the "local amenities" and "leisure at home" categories.