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Heterogeneity in the relationship between subjective well-being and its determinants over the life cycle: A varying-coefficient ordered probit approach☆

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ABSTRACT

We examine the evolution of the mechanism behind subjective well-being (SWB) across the lifespan using data from the 1972–2010 waves of the U.S. General Social Survey. By estimating a semiparametric varying-coefficient partially linear ordered probit model, we find that the influence of race, income, reference income, labor market status, marriage, and number of children on SWB varies greatly and nonlinearly along the life cycle. Among our results, we find that the effect of being black on the representative male's probability of being in the lowest happiness category falls from 9.399 percentage points (pps) at age 29 to 1.709 pps at age 55, turning insignificant afterwards. Being unemployed is associated with an increase in the representative male's probability of being in the lowest happiness category by 6.322 to 15.896 pps, with the largest effect occurring at age 40. The varying-coefficient model enhances our understanding of when life events are most detrimental to a person's well-being. The heterogeneity found highlights that, in order to promote well-being effectively, public policies should be differentiated across people depending on their age.

1. Introduction

There has been an emerging consensus that subjective well-being (SWB) represents an important facet of human development and, as a result, well-being should be assessed regularly and well-being research should be employed to guide policy. The United Nations Development Programme (UNDP) has included national average overall life satisfaction in its statistical annex to the Human Development Report since 2011 (United Nations Development Programme, 2015). The Sustainable Development Solutions Network (SDSN), which is comprised of experts and civil societies around the world, has also recommended that SWB be included as one of the Global Monitoring Indicators that serve to measure progress toward the Sustainable Development Goals (SDGs)—goals that are designed to succeed the Millennium Development Goals (MDGs) and guide UN member states to progress in economic, social, and environmental dimensions in a balanced manner after 2015 (SDSN, 2015). Governments at the national and/or subnational levels in the U.K., U.A.E., U.S., and Mexico have made happiness a policy goal (Helliwell et al., 2015).

Understanding how the mechanism behind SWB, or synonymously happiness, differs by age is crucial for designing suitable public policies that could enable people of different ages to live better lives.[1] Does being unemployed affect the young more than the middle-aged, or vice versa? Such disparities across the lifespan may be averaged out in standard models and can produce misleading policy implications. In addition, various economic and psychology theories have hypothesized that age moderates the relationships between socioeconomic variables and well-being. Therefore, finding out how the well-being effects of socioeconomic variables change across the lifespan is essential to testing important economic and psychology theories. Although the associations between SWB and socioeconomic variables have been studied extensively, very little empirical research has explored the differences in these relationships among the age groups.[2]

This current analysis explores the heterogeneous covariate effects occurring along the dimension of age in SWB regressions, which is an issue that has so far been ignored in the literature. We consider the

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[1] Following Blanchflower and Oswald (2008), Paul and Guilbert (2013), Luechinger et al. (2014), and many previous studies, we measure SWB by happiness and use the two terms "happiness" and "SWB" interchangeably. However, it is worth mentioning that in some recent studies, SWB is modeled as a broader multidimensional construct and happiness is only one of the manifest variables of SWB (Delle Fave et al., 2010 and Zanin, 2013).

[2] For reviews on developments in happiness economics, see Helliwell (2003), Dolan et al. (2008), MacKerron (2012), and Ferrer-i-Carbonell (2013).

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Table 1
Summary of existing evidence on the shape of the age profile of SWB.

Article	Modeling strategy	Estimated shape of the age profile of SWB
Clark (2007)	Dummies for 5-year age blocks	U-shape
Blanchflower and Oswald (2008)	Quadratic term in age	
Stone et al. (2010)	Unadjusted/adjusted mean by age	
De Ree and Alessie (2011)	Detrended age dummies	U-shaped in age before late 60s, with an extra dip in old age
Wunder et al. (2013)	Panelized spline	
Mroczek and Spiro (2005)	Quadratic term in age	Inverted-U shape
Easterlin (2006)	Quadratic term in age	
Frijters and Beatton (2012)	Quadratic term in age	Flat between the ages of 20 and 50 and upward (downward)-sloping between ages 50 and 75 (75 and 90)
Steptoe et al. (2015)	Unadjusted means by age	U-shaped in high income, English-speaking countries, downward-sloping in former Soviet Union, eastern European, and Latin American countries, and flat in sub-Saharan countries

interaction between age and other socioeconomic characteristics in determining SWB. Specifically, we examine the role of age as a distinct direct information variable for SWB and as an indirect conditioning information variable that moderates the relationships between socioeconomic characteristics and SWB. We do so with a varying-coefficient partially linear ordered probit (VPLOP) model in which the intercept and coefficients on some of the explanatory variables are assumed to be smooth functions of age. The direct and indirect roles of age in shaping SWB are respectively captured by the profile shapes of the estimated smooth intercept and slope coefficients.

Many studies have attempted to quantify the relationships between socioeconomic characteristics and SWB. Table 1 summarizes their modeling strategy and the shape of the estimated age profile of SWB. However, the existing evidence was obtained under the assumptions that age plays no moderating role and SWB is a quadratic function of age. Wunder et al. (2013) suspect that the relationship between well-being and age found in the empirical literature is predetermined by the quadratic functional form employed. Moreover, ignoring the interaction between age and non-age variables and imposing a particular functional form are likely to bias the estimation of the direct relationship between age and SWB. A further econometric problem with existing studies is that despite self-reported well-being being bounded and ordinal in nature, it is modeled as a continuous and unbounded dependent variable. Analyzing an ordinal outcome variable using OLS assumes that the happiness score is cardinal — namely, the distances between categories of an ordinal outcome variable are assumed to be equal. For example, a happiness score of 6 is forced to be three times as happy as a score of 2. However, for ordinal data, 6 only means better than 2.

Our work contributes methodologically to the happiness literature in three ways. First, the VPLOP model does not require a priori assumptions regarding functional forms. Second, the semiparametric VPLOP approach avoids the misspecification bias that arises due to the constant–coefficient assumption in linear parametric models. Third, unlike most previous research, we model the SWB score as a bounded ordinal dependent variable.

It is of theoretical interest to allow the intercept and slope coefficients in a SWB regression to be unspecified functions of age. Table 2 summarizes the theoretical underpinnings of why the well-being of people of different ages may be characterized by different models. Theories and experimental evidence in psychology have long suggested that the mechanism behind SWB may change along the life course. The two most notable explanations for the interaction between age and other socioeconomic characteristics in determining well-being are the self-system perspective (Herzog and Markus, 1999) and the socioemotional selectivity theory (Carstensen, 1992, 1995, 2006; Carstensen et al., 1999, 2003; Löckenhoff and Carstensen, 2004). The self-system perspective argues that well-being is a function of domain satisfaction and people may regard the relevance of different life domains differently at different stages of the life cycle. For the purpose of maintaining a stable level of life satisfaction, people may focus less on different life domains at different ages. Hence, people of different ages have different priorities. The importance of health, own income, reference income, unemployment, marital status, and number of children in determining one's well-being may change as one ages. Older people may pay less attention to health so as to minimize negative emotions brought on by aging. Hsieh (2005) provides evidence that the ranking of domain importance changes considerably with age.

According to the socioemotional selectivity theory, when people perceive the amount of time in their lives as getting limited, they adjust their social lives and better regulate their emotions so as to minimize negative and maximize positive affects. As such, elderly people will cut back on activities and relationships that reduce well-being and focus on more emotionally satisfying activities. Moreover, perceived boundaries on time foster a shift of goals from maximizing long-term payoffs to short-term goals such as the maintenance of positive affects. By introducing into the regression interaction terms between age and

Table 2
Theories that predict parameter heterogeneity across the lifespan in SWB models.

Article	Research question	Finding
Hirschman and Rothschild (1973)	Is there heterogeneity in the response of SWB to reference income?	The relative income effect is the disutility associated with the decline in social status caused by an increase in reference group income. The tunnel effect is the utility gained from perceiving an improved prospect of an increase in one's own income due to an increase in reference income.
FitzRoy et al. (2014)		The relationship between reference income and SWB is positive (negative) at earlier (later) stages of life.
Clark et al. (2008)	Is there heterogeneity in the response of SWB to income?	Forcing the effects of income on SWB to stay constant across the lifespan will result in an upward bias in the coefficient on age.
Self-system perspective: Herzog and Markus (1999), Hsieh (2005)	Why may the mechanism underlying SWB change over the life cycle?	To maintain a stable level of life satisfaction, people of different ages have different priorities.
Socioemotional selectivity theory: Carstensen (1992, 1995, 2006), Carstensen et al. (2003), Carstensen et al. (1999), Löckenhoff and Carstensen (2004); Mroczek and Kolarz (1998), Griffin et al. (2006)		Along the life stages, people will cut back on well-being-reducing activities, focus on more emotionally-satisfying activities, and change their life goals.