Time Use and the Pursuit of Happiness

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Abstract

We develop a new economic framework to study the relationship between how we spend our time and our well-being. Our key insight is that while we may pursue enjoyable activities, they do not all equally contribute to happiness. Moreover, even if we understand what we enjoy, we may not fully understand what makes us happy; we learn this over time. We incorporate these ideas into the standard model of time allocation and introduce the notion of psychic capital, a mental stock that facilitates happiness and is augmented by constructive uses of time. This allows us to connect basic tools from price theory to recent empirical findings in the study of well-being and centuries old ideas in moral philosophy. We under-invest in salubrious activities because we do not fully understand how we derive happiness. The relative prices of heterogeneous activities determine the extent of this under-investment and the speed of our learning. Our model explains several puzzles in the economics of happiness such as the Easterlin paradox and the lifecycle trajectory of subjective well being. We use data from the American Time Use Survey to present a variety of evidence in support of this claim and to show that work is most responsible for increases in well-being in older ages. **Keywords: Leisure, Happiness, Time Use, Psychic Capital, Learning. JEL Classification Codes: D01, D83, I31**

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"Thus for the first time since his creation man will be faced with his real, his permanent problem - how to use his freedom from pressing economic cares, how to occupy his leisure, which science and compound interest will have won for him, to live wisely and agreeably and well."

–John Maynard Keynes, 1930

1 Introduction

Over the past several decades, we have grown wealthier without growing happier. This is true both in rich countries such as the United States and rapidly-developing countries such as China. While real income per capita more than doubled in the US between 1972 and 2018, self-reported happiness in the General Social Survey (GSS) of Americans was broadly constant over this time period.[1] Similarly, real income per capita rose by about 250 percent in China between 1994 and 2005, yet over this same time period the share of Chinese adults that reported being satisfied with their lives *dropped* from 78 percent to 63 percent.[2]While a number of explanations for this puzzle have been proposed, a consensus has emerged in parallel across many disciplines that how we spend our time, and in particular our leisure time, is a key determinant of happiness.[3] Indeed, psychologists have noted that it is not simply the amount of free time that we have, but rather how we spend it that shapes our well-being, life satisfaction and even our health and productivity.[4]

In this paper, we enrich the standard economic model of time allocation (e.g., Becker (1965),Gronau (1977)) by explicitly acknowledging the fact that not all forms of work and all forms of leisure are the same. While we may enjoy all forms of leisure in a superficial sense, they do not equally contribute to happiness and meaning. Moreover, even if we understand what we enjoy, we may not fully understand what makes us happy; we learn this over time. By incorporating these featuresinto a neoclassical model with rational, time consistent agents that allows for multiple notions of well-being (OECD (2013); Stiglitz et al. (2009)), we can connect basic tools from price theory to old philosophical ideas, foundational ideas in behavioral economics, and recent empirical findings on time use and other topics as disparate as the relationship between income and happiness, addiction, flat labor supply in wealth, adverse and positive childhood experiences, and the consequences of social media use.

Our model has four novel features: (1) *happiness,* a deep and incompletely understood objective that is derived in part from the well-understood meta-objective of utility, (2) *psychic capital*, a stock variable that is shaped by time use and links flow utility to happiness, (3) heterogeneous *activities*, some of which augment psychic capital, and some of

[1]Peltzman (2026); US Bureau of Economic Analysis (2026)

[2]Kahneman and Krueger (2006); see Easterlin et al. (2012) for a discussion of measurement of happiness in China.

[3]Diener et al. (2018)

[4]Moieni and Eisenberger (2020)

which diminish it, and (4) learning via *experimentation*, which allows agents to discover how happiness is generated. The main theoretical result at the core of our framework is that agents' incomplete understanding of happiness distorts their leisure choices in such a way that they under-invest in the types of activities that augment their psychic capital and overinvest in the types of activities that diminish their psychic capital. This drives a wedge between experienced happiness and the level of happiness that could be obtained in a first-best world in which agents were fully aware of how their happiness was generated. This wedge can be thought of as a measure of unrealized potential happiness; experimentation can narrow it over the agent's lifecycle.

The model highlights the key role of prices in generating and perpetuating this wedge. Allocating time to a particular activity necessarily entails a tradeoff against other activities, which can be represented by a shadow price for that activity. Changes in these prices affect agents' time allocation decisions, which in turn affect their stock of psychic capital and ultimately shape the dynamic profile of their happiness. This standard dynamic mechanism is further influenced by a secondary mechanism in which the nonstationarity in the decision making environment induced by changing prices makes it more difficult for agents to learn what makes them happy.

We present evidence from the the American Time Use Survey (ATUS) that across nearly every narrowly defined activity type, individuals are spending more time alone, which we consider to be relatively destructive to psychic capital.[5]. While we are far from the first to notice this increase in time spent alone[6], we interpret the change as the result of a reduction in the price ratio of engaging in activities alone versus engaging in the same activities with others. Our interpretation is supported by variation in time allocation across cohorts that most strongly affects the youngest cohorts; a change in the overall mix of activities, generally favoring passive, solitary activities; and a broad-based rise in time alone within all categories of time use. We surmise that this change in relative prices has its roots in longstanding structural shifts in social capital (Putnam (2000)) and is almost certainly exacerbated by various technologies such as smart phones and digital media that that have eroded socialization (Haidt (2022)).

We use our model to rationalize several well-known empirical puzzles in the economics of happiness. We first show how the Easterlin (1974) paradox regarding the relationship between income and happiness and its various successors can be understood as a natural consequence of destructive activities becoming relatively cheaper so long as they are not inferior activities. This is indeed the case, as we show that time alone has increased since 2003 uniformly across all income groups. Under the assumption that engaging in intrinsically social activities alone contributes less to psychic capital than engaging in these activities with others[7], our model predicts that rising incomes and a greater set of choices

[5]Atalay (2024) and Hamermesh (2020) find that time alone predicts low levels of well-being.

[6]Kannan and Veazie (2023); Rideout et al. (2021)US Surgeon General (2023)

[7]This is consistent with the findings of Atalay (2024) and Hamermesh (2020)who note that these changes in time use have been associated with concomitant changes in happiness, life satisfaction and social cohesion.

will not necessarily make agents happier – and it may even make them less happy.[8]

We also show that our model explains the U-shaped relationship between age and flow utility whereby utility declines from youth into midlife and rises thereafter (Blanchflower and Oswald (2008)). Standard lifecycle models do not generate such a pattern in any straightforward way (Deaton (2018)). In our model, this relationship emerges naturally as a result of the tension between the bundles of flow utility and happiness offered by activities over the life cycle. We show that the flow utility decline in midlife is associated with less time spent on high-utility, low-happiness activities like watching TV and more time spent on low-utility, high-happiness activities like childcare and work. The increase in flow utility in late adulthood is generated by a reversal of this pattern of time use. However, consistent, monotonic increases in meaning over the life cycle are supported by those midlife investments in psychic capital. In addition to these puzzles, other phenomena such as the flat supply of labor across the wealth distribution, hedonic adaptation, and choice overload are either implied by or follow immediately from our model.

Finally, we discuss how addiction and temptation fit into our framework. While our model does not explicitly rely on either of these behavioral phenomena for its main theoretical contributions, each of them are complementary to our concept of psychic capital and learning. To the extent that destructive activities are addictive or tempting, the predictions of our model are strengthened. Moreover, although agents in our model are time consistent, this demonstrates how time inconsistency can be easily introduced to the model and some of its implications.

Our model rests on three common findings in the literature on happiness and subjective well being that are also closely connected to very old ideas across many cultures. We begin the paper by presenting evidence from the ATUS consistent with adopting these assumptions in our model. First, we take as a starting point that well-being is multifaceted, and different dimensions of well-being may come into conflict with each other. A large literature spanning both psychology and economics emphasizes that well-being is not a scalar object but instead comprises multiple distinct components including experienced affect, evaluative life satisfaction and broader functions of meaning.[9] Of course, this modern literature simply follows a millennia old tradition in moral philosophy that recognizes that there are types of happiness, and they occupy a hierarchy. [10]

Second, we recognize that even if we face the well-defined objective of maximizing the highest form of well-being, happiness, we have an incomplete understanding of how it is generated. Put plainly, even if we understand what we like, we may not fully understand

[8]The model also predicts that older agents will be less affected by price changes, as they are less reliant on learning, and those agents who have developed a greater stock of psychic capital will be cushioned against potential adverse effects.

[9]Diener (1984); Dolan et al. (2008); Kahneman and Deaton (2010); Layard and De Neve (2023)

[10]For example, Aristotle described four levels of happiness, which was echoed two thousand years later in Maslow's hierarchy in which immediate needs and pleasures reside on lower levels and ultimate self-actualization resides at the top. Confucius, Kant and countless thinkers in between distinguished pleasure from happiness.

what makes us happy. In this simplified example, which we model, what we "like" can be thought of as a utility ordering of activities, while what makes us "happy" can be thought of as an ordering of activities on the basis of their contribution to a deeper notion of meaning.[11] Although we may implicitly understand this utility ordering, we are unsure of this happiness ordering. Nevertheless, we are capable of learning what makes us happy. It is hardly an original idea that the nature and sources of happiness and meaning must be discovered over a lifetime.[12] We operationalize this idea in a standard experiential learning problem whereby agents periodically observe the happiness that they derive from the choices that they make and use this information to improve their understanding of the mapping between their choices and their happiness.

Third, we acknowledge that happiness is a more slowly varying dimension of well-being than utility. Indeed, experienced utility or affect has been shown to fluctuate at high frequency, on the order of minutes or hours, while life evaluation and meaning vary over months or years.[13]. This indicates a slowly varying stock variable to mediate the relationship between utility and happiness. We operationalize this as *psychic capital*, which serves as a summary of our psychic state and is determined in part by how we have allocated our time in the past. This idea has its roots in psychology research that shows how positive affect and mental health broaden attention and deepen engagement, increasing the capacity to derive meaning and satisfaction from experience, while depression dampens experienced utility even holding activities fixed.[14] In economics, there is evidence that the gap between decision and experienced utility is mediated by mental state, and that mental health strongly mediates the relationship between circumstances and well-being.[15]

As a corollary, our model also offers timely insights into how the adoption of new technologies might be directed toward well being. A retrospective assessment of the changes in time use that have accompanied the introduction of smartphones, social media, and digital media through the lens of our model emphasizes the importance of incentivizing constructive time use. This lesson may be more critical to heed in anticipation of the impending and likely unprecedented shifts in our time use due to AI. A novel empirical

[11]The economics literature has traditionally focused on preference orderings as the ultimate measure of well-being; recent advances using the approach include Benjamin et al. (2025, 2014). While this is obviously a reasonable approach, our framework does not require preferences to represent what is subjectively "good" for the decision maker. Related discussion can be found in Blackorby (2018); Gilboa and Schmeidler (2001); Broome (1991) Ryan and Deci (2001a) and Section 3.

[12]The classical and existential philosophers who have made this point are too numerous to cite; Frankl (1985) makes a particularly cogent case that the central human task is not the pursuit of pleasure, but the search for meaning.

[13]Kahneman et al. (2004); Deaton (2008); Kahneman and Deaton (2010)

[14]Fredrickson (1998); Ryff (1989)

[15]See, for example, Layard (2005); Kahneman and Deaton (2010); Clark (2018). Deeper roots of this idea include the *Bhagavad Gita*, in which the same action is conjectured to produce different well-being depending on the clarity or dullness of mind; the Buddha, who put forth the notion that one's mental state was the predecessor of happiness; and Aristotle, who arued that well-being depended upon *hexis*, or the state of an individual's character.

finding in this paper is that work is more responsible than other activities for the observed increases in well-being that are sustained deep into adulthood. With labor markets ripe for disruption by AI, it is imperative that we develop policies to encourage constructive uses of our time as the very nature of work evolves.

The remainder of this paper is organized as follows. In Section 2, we document patterns in time use and well-being from the ATUS that reveal several layers of heterogeneity in various measures of subjective well-being. In Section 3, we present a new economic framework that accommodates these patterns. In Section 4, we document clear changes in the bundle of leisure activities that people allocate their time towards, which can be understood to reflect changes in the relative prices of engaging in these activities; the implications of these changes on subjective well-being can be well understood through the lens of our framework. In Section 5, we show how our framework can help explain and reconcile a number of empirical puzzles in the economics of happiness and well-being. In Section 6, we show how standard economic models of addiction and temptation can be easily incorporated into our framework and generate fundamentally new insights. We conclude in Section 7.

2 Patterns in Time Use and Well-Being

2.1 Data

The American Time Use Survey (ATUS) We use data from the American Time Use Survey (ATUS) obtained from Flood et al. (2025) to study how individuals in the US from ages 15 to 70 spent their time between 2003 to 2024.[16] Our focus is the time diary collected during a computer-assisted telephone interview that provides a detailed account of all of the respondent's activities during the previous day. For each activity, this account includes how long the activity lasted, who was in the room or accompanying the respondent during the activity, and where the activity took place.[17]In addition to demographic variables, we also use the family income variable.[18]

The Well-Being (WB) Module A Well-Being (WB) Module has been fielded as part of the ATUS in four years; 2010, 2012, 2013, and 2021. The WB Module asks respondents to

[16]The ATUS is sponsored by the Bureau of Labor Statistics and conducted by the US Census Bureau on a monthly basis. It is comprised of a random subsample of households in the Current Population Survey (CPS), which is a nationally-representative sample of residents in the US that are at least 15 years of age. We treat 2020 data as missing due to the suspension of data collection from mid-March until mid-May of that year as a result of COVID-19.

[17]We should note that like other surveys, the ATUS suffers from the widespread increase in survey non-response (Meyer et al. (2015)). ATUS response rates have fallen from nearly 60 percent in the early 2000s to just above 30 percent in the early 2020s. One person per household is chose to participate in the ATUS survey, and the Census mails an advance letter with the date of their interview and then calls this person for the CATI. This may result in increased measurement error over time.

[18]Income is reported in nominal bins that changed in 2003. To convert family income to real 2024 dollars we impute family income at the midpoint of each bin, deflate that value to 2024 dollars using the CPI-U, and then map each of the resulting values to the midpoint of the 2024 bin in which it would lie.

rate how they felt during three randomly-chosen activities on a scale from 0 to 6, where 0 means they did not experience the feeling at all and a 6 means the feeling was very strong. The respondents were asked how happy, tired, sad, stressed, and in pain they felt.[19] The module also asked how meaningful the respondents found the activities to be and whether they were interacting with anyone during the selected activities. We reproduce the well-being questionnaire in the Appendix.

Measuring "Utility" and "Happiness" There are many approaches to defining and measuring well-being; a series of influential reports culminated in the OECD (2013) recommendation to distinguish between three areas of well-being: experienced (feelings over short periods of time), evaluative (satisfaction and global assessments), and eudaimonic (meaning and purpose).[20] Following Diener et al. (1999)'s distinctions between components of well-being, we use the word "utility" to refer to experienced well-being and "happiness" to refer to the higher order objective in our model that is related to evaluative and eudaimonic well-being.[21]

Signing WB Variables For negative feelings like sadness, pain, stress, and being tired, we re-frame variables as 6 minus the reported level so that higher levels of a measure correspond uniformly to greater well-being.

Classifying Activities We collapse over 400 raw activities into 21 categories of activities, and we show how they partition the 24 hours of a day in Figure 1 . The activities, ordered by their average time in the ATUS, are (1) sleeping; (2) working; (3) spending time watching TV or using a computer not for work; (4) commuting or traveling; (5) housework; (6) eating; (7) grooming / self-care; (8) food preparation; (9) other activities; (10) socializing; (11) caring for others who are not one's child; (12) activities related to formal education; (13) care of one's own children; (14) games; (15) relaxing; (16) engaging in exercise or sports; (17) reading; (18) shopping; (19) spending time with pets; (20) calls;

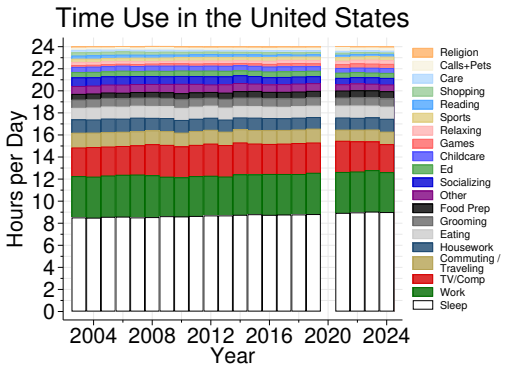
[19]There are concerns about interpreting discrete responses to survey questions as measures of an underlying latent index (Bond and Lang (2019)), though there is also evidence that the gravest concerns are limited in practice (Kaiser and Vendrik (2020); Schröder and Yitzhaki (2017)). There is also an ongoing debate about the dimensionality of well-being (VanderWeele and Johnson (2025); Helliwell et al. (2026)) and how choices like migration might improve its measurement relative to stated responses (Lee et al. (2021)Grimes and Wesselbaum (2019)).

[20]See Stiglitz et al. (2009), Dolan and Metcalfe (2011); see also Stone and Krueger (2018). Note that these areas do not correspond perfectly with the notions of utility developed in Kahneman et al. (1997).

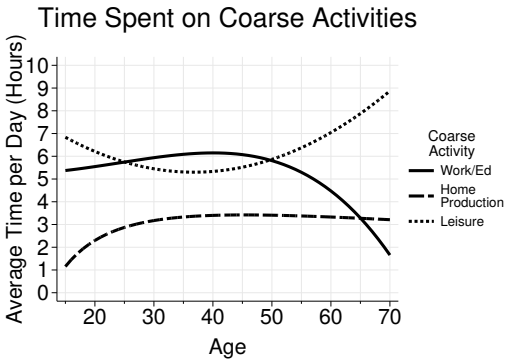
[21]At times, the word "happiness" has been used interchangeably with "utility" or experienced well-being (Ryan and Deci (2001b)). In terms of measurement, Benjamin et al. (2023) report that "on average across respondents, we find that none of the Self-Reported Well-Being measures we examine corresponds closely to lifetime or forward-looking utility, and only one -- happiness yesterday -- closely resembles flow utility." We thus interpret the question in the WB Module on how happy respondents felt during an activity as measuring experienced well-being or "flow utility". Aside from this instance, for the sake of measurement, we use the word "happiness" in its association with evaluative and eudaimonic well-being. This association of the word with higher-order well-being is epitomized by phrases like "the pursuit of happiness," "the art of happiness," and a deeper conception that distinguishes happiness from pleasure and short-run affective states. We thus broadly interpret the question in the WB Module on meaning as measuring "happiness."

Figure 1: Time Use in the US

(a) Time Allocation by Activity



(b) Time Allocation over the Life Cycle



Note: This figure shows data from the Well-Being Module in the 2010, 2012, 2013, and 2021 waves of the American Time Use Survey (ATUS).

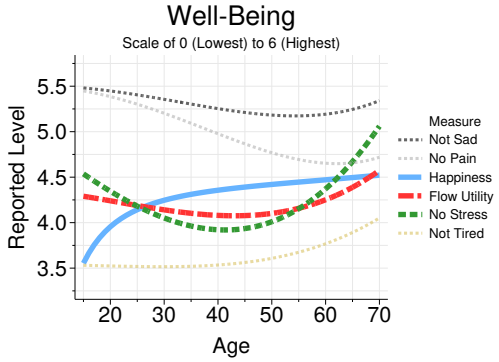
or (21) religious activities.

We further collapse the 20 non-sleeping activities into three coarse activities that are (a) work or education, (b) home production, and (c) leisure. These categories comprise, respectively, (a) working, commuting or traveling, or activities related to formal education; (b) housework, grooming / self-care, food preparation, care of one's own children, and care of others who are not one's child; and (c) watching TV or using a computer not for work, eating, socializing, engaging in exercise or sports, reading, relaxing, shopping (not for groceries), spending time with pets, games, calls, and religious activities. Figure 1 shows how the allocation to these coarse activities over the life cycle. Work or education gently rises until about age 40, declines slowly until about age 50, and then declines rapidly between 50 and 70. Home production rises from an hour per day at age 15 to three hours per day at age 25, where it stabilizes for the remainder of the life cycle. Leisure activities fall from seven hours per day at age 15 to five hours per day around age 40 before increasing in symmetric fashion until age 70.

2.2 Different Measures of Well-Being Have Different Trajectories over the Life Cycle

For any given activity, the ATUS asks respondents to evaluate their experience along six dimensions: the extent to which the activity makes them are happy (which we label as "Flow Utility"), sad, tired, stressed, or in pain, and how much meaning they derive from the activity (which we label as "Happiness"). In Figure2, we present local polynomial estimates of the duration-weighted mean of each of these six measures aggregated over all

Figure 2: Dimensions of Well-Being over the Lifecycle



Note: This figure shows data from the Well-Being Module in the 2010, 2012, 2013, and 2021 waves of the American Time Use Survey (ATUS).

activities as a function of age. We invert the scores of those measures with negative valence (sadness, pain, stress and tiredness) so that all measures are increasing in well-being.

Not only do the levels of these six measures differ over the life cycle, they also exhibit very different trends over the life cycle. Young (15-45) respondents are the least tired and feel the least pain and sadness, but they also feel the least happiness. Tiredness remains flat until middle age, after which it slowly decreases. Sadness remains fairly constant. Meanwhile pain gradually increases over the entire life-cycle. Stress follows a non-monotonic pattern: the youngest and oldest respondents are the least stressed, with stress peaking in the 40s. Flow utility follows a similar pattern to stress, with less variation, but in sharp contrast, happiness increases monotonically with rapid gains before the age of 30.

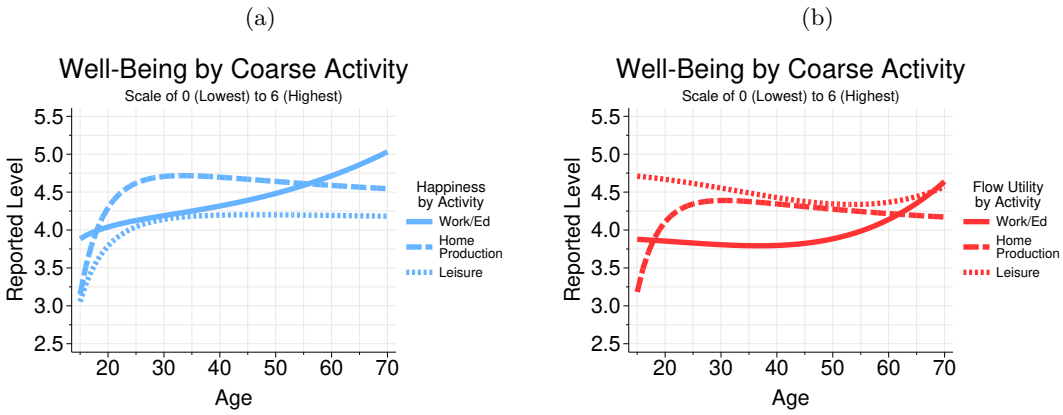
2.3 Work Can Explain Increases in Well-Being after Age 30

A large literature documents and debates trends in well-being over the life cycle; one prominent set of results indicates that well-being consistently increases in late life.[22] Another literature shows that work can be a meaningful activity.[23] To these literatures, we add the novel empirical observation in Figure 3 that among work, home production, and leisure, the increase in well-being starting around age 30, whether measured by flow utility or happiness, can almost exclusively be explained by work. Meaning is flat in leisure and weakly declining in home production past age 30; flow utility is declining in home production after age 30 and has a shallow U-shape in leisure.

[22]Blanchflower and Oswald (2004, 2008)Frijters and Beatton (2012)Stone et al. (2010)Blanchflower (2021)Laaksonen (2018)Bartram (2023)Blanchflower et al. (2023)

[23]White and Dolan (2009)

Figure 3: Well-Being over the Lifecycle by Coarse Activity



Note: This figure shows data from the Well-Being Module in the 2010, 2012, 2013, and 2021 waves of the American Time Use Survey (ATUS).

2.4 Well-Being Is Heterogeneous Within and Across Activities

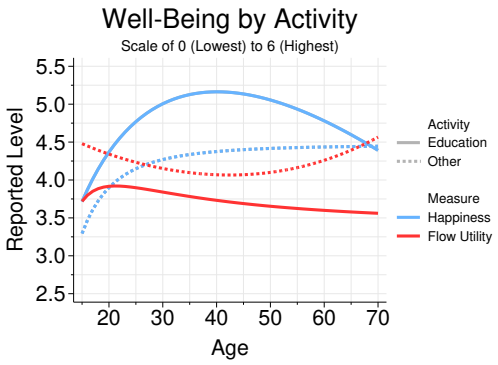
Heterogeneity in patterns of well-being extends across our finer 21-category partition of activities. In Figure 4 we show how flow utility and happiness evolve over the lifecycle for four selected categories. For each category, we also show how these two measures evolve for all other activities; the difference between these roughly corresponds to the marginal benefit from additional time allocated to activities in that category. Educational activities (Panel (a)) generate greater happiness than flow utility at all ages, though this gap widens substantially in middle age and remains large throughout old age. Meanwhile games (Panel (b)) generate much higher levels of flow utility than happiness at all ages, with this gap being particularly large in youth. Work (panel (c)) generates higher happiness than flow utility at all ages; both measures move in parallel, increasing slightly in youth, leveling off in middle age, and increasing again in old age. Finally, TV and computer entertainment generates greater flow utility than happiness at all ages; youth derive very little happiness from TV, by middle age it flattens out at a moderate level. We present results for other categories and disaggregated by demographic groups in Appendix D.

Heterogeneity in these patterns across activities extends across individuals. In Figure 5, we present the joint distributions of flow utility and happiness for the same four selected categories as before (Similar figures are available for all activities in the Appendix.) It is immediate that these distributions do not exhibit a single ridge, much less a ridge that coincides with the diagonal. Moreover, they are all skewed differently. It follows that different individuals obtain different levels of happiness for an equally pleasant activity.

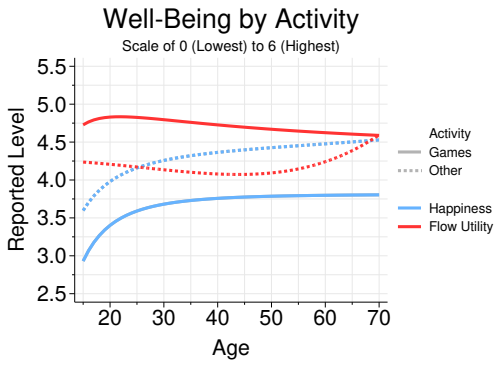
We attempt to summarize the relationships between these various measures of well-being across individuals, activities and over the life cycle with a simple regression exercise.

Figure 4: Dimensions of Well-Being over the Lifecycle, by Activity Category

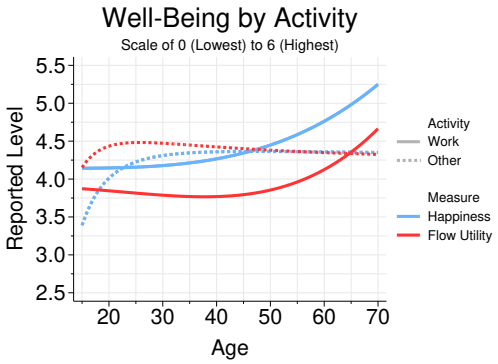
(a) Education



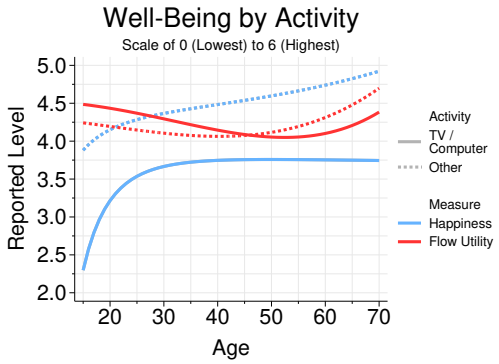
(b) Games



(c) Work



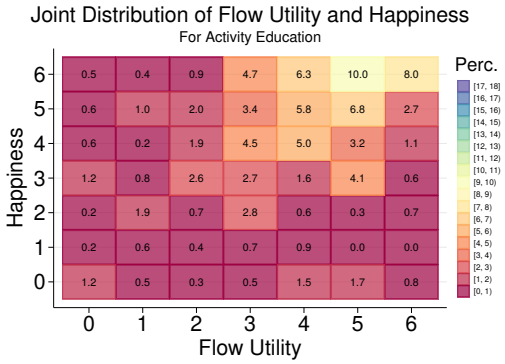
(d) Screen Time



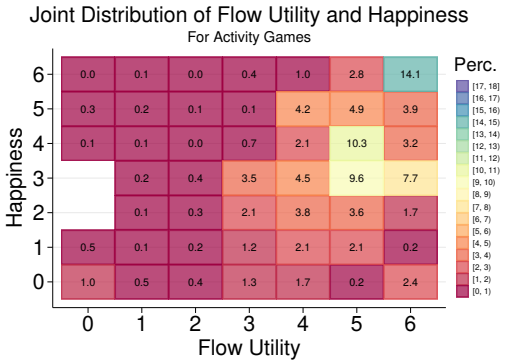
Note: This figure shows data from the Well-Being Module in the 2010, 2012, 2013, and 2021 waves of the American Time Use Survey (ATUS).

Figure 5: Joint Distributions of Flow Utility and Happiness, by Activity Category

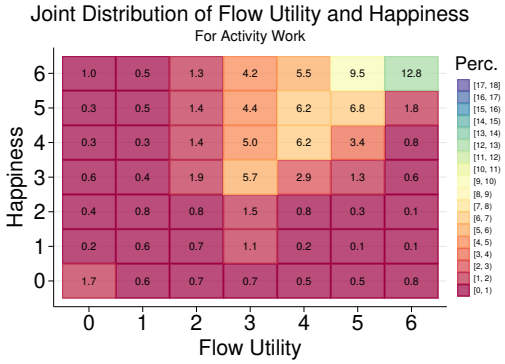
(a) Education



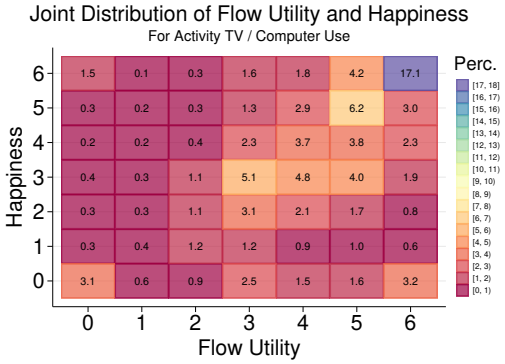
(b) Games



(c) Work



(d) Screen Time



Note: This figure shows data from the Well-Being Module in the 2010, 2012, 2013, and 2021 waves of the American Time Use Survey (ATUS).

Let Y_i^j be the well-being of individual i as measured along dimension j, and let X_i^k be an indicator that is equal to one if individual i engages in an activity in category $k = 1, \ldots, 21$. We estimate the regressions

$$Y_i^j = \beta^{jk} X_i^k + \epsilon_i \tag{1}$$

separately for the sample of young respondents (aged 15-30) and older respondents (aged 40-70), weighted by the time that individual i spends in category k. The coefficient β^{jk} corresponds to the average marginal well-being obtained from additional time allocated to an activity in category k for individuals of a given age group. For each of age group, we then separately calculate the correlation of the β^{jk} across the various categories k for each pair of measures of well-being.[24] We present the results of this exercise in Figure 6.

As expected, nearly all of the measures are positively correlated, but the magnitudes of these correlations vary in notable ways. For instance, stress is strongly correlated to utility, but essentially uncorrelated to meaning and only weakly correlated to pain. Nevertheless, a key robust pattern is that the magnitudes of correlations across these various dimensions of well-being experienced during activities strengthen considerably over the lifecycle. For example, feeling no stress is much more strongly correlated with utility (0.50 versus 0.82); sadness (0.56 versus 0.66); pain (0.11 versus 0.51); and not feeling tired (0.50 versus 0.79) for older respondents than younger respondents. Similarly, the correlation between utility and meaning increases from 0.60 in young age to 0.77 in old age.

3 A Model of Time Allocation, Psychic Capital, and Happiness

In this section, we present a new model of time allocation in which different activities are not simply enjoyed differently by individuals, but have different dynamic implications for happiness. To formalize this link, we introduce a new form of capital, psychic capital, whose stock is both enriched and diminished by various types of activities and is used in the generation of happiness. Although the agent's objective – to maximize their happiness – is singular and well defined, agents are only fully aware of what they like, not necessarily what gives them happiness or meaning. This imperfect understanding generates a wedge between chosen activities and those that would have been counterfactually chosen if happiness was fully understood and allows for agents to learn about how they derive happiness over time.

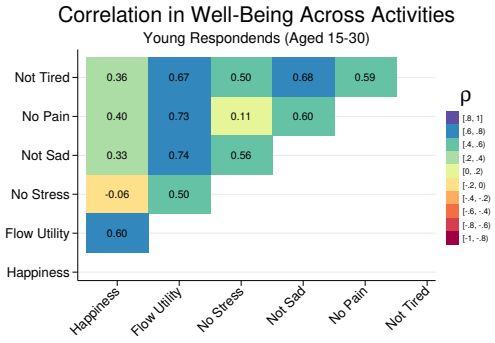
3.1 A Simple Example

We introduce the key ideas of the paper with the simplest possible formulation of a model that contains the following key ingredients: heterogeneous activities, a capital stock

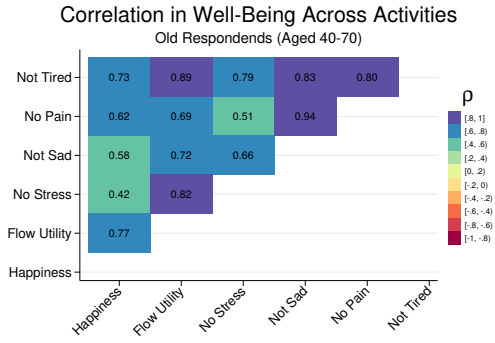
[24] These correlations are not across the entire set of 21 categories because the Well-Being Module does not collect feelings for sleeping, grooming, and some other personal activities.

Figure 6: Correlation Between Measures of Well-Being Across Activities, by Age

(a) Young Respondents (15-30)



(b) Older Respondents (40-70)



Note: This figure shows data from the Well-Being Module in the 2010, 2012, 2013, and 2021 waves of the American Time Use Survey (ATUS). See the text for a description of how these correlations were calculated.

that generates happiness, uncertainty over how happiness is generated, and scope for learning by doing. This takes the form of a model of time allocation across two activities, and tightly parameterized specifications of utility, capital accumulation, happiness, uncertainty and learning. In each period $t = 0, 1, 2, \ldots$, infinitely-lived agents allocate their time across activities A_t^i, which take on two forms: *constructive* ($i =$ "$+$") and *destructive* ($i =$ "$-$"), subject to the time constraint[25]

$$A_t^+ + A_t^- \leq \bar{T} \tag{2}$$

Agents derive instantaneous *utility* over these activities given by

$$u\left(A_t^+, A_t^-; p_t\right) = \frac{a^+}{p_t^+} A_t^+ + \frac{a^-}{p_t^-} A_t^- - \frac{b^+}{2}\left(A_t^+\right)^2 - \frac{b^-}{2}\left(A_t^-\right)^2 \tag{3}$$

where all parameters are positive. The parameters p_t^+ and p_t^- correspond to activity-specific shadow prices; a lower shadow price makes a given use of time more attractive in utility terms.[26] This utility function is fully known and understood by the agent.

[25] In all of the agents' problems specified hereafter, time constraints will bind at the optimum and we will focus on interior solutions.

[26] Our shadow price interpretation is related to the Becker (1965) model of time allocation in which households allocate time across activities, and the relevant objects governing choice are not only market prices but also the shadow values of time in alternative uses. The present setup can be understood as a reduced-form version of that logic. Rather than explicitly modeling household production, goods inputs, and wage-based opportunity costs, the shadow price p_i summarizes the effective trade-off associated with allocating time to activity A^i.

We define *happiness* as a deeper abstraction of utility. Conceptually, the utility that individuals derive from specific decisions is sublimated into happiness, h_t. This conversion is mediated by a stock of psychic capital, k_t which can captures the holistic state of the individual and may encapsulate notions of mental, physical, psychological and/or moral health. Although agents observe how much happiness they derive from their decisions, the happiness generating mechanism is not fully known to them.[27] There is *ex ante* uncertainty over how time allocation decisions will translate into happiness in the form of shocks (which is resolved when agents are rewarded with happiness), and there is also *ex post* uncertainty over how time allocation decisions will translate into happiness, as the true relationship between psychic capital and happiness is uncertain. We formalize this idea by specifying

$$h_t\left(A_t^+, A_t^-, k_t\right) = u\left(A_t^+, A_t^-\right) + \theta k_t + \epsilon_t \tag{4}$$

where $\theta > 0$ is the true contribution of psychic capital to happiness and ε_t is an i.i.d. mean-zero shock. Agents observe their realized happiness at the end of each period, but they do not know θ. *Ex ante* uncertainty prevents agents from inverting h_t and fully resolving *ex post* uncertainty from observation.

Psychic capital evolves according to

$$k_t = (1-\delta)\, k_{t-1} + \gamma^+ A_t^+ + \gamma^- A_t^- \tag{5}$$

where $\delta \in (0,1)$ captures the rate of depreciation of psychic capital. We assume that $\gamma^+ > 0$ and $\gamma^- < 0$; thus, time spent in the constructive activity builds psychic capital, whereas time spent in the destructive activity erodes it.

Full Information Benchmark

In the beginning of period t, agents inherit a stock of psychic capital k_{t-1} and choose a time allocation. Under full information, θ is known, and the agent's optimization problem can be written as

$$V^{\mathrm{F}}\left(k_{t-1}\right) = \max_{A_t^+, A_t^-} \left\{u\left(A_t^+, A_t^-; p\right) + \theta k_t + \beta \mathbb{E}_t\left[V^{\mathrm{F}}\left(k_t\right)\right]\right\} \; s.t.\,(2),(5) \tag{6}$$

The solution to this problem can be expressed as

[27] Evolutionary mismatch is a motivation for why agents' ordering of alternatives by utility and happiness might differ and why the happiness mechanism is not fully known to them. If preferences arise from an evolutionary process (Rayo and Becker (2007); Samuelson and Robson (2011)), then current preferences likely evolved in an environment that differs from the current environment in many ways. Some examples include the scarcity/abundance of resources (Mullainathan and Shafir (2013)), our social organization (Li et al. (2018)), and the stressors to which we are exposed (Brenner et al. (2015); Shonkoff and Garner (2012)).

$$A_t^{i,\mathrm{F}} = \frac{1}{b^+ + b^-}\left(\underbrace{\frac{a^i}{p^i} - \frac{a^{-i}}{p^{-i}}}_{\text{Inst. Utility}} + \underbrace{\beta\frac{\theta}{1-\beta\left(1-\delta\right)}\left(\gamma^i - \gamma^{-i}\right)}_{\text{Dynamic Considerations}} + \underbrace{b^{-i}\bar{T}}_{\text{Constraint}}\right) \tag{7}$$

where an index of $-i$ refers to the opposite sign of i.

The optimal choice of activities is shaped by three considerations that correspond to the three terms in equation (7). First, agents care about the relative attractiveness of each activity in utility terms. Second, informed agents consider the full dynamic considerations of time allocation as mediated through psychic capital. Because $\gamma^+ > 0$ and $\gamma^- < 0$, the future value of psychic capital raises the attractiveness of the constructive activity and lowers the attractiveness of the destructive activity. Finally, the time constraint binds at the optimum. Together, this determine the first-best time allocation.

Learning and Experimentation

In reality, agents face uncertainty over θ and update their beliefs about this parameter by learning from realizations of happiness. Hence, current choices affect both future psychic capital and the trajectory of learning. In the context of this simplified model, we consider the case in which agents learn the value of θ via Bayesian updating. This introduces an experimentation motive.

For simplicity, let beliefs at time t about the value of θ be summarized by the posterior mean m_t and posterior variance s_t^2. The agent's problem is thus a dynamic problem with a three dimensional state $\left(k_{t-1}, m_t, s_t^2\right)$. Psychic capital evolves as before, but the posteriors are updated according to Bayes law following a happiness signal. Given the additively separable formulation of happiness, we can conceptualize the signal as happiness net of utility $(h_t - u_t)$ which is equivalent to $\theta k_t + \epsilon_t$. With a Gaussian prior $\theta \sim \mathcal{N}\left(m_t, s_t^2\right)$, the signal is distributed $\mathcal{N}\left(\theta k_t, \sigma^2\right)$, and standard Bayesian updating yields implies the posteriors

$$m_{t+1} = m_t + \frac{s_t^2 k_t}{\sigma^2 + s_t^2 k_t^2}\left(\left(\theta - m_t\right)k_t + \epsilon_t\right) \tag{8}$$

$$s_{t+1}^2 = \left(\frac{1}{s_t^2} + \frac{k_t^2}{\sigma^2}\right)^{-1} \tag{9}$$

Equation (8) implies that the posterior will tend to move towards the true value of θ over time, and equation (9) implies that the variance of the posterior will decrease over time. A key economic implication is that information gain is proportional to psychic capital (k_t^2), which has a useful interpretation: if agents possess more psychic capital,

then their experiences will be more informative about their happiness. This introduces a new channel whereby the constructive activity not only increases psychic capital by also increases the precision of the agent's understanding of the connection between psychic capital and happiness.

We rewrite the agent's problem with the following Bellman equation:

$$V^{\mathrm{L}}\left(k_{t-1}, m_t, s_t^2\right) = \max_{L_t^+, L_t^-} \left\{ u\left(A_t^+, A_t^-; p\right) + m_t k_t + \beta \mathbb{E}_t \left[V^{\mathrm{L}}\left(k_t, m_{t+1}, s_{t+1}^2\right)\right]\right\} \; s.t. \, (2), (5), (8), (9) \tag{10}$$

where the superscript L refers to learning. Let μ_t^{L} denote the multiplier on the time constraint. Then we can write the optimal time allocation in terms of value function derivatives and the multiplier as

$$A_t^{i,\mathrm{L}} = \frac{1}{b_i}\left(\frac{a^i}{p^i} + \beta \mathbb{E}_t \left[V_k^{\mathrm{L}}\left(k_t, m_{t+1}, s_{t+1}^2\right)\right] \gamma_i + \beta \mathbb{E}_t \left[\underbrace{V_m^L \frac{\partial m_{t+1}}{\partial A_t^i} + V_{s^2}^L \frac{\partial s_{t+1}^2}{\partial A_t^i}}_{\text{Experimentation Term}} \right] - \mu_t^{\mathrm{L}} \right) \tag{11}$$

Given the derivatives of the value function in the experimentation term, there does not exist a closed form solution for the optimal time allocation under learning. In the interest of developing intuition, we make the approximation $V^{\mathrm{L}}\left(k_{t-1}, m_t, s_t^2\right) \approx V^{\mathrm{F}}\left(k_{t-1} | \theta = m_t\right) - \phi s_t^2$ where, in an abuse of notation, $V^{\mathrm{F}}\left(k_{t-1} | \theta = m_t\right)$ is the full information Bellman equation evaluated at $\theta = m_t$. This corresponds to an intermediate situation in which agents do not know θ but also do not learn. As a result, our approximation has the natural interpretation that learning agents prefer a lower posterior variance. With this approximation and the time constraint, we can rewrite the second-best time allocation from equation (11) purely in terms of parameters as

$$A_t^{i,\mathrm{L}} = \frac{1}{b^+ + b^-}\left(\underbrace{\frac{a^i}{p^i} - \frac{a^{-i}}{p^{-i}}}_{\text{Inst. Utility}} + \underbrace{\left[\frac{m_t}{1-\beta(1-\delta)} + \beta\phi \frac{2\sigma^2 s_t^4 k_t}{\left(\sigma^2 + s_t^2 k_t^2\right)^2} \right]\left(\gamma^i - \gamma^{-i}\right)}_{\text{Psychic Capital}} + \underbrace{b^{-i}\bar{T}}_{\text{Constraint}} \right) \tag{12}$$

which is analogous to equation (7) when dynamic considerations are augmented by learning. Let $\pi_t^i = A_t^{i,F} - A_t^{i,L}$ represent the "time wedge" for activity i; that is, the size of the distortion between the first- and second-best time allocations of that activity. Combining

equations (7) and (12) yields

$$\pi_t^i = \frac{\gamma^i - \gamma^{-i}}{b^+ + b^-} \left[\underbrace{\frac{(\theta - m_t)}{1 - \beta(1-\delta)}}_{\text{Misperception}} - \underbrace{\beta\phi \frac{2\sigma^2 s_t^4 k_t}{\left(\sigma^2 + s_t^2 k_t^2\right)^2}}_{\text{Experimentation}} \right]$$

The object in brackets contains two terms. The first corresponds to misperception. To the extent that agents underestimate the value of psychic capital, they will tend to under-engage in the constructive activity and over-engage in the destructive activity. Because there are dynamic ramifications to under-investing in psychic capital, this effect is subject to a multiplier, given in the denominator of that term. However, misperception is mitigated by learning via experimentation as captured in the second term. Suboptimal choices (relative to the first-best) still provide the agent with information about the value of psychic capital.

It is useful to transform this time (quantity) wedge into a price wedge. Define the effective price vector that a learning agent would need to face in order to select the first-best time allocation as $\boldsymbol{p}_{\boldsymbol{t}}^{\mathrm{L}} = \boldsymbol{p}_{\boldsymbol{t}} \left(1 + \boldsymbol{\tau}_{\boldsymbol{t}}^{\mathrm{L}}\right)$ (hereafter boldface refers to vectors). Then $\boldsymbol{\tau}_{\boldsymbol{t}}^{\mathrm{L}}$, the vector of taxes that would implement the first best, is given row-by-row as

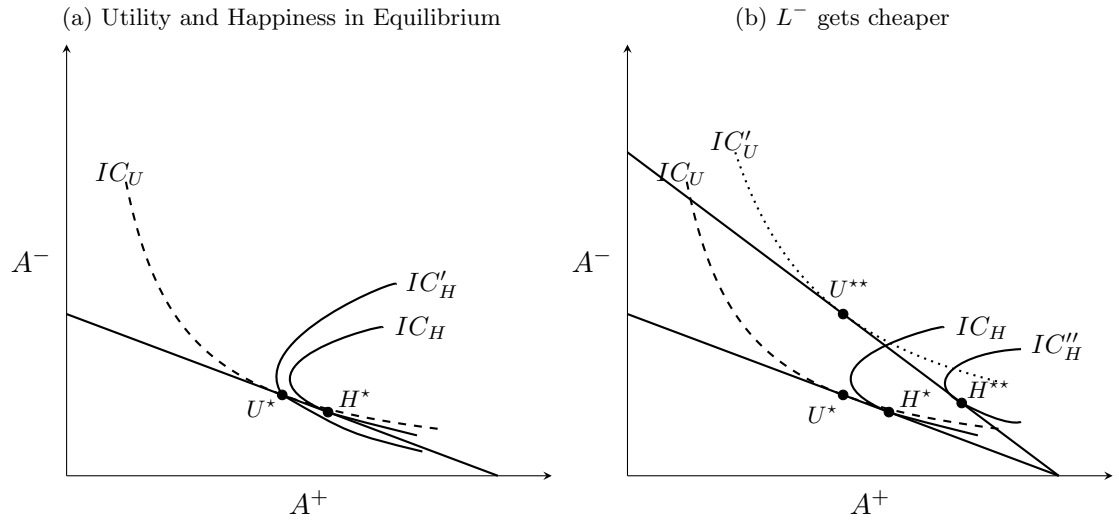
$$\tau_t^{i,\mathrm{L}} = \underbrace{\frac{\gamma^i}{a^i}}_{\text{Psychic Capital}} \times \underbrace{\left(\frac{\theta - m_t}{1 - \beta(1-\delta)} \right)}_{\text{Misperception}} \times \left(1 - \underbrace{\frac{2\sigma^2 s_t^4 k_t}{\left(\sigma^2 + s_t^2 k_t^2\right)^2}}_{\text{Experimentation}} \right)$$

This formulation makes clear that the informational distortion is sustained by the dynamic implications of psychic capital (γ^i) and misperception. Without either of these, there would be no distortion. However learning via experimentation reduces this distortion, since it contributes an informational return to time allocation. Since learning is increasing in k_t, this acts as an implicit subsidy for the constructive activity and tax for the destructive activity. However, experimentation does not eliminate the misallocation. Unless learning is already nearly complete or the informational motive dominates, the continuation-value term remains distorted by the agent's mistaken beliefs, and the wedge persists. In this case, it is straightforward to see that $A_t^{+,\mathrm{L}} < A_t^{+,\mathrm{F}}$ and $A_t^{-,\mathrm{L}} > A_t^{-,\mathrm{F}}$ and psychic capital is under provided.

3.2 Comparative Statics

The novel trade-off introduced into this framework is that of constructive versus destructive activities. The relative quantities of time that are allocated to these activities are determined in three ways: (1) agents' have preferences for the different activities, (2)

Figure 7: Utility and Happiness



different activities contribute to psychic capital differently, and psychic capital contributes to happiness (as captured by the happiness function $h(\cdot)$), and (3) the relative prices of the activities, p^+ and p^-. We analyze how each of these contribute to equilibrium graphically in a series of diagrams that are analogs to standard indifference curve diagrams from basic consumer theory.

In Figure 7, we present representative curves IC_U and IC_H along with a time budget constraint. Each point on IC_U, an iso-utility curve, corresponds to a time allocation that yields the same level of utility. Meanwhile, IC_H, an iso-happiness curve, corresponds to the locus of time allocations that yield the same level of happiness. The slope of the budget constraint corresponds to the ratio of the shadow prices of destructive and constructive activities.

The shape of IC_U follows from the functional form of $u(\cdot)$. However, IC_H takes on a "C" shape. To see this, note that for a fixed level of A^+, happiness is increasing in A^- for low levels of A^- and decreasing in A^- for high levels of A^-. Given the continuity of the model, it follows that for any level of happiness that can be sustained at a particular level of A^+, there generically exist two levels of A^- that sustain it. This gives rise to the "C" shape of IC_H. The time allocation determined by the tangency point of the iso-utility curve and the budget constraint, $U^\star$, corresponds to the allocation that would be chosen by a fully-uninformed agent, i.e., one who believes $m_t = 0$. Meanwhile, the allocation $H^\star$ corresponds to the first-best full-information benchmark. Note that these do not coincide in general. Learning can be understood as a process that takes an agent's time allocation from $U^\star$ to $H^\star$.

We use this diagram to explore how time allocation and happiness change in response to a change in relative prices. In the right panel, we consider a change in the price ratio of activities through a decrease in p^-. This could represent the introduction of new technologies that provide a larger jolt of utility in the same amount of time. Under the new prices, a fully-uninformed agent would choose bundle $U^{\star\star}$ and $H^{\star\star}$ would correspond to the first-best full-information benchmark. Note that the distance between $U^{\star\star}$ and $H^{\star\star}$ is larger than the distance between $U^{\star}$ and $H^{\star}$. This suggests that it may require a greater amount of learning to converge to the happiness maximizing bundle. Second, even though the utility maximizing bundle yields a higher level of utility for the agent, a sufficiently large decrease in p^-, as shown, could result in an uninformed agent being less happy.

In the appendix, we exploring the interplay of these comparative statics with the complementarity and substitutability of these activities. We summarize the key insights here. First, activities that are more complementary tend to yield smaller differences between $U^{\star}$ and $H^{\star}$, and reductions in the relative price of p^- lead to smaller distortions. The intuition for this finding is clear: complementarity ensures that an increase in time allocated to A^- must be accompanied by an increase in time allocated to A^+ even for a fully uninformed agent who only understands their utility. This serves as an implicit buffer against destruction of psychic capital.

When activities are highly substitutable, there is the opposite concern. $U^{\star}$ and $H^{\star}$ may be very similar to each other if activities are highly substitutable and A^+ is relatively cheaper, and small changes in relative prices will result in little change in these bundles. However, for a large enough decrease in the relative price of A^-, $U^{\star}$ and $H^{\star}$ may deviate dramatically from each other as agents substitute wholesale from constructive activity to destructive activity.

The price formulation makes the welfare interpretation especially clear. In a standard revealed-preference framework, a fall in the market price of an activity is typically read as an unambiguous welfare gain. In the present framework, that conclusion need not follow. A fall in the price of an activity with weak or negative psychic consequences can increase the privately chosen quantity of that activity while widening the gap between chosen activities and happiness-maximizing activities. Activities that build psychic capital are effectively too expensive; activities that deplete psychic capital are effectively too cheap. Put differently, the market price system need not encode the full happiness consequences of how time is spent.

3.3 The General Environment

We generalize the decision-making environment of the simple model of Section 3.1 as follows. First, we allow for $n_A \geq 2$ different activities and denote by A_{it} the amount of time spent on activity i in period t. We can gather these in the $n_A \times 1$ vector $\boldsymbol{A_t}$ with an associated vector of time varying shadow prices $\boldsymbol{p_t}$. Accordingly, we rewrite the budget

constraint in equation (2) as

$$\sum A_{it} \leq \bar{T} \tag{13}$$

and the utility function in equation (3) as $u_t = u\left(\boldsymbol{A_t}; \boldsymbol{p_t}\right)$. Second, we allow for agents to have uncertainty over both how happiness is generated *and* how psychic capital is generated. Formally, psychic capital now accumulates according to

$$k_t = (1-\delta)\, k_{t-1} + g\left(\boldsymbol{A_t}; \boldsymbol{\gamma}\right) + \nu_t \tag{14}$$

where the vector $\boldsymbol{\gamma}$ parameterizes the mapping between time allocation and psychic capital and ν_t is an i.i.d. mean zero shock with known distribution. Similarly, happiness is specified flexibly as

$$h_t = h\left(u_t, k_t; \boldsymbol{\theta}\right) + \epsilon_t \tag{15}$$

where the vector $\boldsymbol{\theta}$ parameterizes the mapping between utility and psychic capital into experienced well-being, and ϵ_t remains an i.i.d. shock with zero mean and known distribution. The functions u, h and g are assumed to be continuously differentiable, u and h are assumed to be increasing in all arguments, and u is strictly concave in $\boldsymbol{A_t}$. As before, agents choose their time allocations in discrete time periods $t = 0, 1, 2, \ldots$.

In this general set up, agents do not know the true value of $\boldsymbol{\gamma}$ or $\boldsymbol{\theta}$. Instead, at any period t, their beliefs are generally summarized by a n_s-dimensional, real-valued state vector $\boldsymbol{s_t}$ that evolves according to

$$\boldsymbol{s_{t+1}} = \Psi\left(\boldsymbol{s_t}, h_t, \boldsymbol{A_t}\right) \tag{16}$$

Full Information Benchmark

We establish the full information benchmark assuming that the agent knows $\boldsymbol{\theta}$ and $\boldsymbol{\gamma}$. Their problem can be written as

$$V_t^{\mathrm{F}} = \max_{\boldsymbol{A_t}} \left\{ \mathbb{E}_t \left[h\left(u\left(\boldsymbol{A_t}; \boldsymbol{p_t}\right), k_t; \boldsymbol{\theta}\right) + \beta V_{t+1}^{\mathrm{F}} \right] \right\} \; s.t. \, (\mathbf{??}), (\mathbf{??}) \tag{17}$$

where the budget constraint binds and we use V_t^{F} to refer to $V^{\mathrm{F}}\left(k_{t-1}\right)$. The first order conditions of this problem can be rearranged to generate pairwise comparison functions

$$\pi_{ij}^{\mathrm{F}}\left(\boldsymbol{A}\right) = \mathbb{E}_t\left[h_u\right]\left(u_{A_i} - u_{A_j}\right) + \mathbb{E}_t\left[h_k + \beta V_{k,t}^{F}\right]\left(g_{A_i} - g_{A_j}\right) \tag{18}$$

where each function is evaluated at $\boldsymbol{A}$. At the optimal full-information time allocation, $\boldsymbol{A}^{\mathrm{F}}$, $\pi_{ij}^{F}\left(\boldsymbol{A^F}\right) = 0$ for all activities i, j. Together with the time constraint, this characterizes the (first best) full-information time allocation.

Learning and Experimentation

With learning, the agent's problem becomes

$$V_t^{\mathrm{L}} = \max_{\boldsymbol{A_t}} \left\{ \tilde{h}\left(\boldsymbol{A_t}, k_{t-1}, \boldsymbol{s_t}\right) + \beta \mathbb{E}_t \left[V_{t+1}^{\mathrm{L}} | \boldsymbol{s_t}, \boldsymbol{A_t} \right] \right\} \; s.t. \, (2), (5), (16) \tag{19}$$

where $V_t^{\mathrm{L}} = V^{\mathrm{L}}\left(k_{t-1}, \boldsymbol{s_t}\right)$. Extending the simple example, we define expected happiness as

$$\tilde{h}\left(\boldsymbol{A_t}, k_{t-1}, \boldsymbol{s_t}\right) = \mathbb{E}\left[h\left(u\left(\boldsymbol{A_t}; \boldsymbol{p_t}\right), (1-\delta) k_{t-1} + g\left(\boldsymbol{A_t}; \boldsymbol{\gamma}\right) + \nu_t; \boldsymbol{\theta}\right) | \boldsymbol{s_t}\right] \tag{20}$$

Since g is unknown, the contemporaneous mapping from activity choices to psychic capital is itself part of the uncertainty in happiness. We also now define the posterior average marginal contribution of activity i to psychic capital as

$$\tilde{g}_{A_i} = \mathbb{E}\left[g_{A_i}\left(\boldsymbol{A_t}; \boldsymbol{\gamma}\right) | \boldsymbol{s_t}\right] \tag{21}$$

This yields pairwise comparison functions

$$\pi_{ijt}^{\mathrm{L}}\left(\boldsymbol{A}\right) = \left(\tilde{h}_{A_i} - \tilde{h}_{A_j}\right) + \beta \mathbb{E}_t \left(V_{k,t+1}^{\mathrm{L}} \left(g_{A_i} - g_{A_j}\right)\right) + \beta \left(\mathcal{J}_{it} - \mathcal{J}_{jt}\right) \tag{22}$$

for all activities i, j. The first term captures the difference in the (expected) direct contribution to current happiness between activities i and j because activities generate happiness through utility and psychic capital channels. The second term represents the difference in the (expected) contribution to future happiness through psychic capital accumulation between activities i and j. Finally, the new third term represents the information gain or loss from allocating time towards activity i and away from activity j where

$$\mathcal{J}_{it} = \mathbb{E}_t \left[\sum_{l=1}^{n_s} V_{s_l,t+1}^{\mathrm{L}} \frac{\partial s_{lt+1}}{\partial A_{it}} \right] \tag{23}$$

Evaluating the pairwise misallocation function under learning at the first best allocation under full-information yields a useful decomposition:

$$\begin{aligned} \pi_{ijt}^{\mathrm{L}}\left(\boldsymbol{A}^{\mathrm{F}}\right) = & \underbrace{\left(\tilde{h}_u - h_u\right)\left(u_{A_i} - u_{A_j}\right)}_{\text{Static Happiness Misvaluation}} + \underbrace{\tilde{h}_k\left(\tilde{g}_{A_i} - \tilde{g}_{A_j}\right) - h_k\left(g_{A_i} - g_{A_j}\right)}_{\text{Current Psychic Capital Misvaluation}} \\ & + \underbrace{\beta \mathbb{E}_t \left[\left(V_{k,t+1}^{\mathrm{L}} - V_{k,t+1}^{\mathrm{F}}\right)\left(g_{A_i} - g_{A_j}\right)\right]}_{\text{Dynamic Psychic Capital Misvaluation}} + \underbrace{\beta\left(\mathcal{J}_{it} - \mathcal{J}_{jt}\right)}_{\text{Information}} \end{aligned} \tag{24}$$

This function represents how much better off a learning agent would be if they chose a little more of activity i than activity j at the full-information optimal allocation. When evaluated at the learning-optimal allocation, this is by definition zero ($\pi_{ijt}^{\mathrm{L}}\left(\boldsymbol{A_t^{\mathrm{L}}}\right) = 0$)

but when evaluated at $\boldsymbol{A}^{\mathrm{F}}$, it reveals how much the learning agent incorrectly values activity i relative to activity j on the margin. Moreover, it can be decomposed into four parts. The first term corresponds to static misvaluation: because the learning agent doesn't fully appreciate the role of psychic capital in generating happiness, their current period time allocation is distorted. The second term corresponds to current psychic capital misvaluation: the learning agent does not understand the relationship between their time allocation and their psychic capital accumulation. The third term corresponds to dynamic misvaluation: the learning agent doesn't fully appreciate the dynamic consequences of misinvesting in psychic capital in future periods. Finally, the fourth term corresponds to information: the learning agent must take into account how much more or less they would learn about the true happiness generation process under a counterfactual allocation.

As long as the learning agent is better off at the first-best allocation[28], then for any pair of activities i and j, we can make the agent better off by trading off activity j for activity i if a lower value of j is chosen at the full-information benchmark. The central force in the model is misvaluation of psychic capital. The second and third terms in Equation 24 make clear that the sign of this misvaluation is determined by the relative magnitudes of g_{A_i} and g_{A_j}, both in terms of their actual values and what agents believe about the importance of psychic capital and how it is accumulated. When $g_{A_i} > g_{A_j}$, A_i tends to be underconsumed relative to A_j, which directly generalizes the simple two-activity model. In addition, when agents under-perceive the ramifications of different activities, i.e., $\left|\tilde{g}_{A_i} - \tilde{g}_{A_j}\right| < \left|g_{A_i} - g_{A_j}\right|$, then the time wedge is generally larger than it would otherwise be.

3.4 Implications of the General Model

The basic mechanism in the simple model of Section 3.1is not an artifact of the stylized two-good environment. While that model distinguishes between constructive and destructive activities transparently, the same logic survives in a more general environment when activities are multidimensional, when utility and happiness are nonlinear, and when experimentation is built directly into the choice problem. We briefly note four economically substantive benefits from this generalization.

First, multiple types of activities adds crucial economic realism to our model. For instance, standard models of labor-supply treat work and leisure as entirely separate endeavors, but there is a rich literature that has advanced the idea that there is heterogeneity in utility across job types and that work generates important psychic benefits through strictly non-pecuniary channels – it contributes to individuals' senses of identity, meaning and self-worth. (Wrzesniewski et al. (1997); Terkel (2011); Wilson (2011); Lavetti (2023); Mas (2025)).

Certain aspects of psychic well-being are also derived from certain combinations of activities. This can be modeled with complementarities in the psychic capital production

[28]This will be true as long as the informational value of experimentation near $\boldsymbol{L}^{\mathrm{L}}$ to the learning agent is not too large.

function. In the simple model, the only relevant substitution is between constructive and destructive activities. In the general model, a change in the price of one activity may draw time away from several others, and those displaced activities need not all have the same psychic consequences. This is economically important. A fall in the effective price of one passive, individually consumed, high-immediacy leisure activity might crowd out social leisure, physical leisure, civic leisure, and contemplative leisure all at once. The resulting change in psychic capital may therefore be much larger than would be suggested by a two-good model, precisely because the displaced activities may each contribute positively to psychic capital in distinct ways. A broader range of activities also allows for the possibility of more complex externalities in time use, which Bursztyn et al. (2025) find evidence of in the case of social media. The general model is thus better suited to thinking about broad changes in the composition of time use induced by technological or economic change.

With many forms of leisure available to individuals, basic results from portfolio theory also apply. For instance, the complementarities in the model will generally imply that happiness maximizing bundles will diversify across many activities, which is supported by the findings of Pressman et al. (2009). In addition, the Harvard Study of Adult Development found that individuals who filled multiple social roles – parent, sibling, coworker, neighbor, friend – tended to be happier than individuals who filled fewer social roles, other things equal.

Moreover, multiple types of activities allows the misallocation wedge to operate across many margins at once. In a two-activity model, misallocation takes the form of too much A^- and too little A^+. In the general model, the relevant distinction is not between two labels but between activities with differing marginal contributions to psychic capital. This matters because most real activities cannot be naturally partitioned into a single "good" and a single "bad" activity. Instead, people choose among many activities that vary in immediate gratification, sociality, depth, discipline, creativity, passivity, and psychic consequences. The general model captures the idea that changes in time allocation can occur along many different margins simultaneously, and that the welfare consequences of those reallocations depend on how each activity affects psychic capital.

The second substantive gain arises from potential nonlinearities in happiness. In the simple formulation of our model, we restrict happiness to be linear in utility and psychic capital in order to derive closed-form policy rules. In the general model, psychic capital may exhibit diminishing returns, so that the marginal happiness cost of psychically destructive activities is especially large when psychic capital is already low. Alternatively, psychic capital may complement utility, so that the same amount of immediate utility yields more happiness when generated in a life with greater psychic capital. These possibilities open the door to state dependence. The same activity may be only mildly harmful for an agent with high psychic capital and much more harmful for an agent with low psychic capital. As a result, the wedge between first- and second-best time allocations may vary over the life cycle or across people with different histories of time use.

Third, nonlinearities in the general model clarify the role of path dependence. Because

psychic capital is a state variable, current time use choices affect not only current happiness but the future productivity of different ways of living. Once nonlinearities are allowed in the g or h functions, these dynamic effects can become highly persistent. Repeated overconsumption of psychically destructive activities may gradually reduce psychic capital to a point where life becomes increasingly organized around activities with high immediate utility but weak long-run contribution to happiness. Conversely, sustained engagement in psychically constructive activities may build a stock of psychic capital that makes a wider range of activities more meaningful or satisfying. The general model therefore permits not only wedges, but trajectories as agents may drift into time use compositions that are increasingly difficult to reverse, even when they are trying to learn what makes them happy. Moreover, this implies persistent negative long-run effects of destructive activities in addition to negative short-run effects that have already been documented from, for example, the overconsumption of social media (Braghieri et al. (2022); Bursztyn et al. (2025); Allcott et al. (2020, 2022)).[29]

Fourth, experimentation is less restricted in the general environment. In Section 3, experimentation was introduced in a transparent Gaussian learning environment with the clear implication that an informational term was added to the first-order conditions. In the general model, that same point remains true, but it has broader meaning. Experimentation should not simply be understood to be the acquisition of statistical information about a scalar parameter. It is a process by which agents use their lives to learn how immediate pleasures, habits, social ties, discipline, and forms of psychic accumulation fit together into happiness. The informational motive can push agents toward more informative activity allocations, and in that sense it works against the distortion. But because experimentation itself is filtered through agents' beliefs, it does not generally erase the wedge. People learn, but they learn from within a life already structured by their current understanding of what matters.

For a richer understanding of happiness, that last point is central. Our model does not rely on the notions that people are irrational, that they ignore happiness, or that they are mechanically trapped by a fixed behavioral bias – though that could certainly be the case. Rather, it models people as trying to understand what makes life good while allocating time in an environment where some activities are immediately rewarding, some are psychically constructive, and the relationship between the two is not fully understood. In an environment where agents gradually discover what gives meaning to life, systematic misallocation of their time is a robust implication of the joint presence of heterogeneous

[29]The role of path dependence in our model also offers a clear interpretation of the literature on adverse and positive childhood experiences. Adverse childhood experiences can be seen as shocks to psychic capital; nurturing relationships are particularly effective in neutralizing the adverse effects of these shocks because they offer agents the ability to maintain and rebuild psychic capital (Garner and Yogman (2021); Shonkoff and Garner (2012); Aliprantis and Tauber (2025)), which can return agents in our model back to their original steady state. Moreover, psychic capital can explain why children benefit from nurturing relationships and positive childhood experiences even in the absence of adverse childhood experiences (Bethell et al. (2019,?)).

activities, psychic capital, and incomplete knowledge of the happiness-production process. As we show in Section 6, when we incorporate rational and behavioral augmentations to model phenomena such as addiction and temptation, the central conclusions of our model persist and are likely strengthened.

4 The Prices of Destructive Activities Have Declined

The prices of solitary activities using computers, smartphones, and streaming videos have fallen remarkably over the ATUS sample period. For those technologies that did not exist two decades ago, the price has effectively come down from infinity. Given that these technologies have been robustly adopted by the vast majority of Americans, and that they have different levels of complementarity and substitutabililty with different traditional activities, it follows that the relative prices of most pairs of activities will likely have changed as well.[30]

Importantly, these technologies constitute a new form of extremely low-cost leisure that has been shown to contribute little to an agent's psychic state and may actually lead to its deterioration (Braghieri et al. (2022); Twenge et al. (2018)). [31] The hyper-personalization of this form of leisure has unbundled low-cost, destructive leisure activities from constructive activities. Our model predicts that basic economic incentives would then push agents to shift away from constructive activities and towards destructive activities, which would impair their ability to find happiness. Moreover, the rapid diffusion of these technologies (and associated price changes) presents a highly non-stationary environment that is well known to severely hamper the learning process and exacerbates the central distortion of the model.

Although we cannot observe shadow prices of specific activities, we show here that the changes in quantities observed in the ATUS are consistent with what the model predicts given the broad price changes that we know occurred. We do not attempt to classify all categories of activities as constructive or destructive.[32]Instead, we give a broad overview of

[30]While overall screen time of teenagers was relatively stable near 6.5 hours per day between 2004 and 2016 (Roberts et al. (2005); Rideout et al. (2021)), over this time period the composition of this screen time shifted heavily toward phone and internet-based screen time such as surfing the internet, texting, using social media, and gaming (Twenge et al. (2019)). By 2024 smartphone ownership was 90 percent for adults and 95 percent for teenagers (Pew Research Center (2025); Faverio and Sidoti (2024)). Less than 10 percent of American adults used social media in 2005, but this grew to nearly three-quarters by 2021 (Perrin (2015); Vogels (2021)). Nearly half of American teens aged 13-17 reported being online constantly in 2024 (Faverio and Sidoti (2024)).

[31]See also Haidt et al. (2026);Allcott et al. (2020, 2022); and Orben and Przybylski (2019).

[32]This would be a major undertaking. Consider that it is non-trivial even to classify activities by the coarse categories of work, home production, or leisure. For example,Aguiar and Hurst (2007) andRamey and Francis (2009) reach different conclusions about trends in leisure time due to judgment calls like whether gardening should be classified as leisure or home production; see related discussions in Krueger (2007) and Aguiar et al. (2012).

changes in time use with an emphasis on time alone as an proxy for (relatively) destructive activity in comparison with time spent with others while engaged in an activity in the same category. This is supported by the fact that relationships are critical for happiness (Waldinger and Schulz (2023)) and that spending time alone is robustly associated, on average, with lower happiness (Hamermesh (2020),Atalay (2024)). Figure 8 confirms that similar patterns hold in our data. [33]

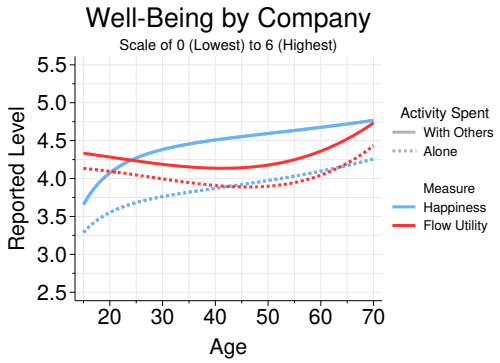


Figure 8: Well-Being by Company during Activity, by Age
Note: This figure shows data from the Well-Being Module in the 2010, 2012, 2013, and 2021 waves of the American Time Use Survey (ATUS).

Another reason for our focus on time alone is that it allows us to get a sense for how the bundling of constructive and destructive activities has changed. Even if we were to classify specific activities as constructive or destructive, it would still be difficult to assess their bundling in the ATUS, as the survey does not collect information on secondary activities.[34] Nevertheless, since the ATUS does collect information about who respondents we with while they engaged in an activity, we are able to observe how time spent in various activities is bundled with spending time with others or alone.

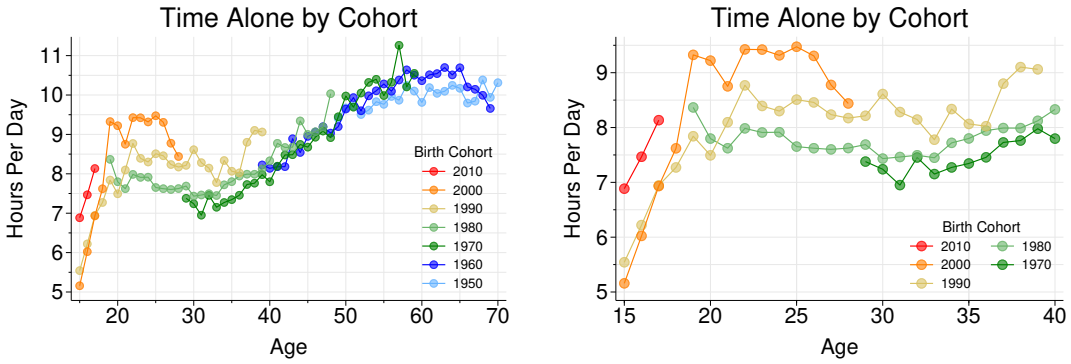
We show three features of the recent changes in time use that each point to a price change rather than a preference shift as their cause. The three patterns documented below include a clear difference across cohorts that most strongly affects the youngest cohorts; a change in the mix of activities, generally favoring passive, solitary activities; and a broad-based rise in time alone within all categories of time use. The combination of these changes can be rationalized as a fall in the relative price of destructive individualized activities.

[33]This does not imply that spending time alone always destroys psychic capital, just asDurlauf (2002) notes that social connectivity and social capital do not always lead to positive outcomes.

[34]The one exception is childcare; see Section 7.6 ofBLS (2025).

4.1 Cohort Trends Are Consistent with a Technology-Driven Price Shock

Figure 9 reveals massive changes in time spent alone across 10-year birth cohorts. The first panel documents an overall lifecycle pattern in which time alone starts low (as children are likely living with parents and siblings), then increases rapidly in the late teens, stabilizes in the 20s, and starts to increase again in the 30s until peaking around age 60. Note that for ages 40 and greater, all birth cohorts centered at years 1980 or earlier display a similar pattern over the life cycle. In the second panel, we zoom in on more recent cohorts at younger ages. Here we see large gaps emerge by birth cohort, as time spent alone increases for younger birth cohorts. These gaps are particularly stark when comparing ages 15 and 25. By age 25, those in the 1990 birth cohort spent nearly a full hour more per day alone than those in the 1980 birth cohort. This pattern continues, as the 2000 birth cohort spent nearly a full hour per day more alone than those in the 1990 birth cohort. Even at age 15, those in the 2010 birth cohort spent between 1.3 and 1.7 hours more alone per day than those in the 1990 and 2000 birth cohorts.



(a) Time Alone by Cohort and Age

(b) Time Alone for Recent Cohorts at Young Ages

Figure 9: Time Alone by Cohort

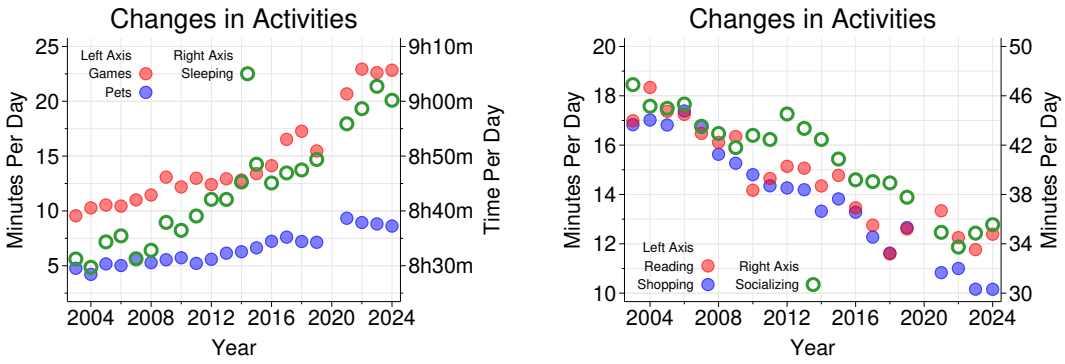
Note: This figure shows time use data from the American Time Use Survey (ATUS). Both panels show the average number of hours per day spent alone by age conditional on being in birth cohorts centered at the labeled year. For example, the 1980 group comprises individuals born between 1975 and 1984. The sample comprises a nationally-representative group of individuals aged 15 to 70.

Had preferences suddenly shifted toward valuing time alone more, we would expect an increase in time alone to occur more uniformly across ages. In contrast, a price change driven by new technologies like smartphones, social media, and streaming media would have the largest effects on the youngest cohorts who are still learning about how their time use translates into happiness and are more likely to adopt novel technologies.

4.2 Time Use Has Changed

We now document meaningful changes in the categories of activities that people engage in. Since 2003 there have been increases in time spent on (video) games, pets, and sleeping (Figure10a). Over this same time period there have been decreases in time spent reading, shopping, and socializing (Figure10b). In AppendixD.3, we show results for additional categories. We find that there have been increases in time spent relaxing and on food preparation; decreases in housework and commuting or traveling; and work and time spent on a TV or computer not for work have been relatively flat (with the exceptions of discrete changes around the Great Recession and the COVID-19 pandemic).

The model predicts that as cheap solitary activities increase, they will simultaneously crowd out constructive social activities through the time constraint. This is consistent with the fact that the increase in passive solitary activities like sleeping and (video) games coincides with a decline in socializing.



(a) Games, Pets, and Sleeping

(b) Reading, Shopping, and Socializing

Figure 10: Changes in Activities

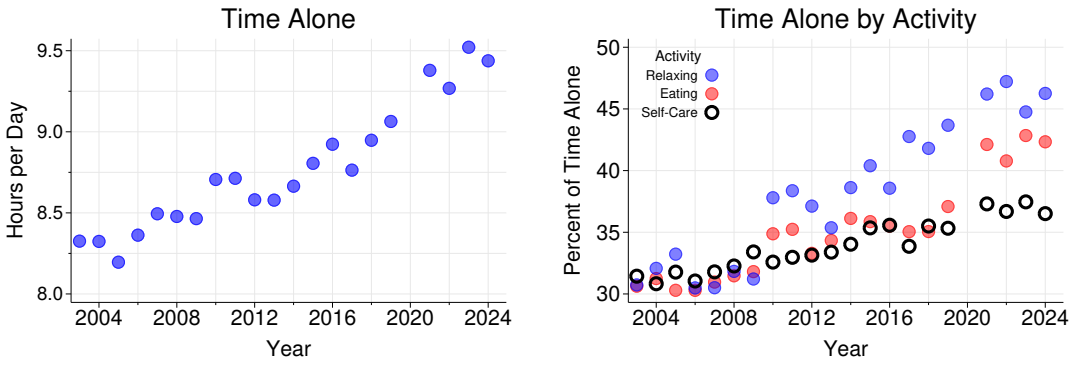
Note: This figure shows data from the American Time Use Survey (ATUS).

4.3 Within-Category Substitution Toward Solitary Activities Indicates Falling Relative Prices

The fact that Americans are spending more time alone is well-known. Figure11a shows that the long-run trend toward spending more time alone has been present since the beginning of the ATUS in 2003.[35]What is perhaps less well-known is how broadly based this

[35]In AppendixD.2, we show that this is a long-run trend pre-dating COVID-19, and that this trend is not simply an artifact of Americans spending more time at home (Sharkey (2024)) While it is difficult to measure overall time alone in the predecessor to the ATUS, the American Heritage Time Use Survey (AHTUS), the most relevant evidence from that data set indicates that leisure time along has been increasing steadily since 1965 (Rinderknecht et al. (2026); Sevilla et al. (2012)).

increase in time alone is. We find that the increasing trend is evident in nearly every activity category over the past two decades. The breadth of this pattern across activities as dissimilar as eating meals, relaxing, self-care, and engaging in sports or exercise is more consistent with a common, all-category shift in the relative price of solitary versus social activities than with category-specific changes in tastes. Figure11b shows some of the potentially surprising examples; the percent of time alone has increased markedly while relaxing, eating, and even engaging in self-care like grooming or showering.[36]



(a) Time Spent Alone

(b) Time Spent Alone

Figure 11: The Increase in Time Spent Alone

Note: This figure shows time use data from the American Time Use Survey (ATUS). The left panel shows the average number of hours spent alone per day by year for a nationally-representative sample of individuals aged 15-70. The right panel shows the average percent of time alone conditional on engaging in a specific activity between 2003 and 2024.

5 Reconciling Some Puzzles in the Economics of Happiness

A large empirical literature documents systematic gaps between observed behavior, well-being, and the predictions of standard utility-based models. While these findings are often treated as distinct anomalies, our framework allows us to understand many of them through a common lens. In this section, we analyze two of the most prominent puzzles – a weak long-run happiness response to income growth and a midlife trough in experienced well-being. We show that the former can arise simply from a falling relative price of destructive activities and that the latter could simply reflect a tension between flow utility and happiness. We also note briefly that several other well established empirical

[36]In AppendixD.4 we show how broadly based these changes are, as they extend to activities such as playing games, spending time on a TV or computer not for work, food preparation, sports and exercise, housework, working, and making calls.

behavioral phenomena that are difficult to reconcile in a standard neoclassical utility maximizing framework such as a flat labor supply response across the wealth distribution, hedonic adaptation, choice overload leading to a decrease in subjective well-being, and a growing divergence between stated and revealed preferences for time allocation all follow immediately from our model given price changes.

5.1 Income Growth and the Easterlin Paradox

One of the earliest and most influential empirical findings in the economics of happiness is the so-called Easterlin paradox: within countries, individuals with higher income report higher subjective well-being, yet over time, increases in average income are associated with much smaller gains in average happiness than standard models would predict. Easterlin (1974) first documented this pattern using cross-country and time-series data, and subsequent work has both refined and challenged the original claim. Notably, Stevenson and Wolfers (2008) argue that happiness does rise with income over long horizons, and Oswald (1997) finds evidence of a positive relationship between happiness and economic growth in the US and Europe. But in both studies the estimated magnitude of this relationship is modest relative to the large increases in GDP per capita observed in many countries.

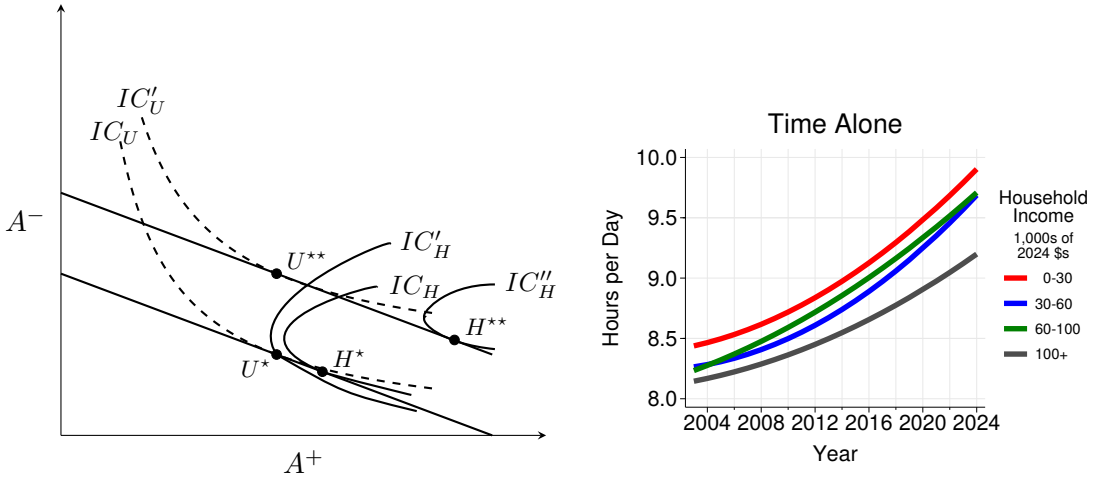
This pattern is difficult to reconcile in a standard utility model in which income is a principle argument of indirect utility because sustained increases in income should translate into sustained increases in well-being. Various explanations for this have been proposed based on relative income and social comparisons (Luttmer (2005)), hedonic adaptation (Diener et al. (2006), Di Tella et al. (2010)), and rising aspirations. Common to all of these explanations is that the mapping from income to experienced well-being is mediated by behavioral or psychological factors.

In our framework, the Easterlin Paradox arises naturally if increases in income need not shift time allocation towards constructive activities. Increases in flow utility made possible by rising incomes could even be offset to some extent by reductions in psychic capital depending on the evolution of prices. The dynamics of psychic capital accumulation imply that even under sustained income growth, the paradox may persist.

We illustrate two facts in Figure (12). In the first panel, we illustrate how an endowment shock might affect the time allocations of uninformed and fully-informed agents in a simple world with two activities, one constructive and one destructive. As shown, the uninformed agent, who would have located at $U^\star$ prior to the shock now locates at $U^{\star\star}$, and the fully-informed agent, who would have located at $H^\star$ prior to the shock now locates at $H^{\star\star}$. It is immediate that even decreases in shadow prices of activities that preserve the price ratio as we would expect from increases in income may lead to small increases – or even decreases – in happiness in all but the most informed agents.

Of course, this would not hold if destructive activities were highly inferior in the sense that they are chosen less as incomes rise. In the second panel of Figure (12) we present evidence on the relationship between income and plausibly destructive activities from 2003

to 2024. Despite the Great Recession and COVID-19 pandemic, real GDP per capita grew by over a third over this time period.[37] Nevertheless, the shift toward greater time spent alone appears uniformly for people of all incomes. This empirical fact would be difficult to reconcile with the idea that destructive activities are inferior.



(a) An Endowment Shock

(b) Time Alone, by Year and Income

Figure 12: Rising Incomes, Stalled Happiness?
Note: Panel (b) uses data from the American Time Use Survey (ATUS).

5.2 The U-Shaped Relationship Between Age and Experienced Well-Being

A large cross-country literature documents a U-shaped relationship between age and flow utility, with utility declining from youth into midlife and rising thereafter.[38]Figure 13 reproduces this pattern in the ATUS as displayed earlier. The U-shape of the dashed red line shows that flow utility declines between ages 15 and the mid-to-late 40s, at which point it rises again. The deep U pattern of the dashed green line is consistent with results in the literature that negative affect plays an important part of this relationship (Blanchflower (2020); Blanchflower et al. (2023)). While this literature is complicated by the difficulty in distinguishing lifecycle effects from cohort effects (Frijters and Beatton (2012); Cheng et al. (2017)) and heterogeneity across space (Steptoe et al. (2015)Deaton (2018)Blanchflower (2021)), the general robustness of this pattern across datasets and countries has made it a central empirical regularity in the literature on subjective well being.

[37]See https://fred.stlouisfed.org/series/A939RX0Q048SBEA. Over this time period overall real GDP grew from 14.9 to 23.3 trillion 2017 US dollars; see https://fred.stlouisfed.org/series/GDPC1#

[38]Blanchflower and Oswald (2004, 2008)Stone et al. (2010)Laaksonen (2018)Bartram (2023)

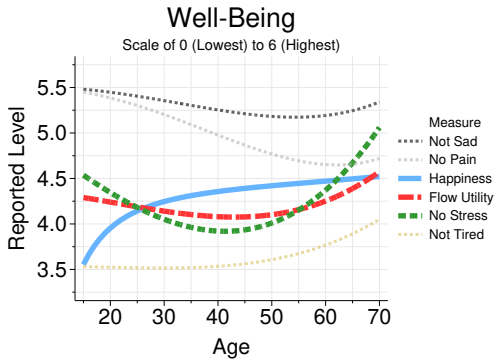


Figure 13: Well-Being by Company during Activity, by Age
Note: This figure shows data from the Well-Being Module in the 2010, 2012, 2013, and 2021 waves of the American Time Use Survey (ATUS).

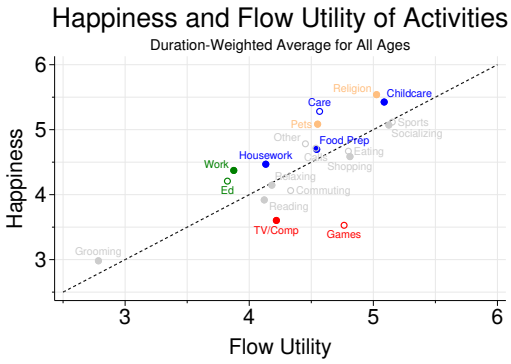
Standard lifecycle models do not generate such a pattern in any straightforward way (Deaton (2018)). Explanations have focused on changing expectations, social comparison, selection effects, and age-related improvements in emotional regulation.[39] Our framework suggests an additional mechanism operating through activities for which there is a conflict between utility and happiness. Choice sets change over the life cycle, with midlife characterized by low or negative utility activities that build psychic capital, like changing diapers, preparing school lunches, or staying in an unpleasant job for the income it generates for one's household.[40] If we think of role obligations as effortful activities that are often unpleasant but meaningful, then the midlife concentration of these obligations (Hamermesh and Lee (2007); Stone et al. (2010)) can be easily explained by our model.

We present evidence from the ATUS in support of this life cycle pattern. Panel (a) of Figure 14 shows a scatter plot of activities by their average flow utility and meaning across all ages. Activities with higher meaning but lower flow utility are located above the 45 degree line and those with higher flow utility than meaning are located below the 45 degree line. The results are in line with standard priors: Shown in green, work and education give higher meaning than utility. Shown in red, screen-based activities like watching TV, using a computer (not for work), and (video) games are all pleasant but low-meaning activities. And shown in blue, activities like caring for one's own child, caring for others who are not one's child, preparing food, and doing housework all receiving ratings of being more meaningful than enjoyable. Panel (b) shows this same figure aggregated to the level of household activities (in blue), word or education (green), screen-based activities (red), and other activities (gray).

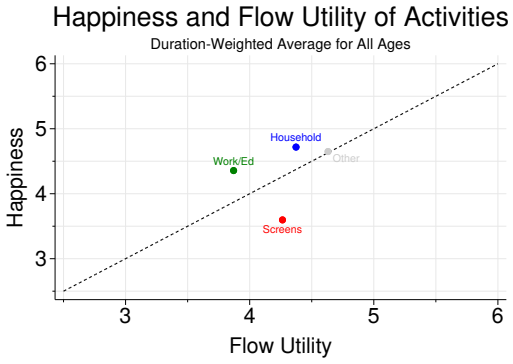
[39] See Easterlin (2001)Clark et al. (2008)Ferrer-i Carbonell (2005); Clark and Oswald (1996)Segerstrom et al. (2016)Roberts et al. (2006)

[40] Childcare ranks low on experienced affect (Kahneman et al. (2004)), despite ranking high for meaning (Nelson et al. (2013)). White and Dolan (2009)show that this tension is true for work as well as childcare.

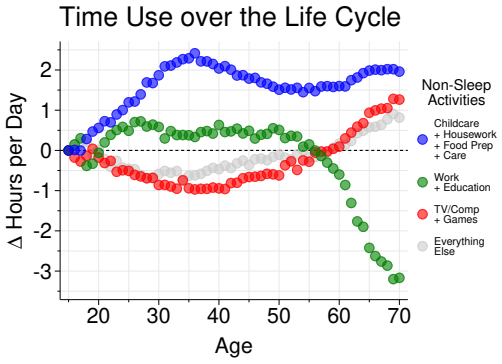
Panel (c) of Figure 14 shows how these activities change over the life cycle relative to their levels at age 15. Shown in blue, household-oriented activities that are more meaningful than enjoyable increase by more than 2.5 hours by age 35, declines by an hour by age 50 and then increases by half an hour between ages 60 and 70. Work and education, shown in green, are also activities that are more meaningful than enjoyable, and these activities gain half an hour by age 25 and stay at that elevated level until starting a sharp decline around age 50. Pleasant but low-meaning screen-based activities, shown in red, decline by an hour between ages 15 and 30, rise by half an hour in the 40s, and start a strong climb around age 50. All other activities, shown in gray, follow a similar pattern as screen-based activities.



(a)



(b)



(c)

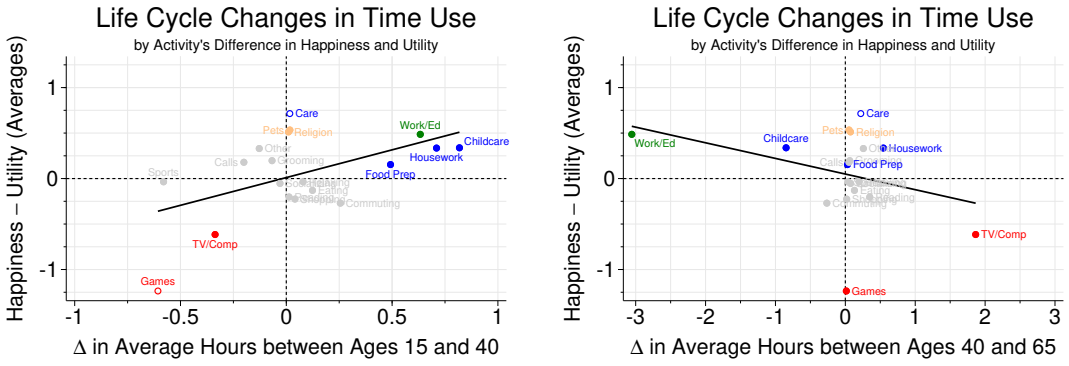
Figure 14: Well-Being by Company and Age

Note: This figure shows data from the Well-Being Module in the 2010, 2012, 2013, and 2021 waves of the American Time Use Survey (ATUS).

Figure 15 statistically confirms this visual pattern. On the y-axis of these figures we

show the difference in how meaningful an activity is versus how enjoyable it is, and on the x-axis we show the change over a given age range in the average number of hours spent on an activity. Panel (a) confirms that between early adulthood and midlife individuals trade off more enjoyable activities for more meaningful ones. The largest increases in activities between the ages of 15 and 40 are toward activities with greater meaning than utility, such as work or education (in green) or childcare, housework, or food preparation (in blue). The largest decreases in activities between ages 15 and 40 are screen-based activities that are more enjoyable than meaningful, as shown in red. The positive slope of the black regression line confirms that on average individuals are selecting into more meaningful activities and out of more enjoyable activities.

Panel (b) of Figure 15 confirms that between midlife and late adulthood individuals trade off more meaningful activities for more enjoyable ones. This relationship is driven almost entirely by a decrease in the more meaningful work or education activity and the more enjoyable activity of watching TV or using a computer, although some of the relationship appears to also be driven by the decrease in time spent caring for one's child. The negative slope of the regression line displayed in black shows that on average, individuals select into activities with higher utility and out of activities with higher meaning.



(a) (b)

Figure 15: Well-Being by Company and Age

Note: This figure shows data from the Well-Being Module in the 2010, 2012, 2013, and 2021 waves of the American Time Use Survey (ATUS).

5.3 Additional Puzzles

The Flat Supply of Labor across the Wealth Distribution In a recent paper, Ferraro and Valaitis (2025) note that in standard heterogeneous agents models, wealthier households consume more, engage in more leisure, and work fewer hours, while in the data, labor supply is flat across the wealth distribution. They show that a model with

Figure 16: Empirical Cumulative Distribution of Meaning Derived from Work, by Age

heterogeneous consumption quality resolves this contradiction, as wealthy households keep working to facilitate their preferred, high-quality consumption.

Our model offers a complementary explanation through activities that are heterogeneous in their flow utility and contribution to happiness. Both wealth (Kuhn and Ríos-Rull (2025)) and meaning from work rise with age (Figure 16). Thus our model suggests that work need not only be instrumental but mightalso generate psychic capital *per se*. In this case, the wealthy may work more and later into their lives because it contributes more to their happiness than other activities.

Hedonic Adaptation An extensive empirical literature documents that individuals exhibit substantial adaptation to changes in life circumstances. Following both positive and negative shocks, life satisfaction tends to move back toward a baseline level over time, although the degree of adaptation varies across domains. Early evidence from Brickman et al. (1978) suggested rapid adaptation to large income shocks, while more recent studies using panels of individuals (Clark et al. (2008)) show that adaptation is often incomplete, particularly for events such as unemployment.

Adaptation poses a challenge for models in which utility depends directly on contemporaneous states because permanent changes in income or circumstances should not produce transitory effects on well-being. One class of explanations emphasizes changing reference points, while another emphasizes psychological habituation. In our framework, adaptation is closely tied to the distinction between activities that generate immediate utility and those that build psychic capital. Activities that yield high contemporaneous utility but little accumulation in psychic capital will produce transient increases in happiness that fade as the underlying state remains unchanged. Likewise, psychic capital can limit the effect of life events that restrict the choice set of activities.

Choice Overload and the Costs of Optimization In practice, expanding the set of available choices does not necessarily increase well-being and may, in some cases, reduce it. Schwartz and Ward (2004) argues that an abundance of options can lead to choice overload, regret, and dissatisfaction, and Iyengar and Lepper (2000) provide experimental evidence that larger choice sets can reduce both participation and satisfaction.

These findings are difficult to reconcile with the standard revealed-preference logic that more choice weakly increases utility. In our framework, a reduction in the full price of certain types of activities is accompanied by a dramatic expansion in the number of available options within those categories. This expansion increases the cognitive burden of optimization and may exacerbate misallocation if individuals have imperfect knowledge of how different activities translate into psychic capital. As a result, the welfare effects of increased choice depend not only on the size of the choice set but also on the structure of preferences, the costs of decision-making, and the dynamics of learning.

Time Use and the Allocation of Activities Evidence from time-use surveys provides a direct window into how individuals allocate their time across activities and how these allocations relate to experienced well-being. A striking finding is that individuals do not systematically devote more time to the activities that yield the highest moment-to-moment happiness. Kahneman et al. (2004) show that activities such as socializing and intimacy are associated with high levels of experienced well-being, while other commonly performed activities yield lower levels.

This divergence between chosen and happiness-maximizing time use poses a challenge for standard models of rational choice. In our framework, it arises naturally from a combination of imperfect information, dynamic considerations, and the distinction between immediate utility and longer-run psychic capital. If individuals overweight the immediate utility of certain activities or underestimate their long-run effects, then observed time use will systematically deviate from the allocation that maximizes experienced well-being. Changes in the relative full price of different activities can amplify this divergence by making low-psychic-capital activities disproportionately attractive.

6 Addiction and Temptation

6.1 Addiction

In their seminal paper, Becker and Murphy (1988) present a rational model of addiction in which time consistent agents develop a dynamic dependency on the consumption of an addictive good. This dependency is mediated through a stock of capital that is augmented by the consumption of the addictive good and in turn increases the agent's future marginal utility for that good. Addictive capital plays a similar role to psychic capital in our model, though there are two important differences. First, and most importantly, there is a learning and experimentation process at the center of our framework; without this, agents act

optimally and there is no wedge between the decisions that they take and the decisions that would maximize happiness *ex post*. Second, the capital stock in our model is directly affected by *all* time allocation decisions, whereas dynamic dependencies in the Becker and Murphy (1988) model are propagated through the consumption of a particular addictive good.

Nevertheless, addiction and (un)happiness seem to share something conceptually in common, and addictive consumption is often a destructive activity. We can incorporate the rational model of addiction into our framework by simply enlarging the utility function with a secondary stock of addictive consumption capital à la Becker and Murphy (1988):

$$u_t = u\left(\boldsymbol{A_t}, S_t\right) \tag{25}$$

where this stock evolves according to

$$S_t = \rho S_{t-1} + A_{jt} \tag{26}$$

where j is the addictive activity, and all else remains the same. Adding addiction to the model will generally increase the amount of time allocated to A_j (at the expense of other activities). However, as long as the contribution of S_t to happiness is known (e.g., it affects happiness through a known, separable channel), then the consumption wedge between the first best and full information time allocations is unaffected. This clarifies that the mechanism driving the misallocation of time in our model is fundamentally informational in nature. Only if S_t interacts with the misperception channel will the wedge be affected. In this sense, rational addiction is a straightforward extension to our model, but operates in a fundamentally distinct way.

6.2 Temptation

Many activities, especially seemingly destructive ones, are regretted by agents after they engage in them. For example, a relatively new leisure activity, the use of social media, has emerged in as one of the fastest growing uses of people's time. Despite its popularity, individuals often express regret about their social media use, they have been shown to be willing to pay to commit to not use social media, and certain groups who are particularly heavy users of social media have also suffered active, short-run harm from social media use.[41]

With this in mind we expand our model to consider tempting activities in a very parsimonious way that captures the commitment problems that arise from engaging in them. A fundamental difference between this extension and that of rational addiction is that here agents are time inconsistent, which seems to be a crucial element to match the growing empirical consensus on this behavior. Formally, we follow the insights of Laibson

[41] Bursztyn et al. (2025); Haidt (2022); Allcott et al. (2020, 2022)

(2001) and model this with an additively separable temptation term in the objective that the agent maximizes. So, although the agent's (structural) happiness function remains the same (i.e., $h_t = h\left(u\left(\boldsymbol{A_t}\right), k_t\right)$), their decision problem is written as

$$V_t^{\mathrm{L}} = \max_{\boldsymbol{A_t}} \left\{ \tilde{h}\left(\boldsymbol{A_t}, k_{t-1}, \boldsymbol{s_t}\right) + \lambda_t v\left(A_{jt}\right) + \beta \mathbb{E}_t \left[V_{t+1}^{\mathrm{L}} | \boldsymbol{s_t}, \boldsymbol{A_t}, \lambda_t \right] \right\} \; s.t. \, (2), (5), (16) \tag{27}$$

where A_j is the tempting activity, and v is function that satisfies $v' > 0$, $v'' \leq 0$. The coefficient λ_t is increasing in prior time spent on activity A_j. We model this in the simplest possible way as

$$\lambda_t = \eta A_{jt-1} \tag{28}$$

where $\eta > 0$. The more that an agent is tempted to engage in activity A_j, the greater its marginal utility to the agent. Everything else is unchanged from the original, general model. In this model, the time allocation wedge between non-tempting activity i and tempting activity j can now be written as

$$\begin{aligned} \pi_{ijt}^{\mathrm{L}}\left(\boldsymbol{A}^{\mathrm{F}}\right) = & \underbrace{\left(\tilde{h}_u - h_u\right)\left(u_{A_i} - u_{A_j}\right)}_{\text{Temptation Augmented Static Misvaluation}} + \underbrace{\beta\eta\left(V_\lambda^L - V_\lambda^F\right)}_{\text{Temptation Stock}} + \underbrace{\beta\left(\mathcal{J}_{it} - \mathcal{J}_{jt}\right)}_{\text{Information}} \\ & + \underbrace{\tilde{h}_k\left(\tilde{g}_{A_i} - \tilde{g}_{A_j}\right) - h_k\left(g_{A_i} - g_{A_j}\right)}_{\text{Current Psychic Capital Misvaluation}} + \underbrace{\left(\left(\tilde{h}_k - h_k\right) + \beta\left(V_k^{\mathrm{F}} - V_k^L\right)\right)\left(g_{L_i} - g_{L_j}\right)}_{\text{Dynamic Psychic Capital Misvaluation}} \end{aligned} \tag{29}$$

Note two changes as compared with equation (24). First, the wedge now evolves over time independently of learning in the information term since there is a new state variable (λ_t). Since both the fully informed and learning agents are susceptible to temptation, current period temptation payoffs do not generate any static misvaluation. Second, there is a new term that captures the dynamic contribution of the temptation stock to the wedge. If the tempting activity j is destructive relative to activity i, then incorporating temptation into the model widens the wedge and exacerbates the misallocation of time away from constructive activities and towards destructive activities if the learning agent underestimates the future welfare cost of temptation. This results in lower psychic capital and happiness.

7 Conclusion

Few ideas are as timeless and universal as the idea that life is a constant search for meaning; the true nature of what we seek is not fully known but rather learned through experiences. We formalize this idea with a parsimonious economic model that features an imperfectly understood objective that we term happiness, which is gradually discovered

through experimentation and is generated jointly by how agents allocate their time and their endogenous psychic state. The central contribution of this model is to illuminate the limitations that agents face in maximizing their happiness that emerge from this information problem. An incomplete understanding of happiness leads to both static misvaluation of the benefits of different activities and dynamic misvaluation of how current time allocation affects future happiness through the agent's psychic state, though these are tempered by learning.

Our framework formalizes the tradeoffs between various activities transparently through a set of prices that shape individuals' time allocation decisions. This provides a powerful tool to reconcile many longstanding empirical puzzles in the economics of well-being. It also allows us to speculate how technological advances might shape the happiness of future generations. We argue that over the past several decades, new innovations in leisure, such as the proliferation of on-demand digital media, has introduced a new form of extremely low-cost leisure that contributes little to an agent's psychic state. The hyper-personalization of this and other activities, have also unbundled various types of activities. As a result, basic economic incentives have pushed agents to shift away from constructive activities and towards destructive activities, which has impaired their ability to find happiness. Moreover, the rapid rate of change in these activities has contributed to a non-stationary environment in which learning has been made more difficult. This exacerbates the central distortion of the model.

A nice feature of our framework is its ability to readily accommodate other phenomena such as addiction and temptation that have been studied by both neoclassical and behavioral theorists. We hope that this serves as a scaffolding to improve our understanding of new decisions that have potentially complex psychological implications surrounding modern media, entertainment and artificial intelligence.

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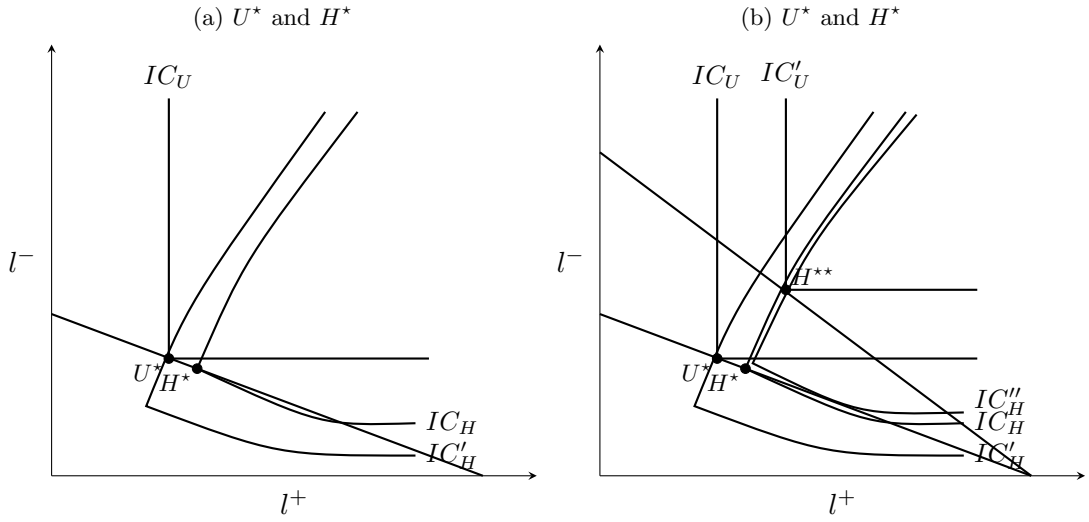
A Appendix

A.1 Comparative Statics under Full Complementarity and Substitutability

In Figure 17, we consider the case in which constructive and destructive leisure are perfect complements. Not surprisingly, this results in kinked indifference curves as seen in the left panel. This also results in kinked iso-happiness curves. However, the vertical arm now tilts to the right, as higher levels of L^- yield lower levels of happiness, and that reduction must be offset by higher levels of L^+. Analogously, the horizontal arm now tilts down. The fully uninformed and fully informed bundles ($U^\star$ and $H^\star$) again will generally not coincide. In the right panel, we consider the same hypothetical reduction in p^-. While this results in a large increase in utility, as we move from IC_U to IC'_U, it results in a far more modest increase in happiness. This is because complementarity ensures that slackened budget is shared between L^+ and L^-, whereas this newfound slack would be disproportionately allocated to l^+ in the full-information benchmark.

In Figure 18, we now consider the case in which constructive and destructive leisure are perfect substitutes. Here, the analysis changes substantially. While iso-utility curves can now be represented by straight, downward lines, iso-happiness curves once again take a familiar "C" shape for the same reasons as before. Note that uninformed agents' bundles generally locate at corners. If such a bundle is at the L^+ corner, as shown in the right panel, then $U^\star$ may coincide with the fully informed agent's bundle $H^\star$. However, in this case, happiness is potentially far more sensitive to price changes. In the left panel, we

Figure 17: Perfect Complements



consider the same decrease in p^-. This is sufficiently large to shift the uninformed agent's bundle to the L^- corner at $U^{\star\star}$ resulting in a catastrophic loss in happiness.

B Appendix: American Time Use Survey (ATUS) Response Rate

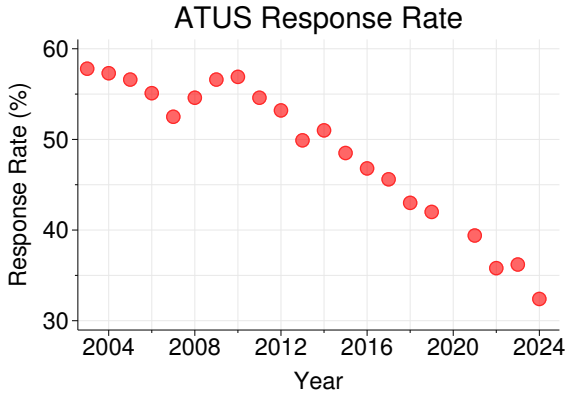
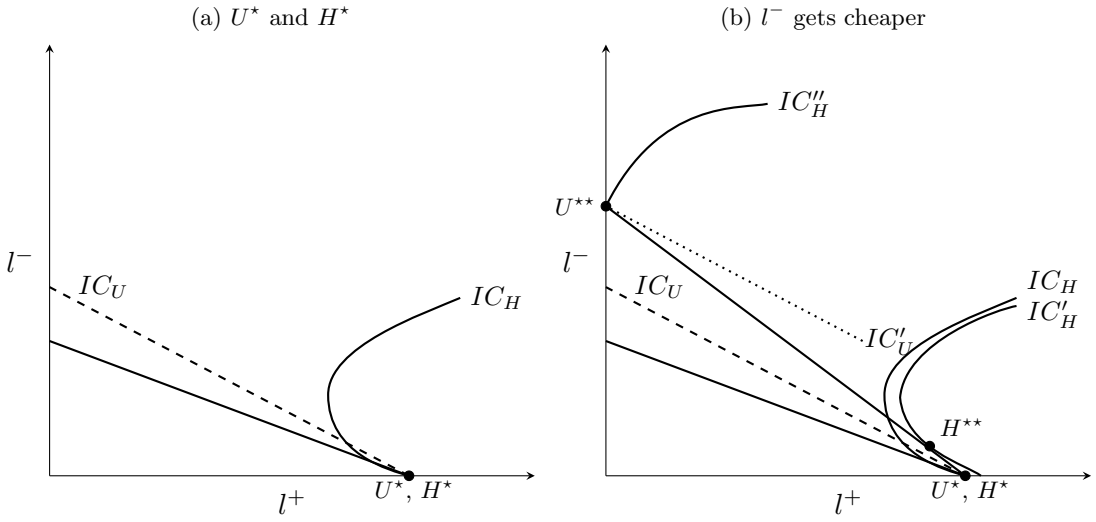


Figure 19: The Decline in Response Rates in the ATUS
Note: This figure shows data from the American Time Use Survey (ATUS).

Figure 18: Perfect Substitutes



C Appendix: The Well-Being Module of the ATUS

We reproduce the American Time Use Survey Well-Being Module Questionnaire as reported in CITE and available at https://www.bls.gov/tus/questionnaires/wbmquestionnaire.pdf.

QUESTIONS 1 THROUGH 7

> Now I want to go back and ask you some questions about how you felt yesterday. We're asking these questions to better understand people's health and well-being during their daily lives. As before, whatever you tell us will be kept confidential. The computer has selected 3 time intervals that I will ask about.
>
> Between [STARTTIME OF EPISODE] and [STOPTIME OF EPISODE] yesterday, you said you were doing [ACTIVITY]. The next set of questions asks how you felt during this particular time.
>
> Please use a scale from 0 to 6, where a 0 means you did not experience this feeling at all and a 6 means the feeling was very strong. You may choose any number 0,1,2,3,4,5 or 6 to reflect how strongly you experienced this feeling during this time.
>
> 1. **Happy** First, from 0 – 6, where a 0 means you were not happy at all and a 6 means you were very happy, how happy did you feel during this time?

2. **Tired** From 0 – 6, where a 0 means you were not tired at all and a 6 means you were very tired, how tired did you feel during this time?

3. **Stressed** From 0 – 6, where a 0 means you were not stressed at all and a 6 means you were very stressed, how stressed did you feel during this time?

4. **Sad** From 0 – 6, where a 0 means you were not sad at all and a 6 means you were very sad, how sad did you feel during this time?

5. **Pain** From 0 – 6, where a 0 means you did not feel any pain at all and a 6 means you were in severe pain, how much pain did you feel during this time if any?

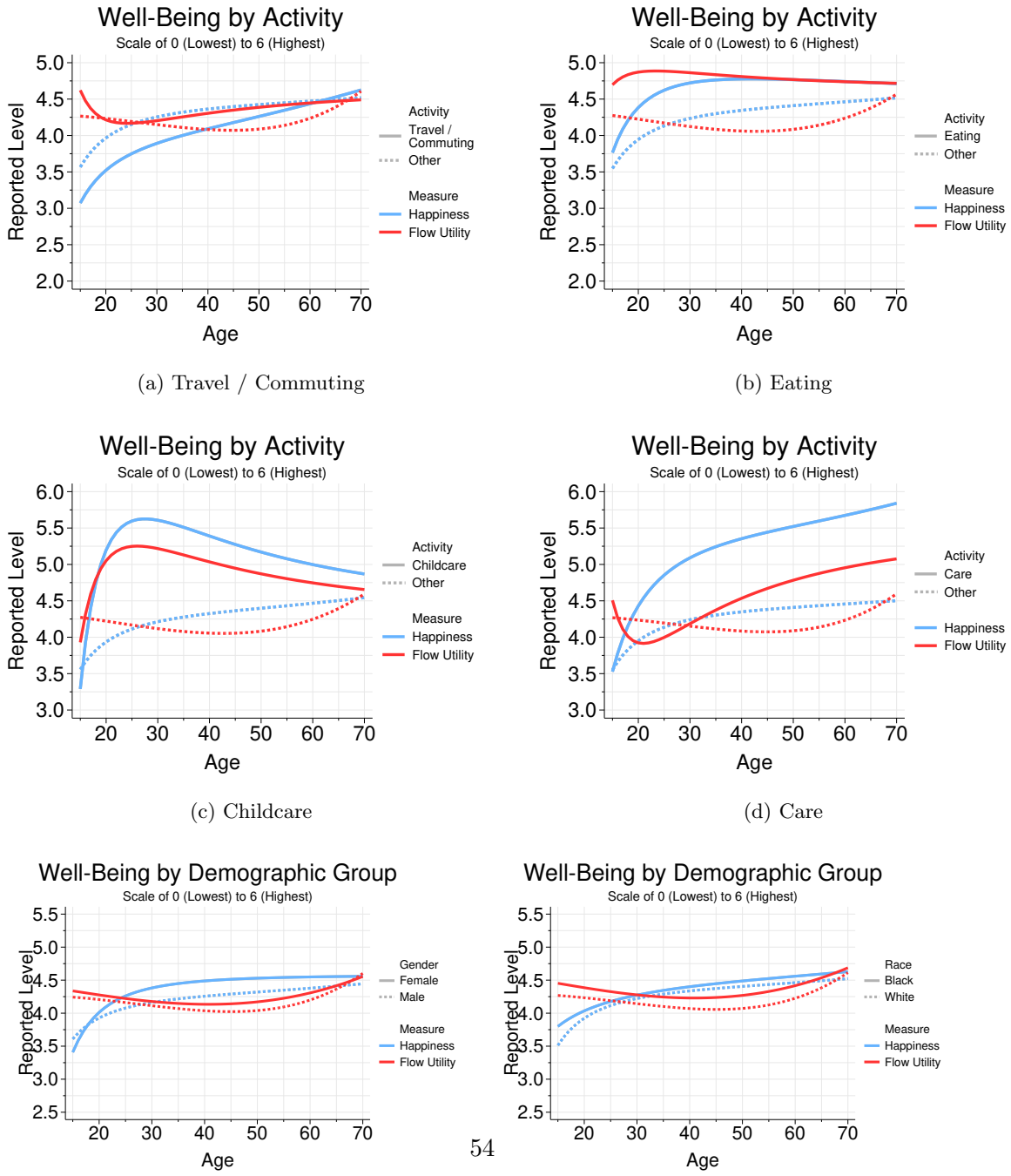
6. **Meaningful** From 0 to 6, how meaningful did you consider what you were doing? 0 means it was not meaningful at all to you and a 6 means it was very meaningful to you.

   [THE ORDER OF THE AFFECTIVE DIMENSIONS (ITEMS 1-5) WAS RANDOMIZED BY RESPONDENT].

7. Were you interacting with anyone during this time, including over the phone? (Yes/No)

D Appendix: More Evidence on Time Use and Well-Being from the ATUS

D.1 Flow Utility and Happiness



(a) Travel / Commuting

(b) Eating

(c) Childcare

(d) Care

(e) Gender

(f) Race

Figure 20: Flow Utility and Happiness, by Activity and Demographics
Note: This figure shows data from the American Time Use Survey (ATUS).

D.2 Overall Changes in Time Alone

Figure 22 shows that time alone has been increasing both at home and outside the home. And Appendix Figure 22b shows that, in contrast to time alone, time at home is much less of a long-run trend and much more of a discrete jump due to COVID-19.[42]

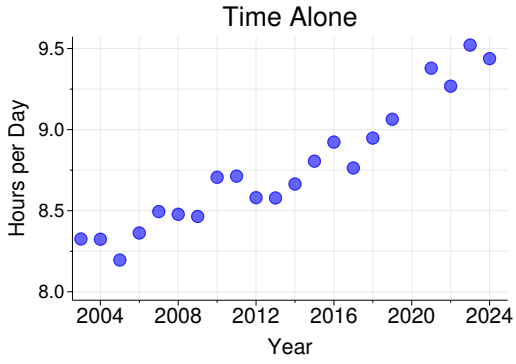


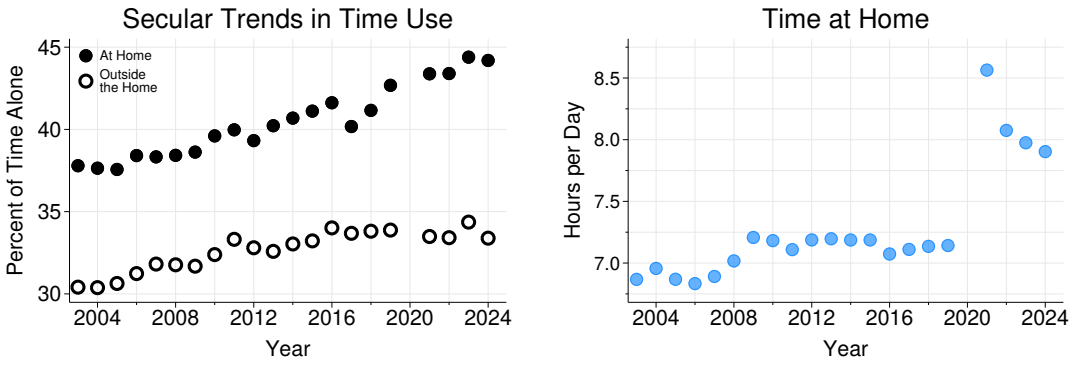
Figure 21: Secular Trends in the American Time Use Survey

D.3 Changes in Leisure Activities

Note: This figure shows time use data from the American Time Use Survey (ATUS). The data set comprises a nationally-representative sample of 16-70 year old Americans conducted in CPS DETAILS HERE. The left panel shows the average hours per day that were spent alone between 2003 and 2024. The right panel shows the percent of time spent alone conditional on whether an activity occurred at the respondent's home or outside their home.

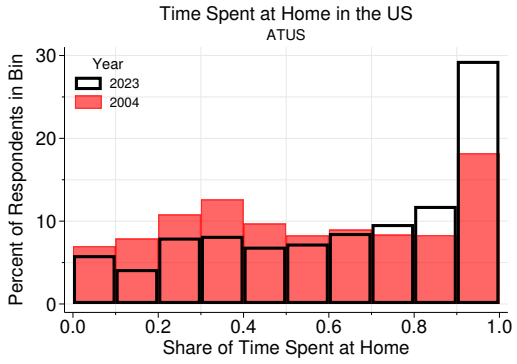
D.4 Changes in Time Alone by Activity

[42] Appendix Figure 22b shows that this increase in time spent at home is driven by people spending their entire day at home (see the right-most bar).



(a)

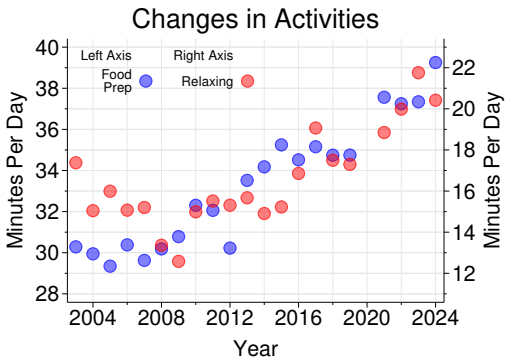
(b) Average Time Spent at Home



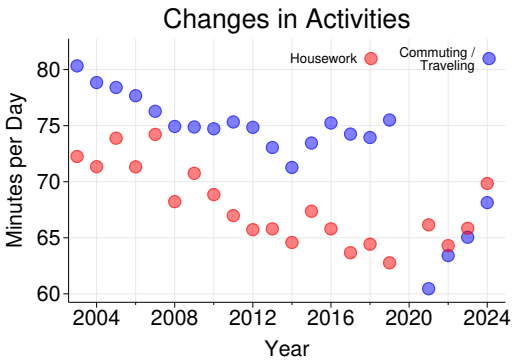
(c) Distribution of Time Spent at Home

Figure 22: Time Spent Alone, by Location

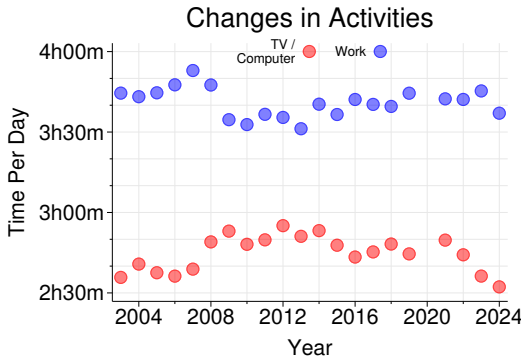
Note: This figure shows time use data from the American Time Use Survey (ATUS). The data set comprises a nationally-representative sample of 16-70 year old Americans conducted in CPS DETAILS HERE. The left panel shows the average hours per day that were spent alone between 2003 and 2024. The right panel shows the percent of time spent alone conditional on whether an activity occurred at the respondent's home or outside their home.



(a)



(b)



(c)

Figure 23: Changes in Leisure Activities by Category

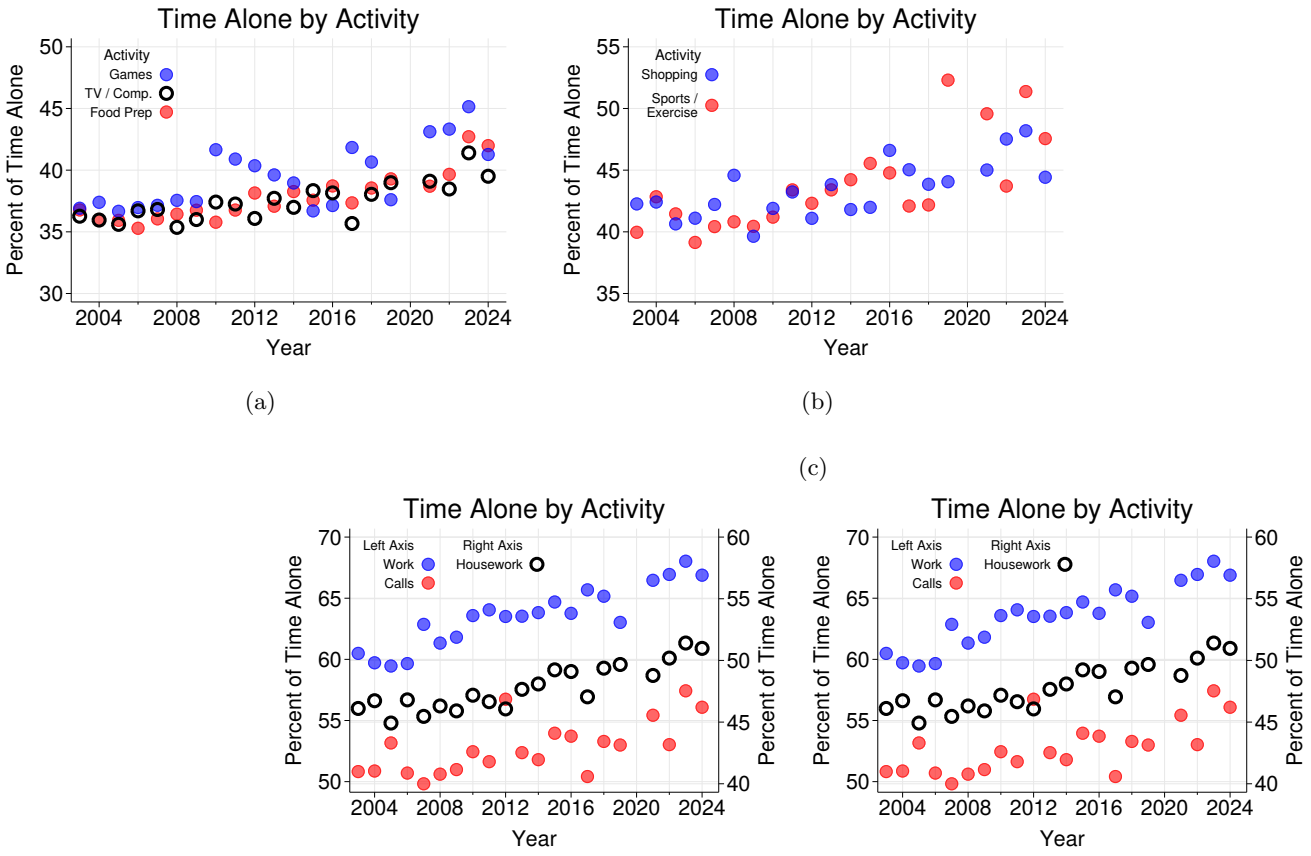


Figure 24: Time Spent Alone
Note: This figure shows time use data from the American Time Use Survey (ATUS).