# Life Expectancy, Age, and Patience *

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**Abstract**

Models of intertemporal choice typically assume that decision makers are impatient and often refer to the limited length of life as motivation for this assumption. Yet direct empirical evidence for the association between life expectancy and patience is scarce and restricted to variation in age. This paper documents distinct associations of patience with life expectancy and age. The analysis is based on data for 80,000 individuals in 76 countries and exploits variation in expected remaining years of life from period life tables. The empirical findings document that higher life expectancy is associated with a greater patience, conditional on age. Our findings also show that the association is unique to patience and does not pertain to other preferences, provide evidence for a hump-shaped age profile, document an association of patience with institutions in addition to life expectancy, hold conditional on country-cohort-specific variation in development, and provide indirect evidence for selective mortality influencing the life expectancy-patience nexus.

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# 1 Introduction

Patience constitutes a fundamental determinant of any inter-temporal choice and is a crucial component in most economic models. Empirical work has shown that variation in patience is associated with differences in income at the individual level (see, e.g., Mischel et al., 1989, Chabris et al., 2008, Sutter et al., 2013, Figlio et al., 2019, Giuliano and Sapienza, 2020, Falk et al., 2021). Variation in patience also accounts for a considerable part of the observed heterogeneity in education, savings and per-capita income across individuals, regions, and countries (Falk et al., 2018). Moreover, with the amplification of these patterns at the aggregate level, heterogeneity in patience is an important factor for explaining comparative development patterns (Sunde et al., 2022).

The reasons for heterogeneity in patience are not well understood, however. Theoretical work in psychology and behavioral economics usually motivates time discounting by idiosyncratic "pure time preferences", or by referring to limited life expectancy as the main reason for impatience (see, e.g., Frederick et al., 2002; Cohen et al., 2020, and the references therein). Theoretical models of life cycle behavior typically incorporate mortality-adjusted discount rates following the seminal work by Yaari (1965). As of today, there is a lack of empirical evidence supporting the conjecture that life expectancy influences patience. In fact, most theoretical and empirical work has viewed limited life expectancy and age as equivalent, and existing empirical research has provided evidence that patience varies with age. Importantly, the evidence on the shape of the age profile of patience is mixed. Several studies have documented substantial variation of patience across age groups, reporting findings for patience being either increasing (Green et al., 1994; Bishai, 2004; Bettinger and Slonim, 2007; Andreoni et al., 2019), decreasing (Chesson and Viscusi, 2000), or invariant (Coller and Williams, 1999; de Wit et al, 2007) in age.

Conceptually, life expectancy and age relate to patience in distinct ways. The variation in patience by age might reflect biological or retrospective factors that are related, e.g., to lifetime experiences, biological aging processes, and learning, whereas life expectancy reflects the prospective horizon available for intertemporal choice. Moreover, work on the evolutionary foundations of time preference has suggested that discount rates might be affected by aggregate uncertainty about the length of life in addition to idiosyncratic mortality risk (Robson and Samuelson, 2009), providing a rationale for distinct profiles of patience across age and life expectancy at the population level.

This paper contributes four novel findings. First, we document that greater life expectancy is associated with greater patience. This association is significant and distinct from the age profile of patience. While the analysis does not establish evidence for a causal relationship, we show that the association is robust to the inclusion of an extensive set of control variables that might constitute potential confounds. These include gender, religion, language, or potentially endogenous variables such as proxies for cognitive ability, education, and income. The positive association of patience with life expectancy emerges for all geographic regions of the world and is present for both women and men, it holds for alternative data sources and measures for life expectancy, is found when instrumenting current remaining years of life with values based on earlier cohorts, and is unaffected by controlling for subjectively-perceived health, which is itself also positively associated with patience. When investigating the discriminatory robustness, we find no significant association between life expectancy and other preference measures such as risk attitudes, altruism, trust or negative reciprocity, only for positive reciprocity.

Second, we provide evidence that the association between patience and life expectancy is distinct from age-related variation in patience, which exhibits a hump-shaped age profile when accounting for life expectancy, as opposed to a monotonically downward sloping profile when life expectancy is not accounted for.

Third, we investigate whether the institutional environment experienced by individuals accounts for the associations of patience with life expectancy or age. Our findings show that experiences of higher institutional quality as well as subjective perceptions of higher institutional quality also exhibit a positive association with patience, providing supportive evidence for a prominent conjecture about the determinants of patience that, to our knowledge, has not been tested empirically. Importantly, the association of patience with life expectancy remains unaffected.

Fourth, based on simulations, we find suggestive evidence for the association between patience and life expectancy being affected by selective survival of more patient individuals.

The empirical analysis of the association between life expectancy and patience is based on the combination of a measure of patience at the individual level with variation in life expectancy from life tables. Specifically, the analysis is based on a global dataset that contains a measure of individual patience constructed from survey items that were selected through a validation procedure to ensure predictiveness of incentivised future-oriented behavior. The data contain information on patience for a total of 80,000 individuals in 76 representative country samples that cover all continents and substantial variation in economic development. We combine the individual patience data with granular data from period life tables provided by the *Population Division of the United Nations*. The life tables contain information about the expected remaining years of life based on period mortality for a given gender-age cell in a particular country. By construction, the expected remaining life years are based on mortality patterns of older cohorts in a given gender-country cell. Although the goal of this paper is to estimate an association between life expectancy and patience, the use of life table information thus alleviates concerns regarding reverse causality from individual patience to life expectancy. In contrast to subjective beliefs about life expectancy, variation in expected remaining years of life based on life table information is plausibly exogenous to variation in individual patience, and even to the corresponding actions of the individuals of the respective age group in the observation period. To further address identification concerns, the estimation framework controls for systematic variation in other dimensions, including gender, cognitive skills, education, income, and systematic variation across countries.

This paper contributes to several strands of literature. By documenting the distinct influences of life expectancy and age on patience, our findings relate to literature in psychology that has investigated whether individual discounting is related to country-level life expectancy (Lee *et al.*, 2018) and individual mortality salience (Kelley and Schmeichel, 2015). In contrast, we document the link between life expectancy and individual patience using a global sample of individuals spanning 76 countries and exploiting life-table variation across gender-age-country cells. Unlike existing empirical studies that have reported correlational evidence for the age profile of patience, our approach allows us to disentangle the age profile of patience that might be related to (socio-)biological factors emphasized in the psychological and neurological literature (Steinberg et al., 2009) from the association with life expectancy. A recent literature has documented evidence for age profiles of preferences (see, e.g., Dohmen et al., 2017; Fitzenberger et al., 2022) and specifically for discounting (Kureishi et al., 2021, Burro et al., 2022, Seaman, 2023). To our knowledge, our paper is the first to disentangle the association of patience with life expectancy and with age, reconciling the mixed evidence regarding the shape of the age-patience relation. Conceptually, our approach is rooted in the distinction between chronological age and prospective age that has been popularized in demography (Sanderson and Scherbov, 2019).

Our paper also relates to empirical work on the determinants of patience that has primarily investigated time-invariant factors at the population level, such as geography, pre-industrial agro-climatic conditions and technology (Galor and Özak, 2016; Möhrle and Sunde, 2021), historical migration patterns (Becker *et al.*, 2020), and language (Chen, 2013, Falk et al., 2018, Herz et al., 2021). In contrast, we provide evidence for a factor, life expectancy, that exhibits systematic variation at the individual level within the population as well as across populations. By disentangling the distinct associations of patience with life expectancy and with institutions at the age-gender-country level, our results complement findings regarding the importance of lifetime experiences for preference and belief formation (Malmendier and Nagel, 2011, 2016). Our evidence also informs the literature on the emergence of cognitive and non-cognitive personality traits (Heckman, 2007) and on the role of health for the emergence of heterogeneity in time preferences (Robson, 2001).

# 2 Data and Empirical Approach

## 2.1 Data

**Patience.** Data on patience is taken from the Global Preference Survey (GPS), a survey data set that contains validated measures of fundamental economic and social preferences for approximately 80,000 individuals in representative samples from 76 countries (see Falk et al., 2018, for a detailed description). The countries selected for the survey cover all continents and represent a total of 90% of the world's income and population (see Appendix Figure A1 for a world map of countries covered in the data).

The GPS contains a composite measure for patience that is based on two survey measures that were selected through a rigorous, ex-ante experimental validation using German student subjects before the implementation in the international survey (for details, see the validation study by Falk et al., 2023). In this validation procedure, subjects responded to survey questions but also participated in incentivised choice experiments. Out of a large set of survey questions, the two survey items were selected for the international survey as the best joint predictors of incentivised behavior – a quantitative survey question involving hypothetical intertemporal choices, and a qualitative self assessment. To construct the composite measure, each of the two survey items was standardised using the mean and variance of the entire worldwide sample, the resulting z-scores were averaged using weights from the experimental validation, and the combined measure was standardised on the worldwide sample to exhibit a mean of zero and standard deviation of one (for further details on the patience measure in the GPS data see Supplementary Appendix A.1 and Falk et al., 2018).

**Life Expectancy.** We combine the individual-level patience measures with granular period life table data from the *Population Division of the United Nations*.[1]

[1]See United Nations Population Division (link).

These period life tables provide information about age-specific mortality for gender-age-country cells and can be used to compute life expectancy in terms of remaining years of life for each gender-age-country cell.

The mortality data by age and gender are obtained from vital registration systems in each country in a given year that are reported to either the United Nations Statistics Division or the World Health Organization (WHO) and are combined with data from population censuses to obtain mortality patterns in given years.[2] The use of period life table information implies that the respective remaining years of life for individuals in a particular gender-age-country cell are based on mortality information from older cohorts. Provided that past mortality patterns are stable, the life table information provides a valid measure of the expected average life expectancy for individuals (Smith *et al.*, 2001) and is likely to be more accurate and reliable than subjective beliefs about life expectancy (Hamermesh, 1985; Elder, 2013). For some ages, the information for age-specific mortality rates and the corresponding age-specific life expectancy relies on model-based life table imputations. This is particularly the case for certain age groups in developing countries for which reliable data are often missing. In practice, however, modeling assumptions do not result in relevant differences for mortality rates (see, e.g., Preston et al., 2001, p. 46-47).[3]

## 2.2 Empirical Strategy

The empirical strategy is conceptually rooted in considering a discount function that takes the form of weights for realizations of utility at different points in time, with utility in the present receiving a normalised weight of 1 (see, e.g., Cohen et al., 2020). The reasons for impatience, i.e., for assigning lower weights to utility from the same levels of consumption if they materialise in the future, include "pure" time preferences. In addition we allow discounting to be a function of various other determinants, such as life expectancy, age, and other factors that capture individual characteristics like gender, cognitive ability, education, socio-economic background, or factors of the aggregate environment, such as institutions.[4]

[2] See also the information provided by the WHO (link) for details on the methodology and the method descriptions for the UN World Mortality Data (link) for details on the record linkage procedures.

[3] By design, the empirical strategy discussed below mitigates potential influences of model life table construction on the estimates of interest. Nevertheless, for robustness checks, we also make use of alternative life table data provided by the *The Human Mortality Database*, which are based on slightly different methods. See the Human Mortality Database (link).

[4] To fix ideas, let $D(\cdot)$ denote the discount function. Total utility of an individual of age $a$ is then computed as the sum of discounted future period (or flow) utilities, $U = \sum_{t=a}^{T} D(\cdot)u(c_t)$ with $u(\cdot)$ denoting utility from consumption in period $t$, $c_t$. This representation follows most of the literature by implicitly assuming separability of discounting from period utility and its curvature. Here we

The empirical model is a regression of patience $D_{igac}$ of an individual $i$ of gender $g$ and age $a$ in country $c$, on the expected remaining years of life $E_{gac}$ of this individual, controlling for a vector of age fixed effects $\delta_a$, gender $\zeta_g$, a vector of country fixed effects $\alpha_c$, and additional potentially relevant individual characteristics $X_{igac}$,

$$D_{igac} = \gamma \cdot E_{gac} + \delta_a + \zeta_g + \alpha_c + \chi \cdot X_{igac} + \varepsilon_{igac}, \tag{2}$$

where $\varepsilon_{igac}$ captures an idiosyncratic error term. In the baseline analysis, we cluster standard errors at the country level and the vector of individual characteristics $X$ includes subjective math skills as proxy for cognitive ability, education and the log of household income per capita. Summary statistics of the variables contained in the baseline analysis are displayed in Appendix Tables A1 and A2.

An unbiased estimate of the association of interest, $\gamma$, requires the error term to be uncorrelated with variation in life expectancy, conditional on controls. The estimation framework can be seen as an intent-to-treat approach to estimate the association between individual life expectancy and individual patience. Intuitively, the source of identifying variation is the difference in remaining years of life between individuals of different ages in a particular country relative to another country, assuming a (flexible) age-related pattern in patience that is common across countries. The logic is analogous to a difference-in-differences design in which the correlation of interest is estimated by relating the variation in patience of individuals with different ages (say, age 20 and 50) from different countries (say, the US and South Africa) to the corresponding variation in life expectancy, conditional on age and on other potential correlates. This empirical strategy disentangles the association of life expectancy with patience from other systematic variation in patience across countries, age groups and gender groups. Specifically, due to the cross-country and cross-gender variation in life expectancy within the same age group, it also allows disentangling the role of variation in life expectancy from a pure age gradient that might arise independently as the result of physiological or psychological mechanisms. The estimation framework accounts for all age-specific confounding factors shared by individuals of the same age, whereas the existing empirical literature has typically used age as proxy for life expectancy. Moreover, concerns about country-specific patterns related to institutional quality during the observation period, the public

are interested in the empirical determinants of patience as reflected by the discount function $D(\cdot)$,

$$D\left(t - a, \rho, E(a), a, X\right)$$

which include the conventional role of time delay, $t - a$, individual-specific idiosyncratic, "pure" time preference $\rho$, as well as various other determinants, such as life expectancy $E(a)$ (which itself depends on age-specific survival rates between $a$ and $T$), age $a$, and other factors $X$.

health environment, or specificities of the country-specific life tables are accounted for by country fixed effects. Control variables account for systematic variation in socio-economic factors, such as education.

The use of life-table information has a distinct advantage over using subjective measures of, or beliefs about, life expectancy for the purpose of this study. Importantly, the measure of expected remaining years of life is based on mortality rates of past cohorts and thus captures the best statistical prediction of the remaining life time of an individual in a particular age-gender-country cell. This mitigates concerns about reverse causality or potential endogeneity at the individual level, as the life expectancy measure is not affected by the behavior of a given individual. However, in the absence of random variation or panel data, the analysis can only establish correlational evidence.

Below, we will relax the assumption of identical age profiles across countries and explore the role of life time experiences that affect the same age groups differently across countries. For instance, patience may follow age patterns that are shaped by environmental factors, such as variation in institutional quality, civil violence, or economic development, all of which can be accounted for by the empirical framework. In fact, following the same logic, the estimation framework allows us to estimate the association of patience with experienced institutional quality or macroeconomic development early in life, and to decompose these associations from the associations of patience with life expectancy or age.

# 3 Results

## 3.1 The Association Between Life Expectancy and Patience

Table 1 presents the main results. The most parsimonious specification in Column (1) documents a significant positive association between life expectancy (the expected remaining years of life) and individual patience. The results imply that a ten-year increase in life expectancy, conditional on age, country, and gender is associated with an increase in patience of 16.3 percent of a standard deviation. Adding other, potentially endogenous, individual-level controls such as cognitive ability, education, or log household income per capita as in Column (2) yields a virtually unaffected point estimate. Similar point estimates emerge when controlling for within-country regions instead of country fixed effects in Column (3). In addition, given previous evidence emphasizing the potential role of religion (Becker and Woessmann, 2009) or language (Chen, 2013) for education and future orientation, we control for religion and language in Columns (4) to (6). The results are virtually identical when controlling for these factors separately or all factors jointly. Figure A2 in the Supplementary Appendix complements these results by visualizing the positive association between life expectancy and patience at the country level without and with controls, and in terms of partial regression plots that illustrate the results in Column (1) of Table 1, respectively.

Table 1: Life Expectancy and Patience at the Individual Level

| | Dependent variable: Patience | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Remaining years of life | 1.626*** | 1.643*** | 1.591*** | 1.586*** | 1.671*** | 1.493*** |
| | (0.359) | (0.363) | (0.363) | (0.368) | (0.399) | (0.408) |
| 1 if female | -13.488*** | -11.394*** | -11.514*** | -10.608*** | -12.271*** | -11.062*** |
| | (2.246) | (2.145) | (2.149) | (2.220) | (2.230) | (2.346) |
| Subj. math skills | | 2.273*** | 2.080*** | 2.249*** | 2.244*** | 2.075*** |
| | | (0.207) | (0.190) | (0.216) | (0.207) | (0.193) |
| Log [Household income p/c] | | 3.312*** | 3.034*** | 3.482*** | 3.332*** | 3.483*** |
| | | (0.560) | (0.547) | (0.578) | (0.604) | (0.620) |
| Country FE | Yes | Yes | No | Yes | Yes | No |
| Age FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Education Level | No | Yes | Yes | Yes | Yes | Yes |
| Region FE | No | No | Yes | No | No | Yes |
| Religion FE | No | No | No | Yes | No | Yes |
| Language FE | No | No | No | No | Yes | Yes |
| Observations | 79433 | 77693 | 76793 | 69245 | 71987 | 62691 |
| $R^2$ | 0.161 | 0.173 | 0.219 | 0.177 | 0.185 | 0.233 |

*Notes:* Table 1 presents OLS estimates of a regression of the combined measure of patience on remaining years of life. The combined patience measure has been standardised to exhibit a mean of 0 and a standard deviation of 100. Controls include dummies for education level (elementary, secondary, higher) a dummy for gender, country fixed effects, age fixed effects, and different sets of control variables. In the specifications using within-country region fixed effects, no country fixed effects are included as they are collinear. Standard errors clustered at the country level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

## 3.2 Robustness and Discriminatory Validity

**Robustness.** The finding of a significant association between life expectancy and patience is unaffected when allowing for alternative patterns of cross-sectional dependencies and applying two-way clustering on country and age (Table A3). Moreover, the positive association of patience with life expectancy robustly emerges when splitting the sample by continent or economic development (Table A4). Across geographic world regions, coefficient estimates are largely comparable in size and not statistically different (Table A5), albeit somewhat smaller in less developed countries. Moreover, the association is prevalent when considering women and men separately (Table A4), with a larger association for women. The stronger association among women may reflect differential gender-specific biological and societal pressures and is in line with evidence that women's preferences are on average more malleable with respect to environmental conditions relative to men's (Croson and Gneezy, 2009). When allowing for heterogeneous effects of life expectancy by household income in quintiles or by education level, we find no evidence for significantly heterogeneous effects or only very moderate heterogeneity (Tables A6 and A7).

**Alternative Measures of Life Expectancy.** The results for the association between life expectancy and patience are similar when using alternative measures of life expectancy from the *Human Mortality Database* to compute the remaining years of life for each country-age-gender cell, and when using the inverse of the probability of dying within the next year, which captures a more immediate or short-term measure of life expectancy than focusing on the entire remaining life span (Table A8).

While reverse causality is unlikely as a consequence of the construction of the measures of life expectancy, we replicated the analysis using life table information for 2000, 1990, 1980, and 1970, respectively, to instrument the measure of remaining years of life computed from the period life table for 2010 to mitigate potential concerns about simultaneity bias and potential measurement error. In this setting, the variation used for identification pertains to age-specific mortality of cohorts even further in the past. The second-stage results reveal that the coefficient for remaining years of life is statistically significant in all specifications and quantitatively almost identical to the baseline estimates (Table A8).[5]

**Subjective Health Status, Optimism, and Emotional Well-Being.** Evidence has pointed to the influence of health perceptions as a predictor of individual mortality (van Solinge and Henkens, 2018). Replicating the analysis while controlling for subjective health perceptions confirms the robustness of the results obtained with objective life expectancy information from life tables (Table A10).[6] Individuals with a better subjective perception of their health status also exhibit greater patience, conditional on age and other control variables. Similar findings apply when additionally controlling for subjective optimism and emotional well-being (Ta-

[5]The first-stage estimates are shown in Table A9 and reveal that remaining years of life computed from life tables in the past are strong predictors of remaining years of life in the present, with F-statistics exceeding the usual thresholds in all specifications.

[6]Individual health perceptions are measured in terms of a personal health index that is constructed from combining individual responses to six questions about self-reported personal health assessments. For details of the index construction see Gallup (2008).

ble A11).[7] When interpreting these results, however, one has to keep in mind that subjectively-perceived health status and well-being might be prone to endogeneity or bad control problems (Angrist and Pischke, 2009). Nevertheless, the association between patience and average remaining years of life based on life table statistics remains significant and quantitatively virtually unchanged compared to the baseline results.

Similarly, the results are robust to adding the expected length of life of an individual at the time of their birth as additional control. This sheds light on the question whether life expectancy forms patience early in life or whether patience is predominantly determined by contemporaneous life expectancy.[8] The results confirm the robust association of patience with contemporaneous life expectancy, with similar estimates as in the baseline specifications in Table 1, but no evidence for an additional association with life expectancy at birth (Table A12).

**Forward-looking Behavior.** Another, more indirect, way to investigate the association of life expectancy with patience is to consider the consequences for individual forward-looking behavior. Through its association with patience, higher life expectancy should induce individuals to save in order to obtain higher rewards or utility in future time periods. To explore this behavioral ramification of the life expectancy-patience link, we estimated a model with the dependent variable reflecting whether an individual made any savings over the year before the data collection. The results deliver a significant positive association of remaining years of life with savings (Table A13).[9]

**Discriminatory Validity: Life Expectancy and Other Preferences.** To investigate the discriminatory validity of the hypothesis for patience in contrast to a broader pattern related to preferences, we replicated the main analysis for measures of other preferences related to risk taking, altruism, trust, and positive and negative reciprocity. These preferences were elicited in comparable ways to patience by

[7] Optimism as measured by an optimism index that reflects respondents' positive attitudes about the future (in terms of certain aspects of life getting better or worse). Emotional well-being is measured by a positive experience index (affirmative answers to a set of five questions). For details of the index construction see Gallup (2008).

[8] Information on life expectancy at birth is taken from past period life tables provided by the *Population Division of the United Nations*. As these data are only available back to 1950, we conduct a linear extrapolation to impute life expectancy at birth for older cohorts.

[9] In a linear probability model, a one-year increase in life expectancy induces a 1.2% (s.e.=0.004) increase in individuals' propensity to save conditional on age, gender, and country fixed effects. The point estimates remain quantitatively similar conditional on additional controls. Moreover, we obtain similar results when employing a probit specification instead of a linear probability model (Table A14).

Table 2: Life Expectancy and Other Preferences

| | Alternative Outcome | | | | |
|---|---|---|---|---|---|
| Dep. Var.: | Risk Taking | Altruism | Trust | Pos. Recip. | Neg. Recip. |
| | (1) | (2) | (3) | (4) | (5) |
| Remaining years of life | 0.70 | -0.030 | -0.59 | 0.95*** | 0.58 |
| | (0.599) | (0.379) | (0.438) | (0.342) | (0.432) |
| Subj. math skills | 4.01*** | 3.79*** | 5.88*** | 3.31*** | 3.94*** |
| | (0.344) | (0.309) | (0.270) | (0.264) | (0.419) |
| Log [Household income p/c] | 5.26*** | 3.19*** | -0.97 | 2.81*** | 1.55* |
| | (0.680) | (0.616) | (0.658) | (0.719) | (0.903) |
| Gender | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes | Yes |
| Age FE | Yes | Yes | Yes | Yes | Yes |
| Education Level | Yes | Yes | Yes | Yes | Yes |
| Observations | 77641 | 77822 | 77040 | 78053 | 76728 |
| $R^2$ | 0.174 | 0.139 | 0.113 | 0.131 | 0.113 |

*Notes:* Table 2 presents OLS estimates of a regression of different preferences on remaining years of life controlling for education level (elementary, secondary, higher), gender, country fixed effects, age fixed effects and additional controls that include subjective math skills, education level, and log household income per capita. All preferences are standardised to exhibit a standard deviation of 100. Standard errors clustered at the country level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

using a combination of qualitative and quantitative survey items (Falk et al., 2018, 2023). While these preferences might also be associated with life expectancy, it is conceptually much less obvious to formulate clear empirical hypotheses. The results reported in Table 2 document no significant association of life expectancy with any other preference measure, with the exception of positive reciprocity. The positive association with positive reciprocity appears plausible in light of the intrinsic relation between reciprocity and future-oriented behavior. Reciprocity helps maintaining social relationships and individuals who are willing to reciprocate invest resources today to reap potential benefits from social relationships in the future (see, e.g., Kreps et al., 1982; Gächter and Falk, 2002). This finding is consistent with a close relation between patience and cooperation in repeated games (see, e.g., Dal Bó and Fréchette, 2018) and consistent with the fact that within person, positive reciprocity is positively correlated with patience. However, quantitatively, this association is considerably weaker than the one with patience.

### 3.3 Decomposing Age and Life Expectancy

While the limited length of life is a typical justification for discounting of future payoffs, existing work has taken the age pattern in patience as proxy for this relationship. Here, we explore whether the age gradient in patience is distinct from the association of patience with life expectancy. Specifically, age might be a proxy for retrospective factors, related to lifetime experiences or biological aging, whereas life expectancy refers to the prospective length of life. By implication, without accounting for life expectancy, estimates of the age profile in patience might capture both influences. To investigate this conjecture, we compare estimates of age profiles in patience without and with accounting for variation in remaining years of life.

Figure 1 plots the age profile based on non-parametric estimates (age dummies). The age profile resulting from a specification with country fixed effects and gender controls, but without controlling for life expectancy (the dashed line) reveals a monotonic decline in patience with age. The corresponding results for a specification that additionally controls for life expectancy in terms of remaining years of life (the solid line) reveal an age profile that is increasing until age 60 and flat or weakly declining at higher ages. This hump-shape pattern is reminiscent of the typical age profiles in human capital (e.g., Ben-Porath, 1967) and consistent with implications of models in which pure time preference is a state variable that can be accumulated by utility-maximizing individuals (Becker and Mulligan, 1997). In sum, estimates of age profiles of patience that do not account for life expectancy are likely to partly capture the influence of life expectancy. This also helps reconciling the mixed existing evidence for the shape of the age-patience relation as this relation reflects variation in remaining years of life (or sample composition along this dimension).

## 3.4 Lifetime Experiences: Development and Institutions

The results presented so far indicate that life expectancy is a relevant explanatory variable for individual patience, conditional on age, country-specific effects and other control variables. The results also show that age is associated with patience, but under the implicit assumption that the age pattern is homogeneous across countries. Next, we relax this assumption and test the hypothesis that the age pattern reflects cohort-specific lifetime experiences that might differ across countries and that might correlate with individual patience. Due to the cross-sectional nature of the GPS data, age effects and birth cohort fixed effects are equivalent so that country-specific age patterns are equivalent to country-specific cohort patterns.

To assess the robustness of the previous results, we conducted additional analysis that accounts for other factors that vary by age-gender-country cells conditional on country- and age-specific effects. These include differences in institutional quality over the life course which have been associated with cultural norms such as future orientation (Lowes et al., 2017), economic hardship during youth that has been shown

Figure 1: Age and Patience


*Notes:* The figure displays the age profile of patience. The dashed line displays the age pattern (age fixed effects) without controls for life expectancy. The solid line displays the age pattern when conditioning on life expectancy. The gradients are normalised such that the average individual at age 20 constitutes the reference group normalised to zero. Grey areas reflect 95% confidence intervals. The combined patience measure has been standardised to exhibit a standard deviation of 100. All specifications include controls for country fixed effects, and gender.

to affect individual willingness to take risks (Malmendier and Nagel, 2011, 2016), social preferences (Bietenbeck *et al.*, 2025), living conditions that have been documented to correlate with preferences (Tanaka et al., 2010; Fehr and Haushofer, 2014; Kosse et al., 2020; Falk et al., 2021; Giuliano and Nunn, 2021), exposure to violent conflict that has been associated with individual willingness to take risks (Callen et al., 2014), and individual exposure to an institutional environment has been shown to affect preferences for democracy (Fuchs-Schündeln and Schündeln, 2015). Finally, the subjective perception of institutional quality or the risk of expropriation and violence might influence individual patience and the willingness to undertake investments, for instance in education (see, e.g., Acemoglu et al., 2014).

To test whether such lifetime experiences predict patience and confound the previous results, we construct, for each cohort in each country, average lifetime values of experienced log GDP per capita using data from the *Maddison Project*, institutional quality using the Polity IV index from the *Polity IV Project*, democracy using data from *Freedom House*, and political violence using information from the *Peace Research Institute Oslo*. These variables exhibit variation across age-country cells and thus allow for a conceptually similar identification as the measure for remaining years of life. The only difference is that the measures of experiences exhibit no variation across gender groups. Importantly, the cohort-specific variation in lifetime experiences of development, institutional quality, or conflict allows decomposing common age patterns from country-specific cohort influences to patience, while still being able to identify the association of patience with life expectancy.

In addition, the analysis controls for a measure of subjectively-perceived institutional quality as reported by respondents to the Gallup World Poll. For individual decision-making, subjective perceptions about institutional quality are potentially more important than the objectively experienced institutional environment. However, in contrast to the other institutional background variables, which exhibit plausibly exogenous variation in the present context, subjective perceptions might constitute a bad control (Angrist and Pischke, 2009).

Table 3 presents the corresponding results for an extended specification of the empirical model. The estimates provide evidence for a positive association of patience with institutional quality experienced over the lifetime and with subjectively perceived institutional quality. The results also show, however, that the association between patience and remaining years of life is essentially unaffected when accounting for lifetime experiences and subjective institutional quality.

Additional robustness checks focusing on income, institutional quality or democracy and violence at birth or the age of 15 instead of aggregating over the life cycle provide very similar conclusions (Tables A15 and A16). The same holds for the age pattern. Comparing the estimation results for the age profile obtained with specifications that do not account for life experiences but that do account for such lifetime experiences reveal some variation (Appendix Figure A3). However, the differences between the age profiles is smaller when conditioning on life expectancy. Moreover, the estimates deliver a robust association between life expectancy and patience.

## 3.5 Heterogeneity and Selective Survival

The association between patience and life expectancy based on period life table data implies that the association is not affected by idiosyncratic endogenous characteristics and behaviors of an individual. This mitigates concerns about reverse causality or simultaneity arising, for instance, through educational investment (Kemptner and Tolan, 2018), labor market outcomes (DellaVigna and Paserman, 2005), smoking behavior (Khwaja, et al., 2007; Kang and Ikeda, 2007), or investments in general health (Lawless et al., 2013; Huffman et al., 2019). Nevertheless, it is plausible that such heterogeneity exists, which would lead to sample composition affecting the

Table 3: Life Expectancy and Patience: Experiences with Development and Institutions

| | Dependent variable: Patience | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Remaining years of life | 1.55*** | 1.54*** | 1.55*** | 1.46*** | 1.55*** | 1.55*** | 1.54*** | 1.43*** |
| | (0.369) | (0.368) | (0.370) | (0.382) | (0.369) | (0.369) | (0.367) | (0.384) |
| Avg. log GDP p/c lifetime | -0.45 | | | | | | 4.27 | 7.61 |
| | (2.403) | | | | | | (12.156) | (14.452) |
| Avg. institutional quality lifetime | | -1.72 | | | | | -1.00 | -4.75 |
| | | (2.376) | | | | | (15.084) | (17.453) |
| Avg. democracy lifetime | | | -13.1 | | | | -27.3 | -56.9 |
| | | | (25.119) | | | | (238.864) | (283.496) |
| Subjective institutional quality | | | | 0.15*** | | | | 0.15*** |
| | | | | (0.024) | | | | (0.024) |
| Avg. societal political violence lifetime | | | | | -8.73 | | -12.2 | -11.1 |
| | | | | | (20.733) | | (26.986) | (31.676) |
| Avg. interstate political violence lifetime | | | | | | -23.0 | -30.3 | -34.0 |
| | | | | | | (25.959) | (38.921) | (85.982) |
| Gender | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Age FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Additional Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Education Level | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 78164 | 78164 | 78164 | 58433 | 78164 | 78164 | 78164 | 58433 |
| $R^2$ | 0.172 | 0.172 | 0.172 | 0.167 | 0.172 | 0.172 | 0.172 | 0.167 |

*Notes:* Table 3 presents OLS estimates of a regression of patience on remaining years of life controlling for gender, country fixed effects, age fixed effects, experienced development and institutional quality. Additional controls include subjective math skills, education level, and log household income per capita. Patience is standardised to exhibit a standard deviation of 100. Standard errors clustered at the country level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

estimates. For instance, selective survival of more patient individuals, who are also better educated, wealthier and healthier on average, would imply that more patient individuals exhibit a higher idiosyncratic life expectancy relative to the *average* life expectancy for the cohort. As a consequence, intrinsically more patient individuals will live longer and represent a larger fraction of the living population in cohorts that are statistically closer to death, thereby increasing the observed average patience in these cohorts due to selection. As a consequence, the observed association between patience and statistical life expectancy based on life table data could be non-linear, or even non-monotonic, in cells with low remaining years of life.

Figure 2 displays the results of estimates of a flexible semi-parametric specification for life expectancy, conditional on age fixed effects, country fixed effects, and gender. The figure again reveals a positive association between remaining years of life and patience. However, the flexible estimates also indicate a non-monotonic relationship for low levels of life expectancy: Over almost the entire range, a reduction in the remaining years of life is associated with lower patience, but for very low levels of life expectancy the relationship reverses.

To explore whether this reversal could be the result of selective survival and to investigate the quantitative relevance of such a selection effect, we conducted a simulation exercise for which we assume that individuals are assigned an idiosyncratic patience endowment at birth. Their patience is drawn from a normal distribution. For the simulation, we assume that the age-dependent death rates (over one year) are equal to the empirical world average observed in the data. Moreover, we assume that a decrease in statistical life expectancy – i.e., the average life expectancy for an individual of a given age – of one year decreases patience by 0.0163 standard deviations, which corresponds to the baseline estimate of our previous analysis. The idea behind selective mortality is that more patient individuals have a higher idiosyncratic survival rate, and hence will be relatively over-represented in the group of people who reach old age and who, at the same time, exhibit a low remaining statistical life expectancy. Thus, to introduce selective survival, we assume that a one-standard deviation increase in patience (relative to individuals of the same age) decreases the propensity of dying by 0.25 standard deviations.

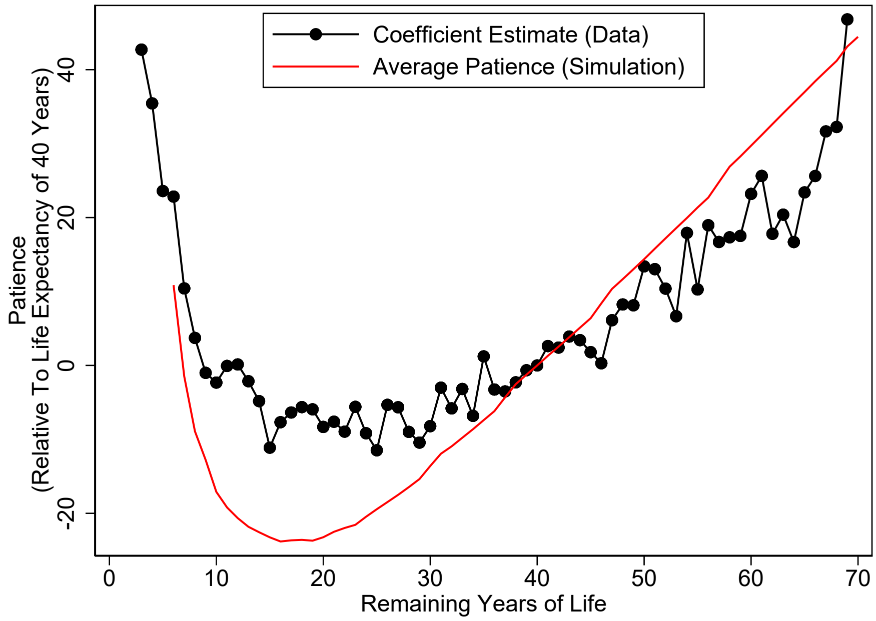
Figure 2 plots the average level of patience as a function of statistical remaining years of life that results from this simulation exercise. For high levels of life expectancy, a decline in expected remaining years of life leads to a decrease in patience. However, at ever lower levels of life expectancy, selective survival implies that more patient individuals are more likely to survive to the next period, which ultimately leads to a reversal in the relationship between observed patience and life expectancy. The reversal in the relation between patience and life expectancy in the simulated data is very similar in shape and quantity to the pattern observed in the estimation results.[10] Overall, the results of analyzing the role of selective survival provide further support for the positive average association between life expectancy and patience.

# 4 Discussion

The significant positive association between life expectancy and patience has far-reaching implications for comparative development. Our results complement studies that have provided evidence for a link between health and various forms of forward-looking behavior in particular contexts, such as retirement savings or educational investment (Jayachandran and Lleras-Muney, 2009; Oster et al., 2013; Currie, 2020). We contribute direct evidence for a link between life expectancy and time preferences, which constitutes the fundamental non-cognitive trait that influences intertemporal choice across a wide range of decision-problems (Borghans et al., 2008).

[10]Simulations with alternative assumptions about the strength of the selective survival indicate that even small selection effects can lead to a reversal in the empirical relationship of patience with statistical remaining years of life, as shown in Appendix Figure A4. Quantitatively, the pattern is consistent with a decline of 0.25 standard deviations of the propensity to die in response to a one-standard deviation increase in patience (relative to individuals of the same age).

Figure 2: Longevity, Patience, and Selective Survival




*Notes:* The line with square markers visualizes the empirical relationship of patience with expected remaining years of life, estimated non-parametrically, conditional on gender, age fixed effects, and country fixed effects. The solid line visualizes simulations of the relationship of patience with expected remaining years of life under selective survival of more patient individuals. For each cohort born we assume that patience is distributed normally. Each one-year decrease in expected remaining years of life induces a 0.0163 standard deviation decrease in patience (equal to our baseline estimate in Table 1). For illustration, we further assume that an individual's average dying probability conditional on age equals the world average. Moreover, we assume that an individual's patience decreases her idiosyncratic dying probability. Specifically, it is assumed that a one standard deviation increase in patience (relative to individuals of the same age) decreases the propensity of dying 0.25 standard deviations. For alternative scenarios, see Appendix Figure A4. In both cases, the combined patience measure has been standardised to exhibit a standard deviation of 100.

The evidence presented in this paper provides scope for a feedback effect that amplifies the consequences of life expectancy for long-run development. Recent work on poverty traps has isolated various factors that can lead to detrimental feedback loops, including bio-physical and psychological factors, low levels or loss of human capital, bad health conditions, or financial market imperfections (see the introductory discussion by Barrett *et al.* (2019) and the contributions in their collected volume). Improvements in life expectancy have been shown to be crucial for the transition from quasi-stagnation to sustained growth due to their effects on human capital investment (Cervellati and Sunde, 2005, 2015; Castello-Climent and Domenech, 2008). Our results provide individual-level evidence that is consistent with this view, with potentially far-reaching implications for explaining differences in economic development. This intuition captures the interplay between life expectancy and idiosyncratic patience and highlights the potential for a life expectancy-patience poverty trap. Importantly, this link complements standard mechanisms leading to poverty traps, which are related to either external frictions or non-homothetic preferences (Ghatak, 2015). At the same time, the link between health and patience extends previous work on endogenous time preferences (Becker and Mulligan, 1997; Strulik, 2012).

Our results constitute a first step in understanding the potentially powerful link between life expectancy and patience, and more work along these lines is needed. The evidence also suggests that besides the associations of patience with life expectancy and with age, patience correlates with experienced and subjectively perceived quality of institutions. These associations are distinct and presumably operate through different mechanisms that need to be better understood. The reliance on cross-sectional data limits our ability to draw causal inferences about the impact of life expectancy on patience over time. In the absence of longitudinal survey data that track the same individuals for a panel of countries over time, deeper insights into how changes in life expectancy causally affect patience are left to future research. In terms of policy implications, our findings suggest that health interventions that improve life expectancy might have positive externalities: besides increasing individual health, productivity and well-being, higher life expectancy may induce a shift in the relative weight of future outcomes in individual utility, thereby fostering future-oriented decision-making, with important implications for investments in physical or human capital.

# References


Acemoglu, D., Gallego, F.A. and Robinson, J.A. (2014). 'Institutions, human capital, and development', *Annual Reviews of Economics*, vol. 6, pp. 875–912.

Andreoni, J., Kuhn, M.A., List, J.A., Samek, A., Sokal, K. and Sprenger, C. (2019). 'Toward an understanding of the development of time preferences: Evidence from field experiments', *Journal of Public Economics*, vol. 177, p. 104039.

Angrist, J.D. and Pischke, J.S. (2009). *Mostly Harmless Econometrics*, Princeton, NJ: Princeton University Press.

Barrett, C.B., Carter, M.R. and Chavas, J.P. (2019). 'The economics of poverty traps: Introduction', in (C. B. Barrett, M. R. Carter and J.-P. Chavas, eds.), *The Economics of Poverty Traps*, chap. 1, Chicago, IL: University of Chicago Press.

Becker, A., Enke, B. and Falk, A. (2020). 'Ancient origins of the global variation in economic preferences', *AEA Papers and Proceedings*, vol. 110, pp. 319–323.

Becker, G.S. and Mulligan, C.B. (1997). 'The endogenous determination of time preference', *Quarterly Journal of Economics*, pp. 729–758.

Becker, S.O. and Woessmann, L. (2009). 'Was weber wrong? a human capital theory of protestant economic history', *Quarterly Journal of Economics*, vol. 124(2), pp. 531–596.

Ben-Porath, Y. (1967). 'The production of human capital and the life cycle of earnings', *Journal of Political Economy*, vol. 75(4), pp. 352–365.

Bettinger, E. and Slonim, R. (2007). 'Patience among children', *Journal of Public Economics*, vol. 91(1-2), pp. 343–363.

Bietenbeck, J., Sunde, U. and Thiemann, P. (2025). 'Recession experiences shape prosocial attitudes', *Journal of Public Economics*, vol. 243, p. 105327.

Bishai, D.M. (2004). 'Does time preference change with age?', *Journal of Population Economics*, vol. 17(4), pp. 583–602.

Borghans, L., Duckworth, A.L., Heckman, J.J. and Ter Weel, B. (2008). 'The economics and psychology of personality traits', *Journal of Human Resources*, vol. 43(4), pp. 972–1059.

Burro, G., McDonald, R., Read, D. and Taj, U. (2022). 'Patience decreases with age for the poor but not for the rich: an international comparison', *Journal of Economic Behavior and Organization*, vol. 193, pp. 596–621.

Callen, M., Isaqzadeh, M., Long, J.D. and Sprenger, C. (2014). 'Violence and risk preference: Experimental evidence from afghanistan', *American Economic Review*, vol. 104(1), pp. 123–148.

Castello-Climent, A. and Domenech, R. (2008). 'Human capital inequality, life expectancy, and economic growth', *Economic Journal*, vol. 118(528), pp. 653–677.

Cervellati, M. and Sunde, U. (2005). 'Human capital, life expectancy, and the process of development', *American Economic Review*, vol. 95(5), pp. 1653–1672.

Cervellati, M. and Sunde, U. (2015). 'The economic and demographic transition, mortality and comparative development', *American Economic Journal: Macroeconomics*, vol. 7(3), pp. 189–225.

Chabris, C.F., Laibson, D., Morris, C.L., Schuldt, J.P. and Taubinsky, D. (2008). 'Individual laboratory-measured discount rates predict field behavior', *Journal of Risk and Uncertainty*, vol. 37(2-3), pp. 237–269.

Chen, M.K. (2013). 'The effect of language on economic behavior: Evidence from savings rates, health behaviors, and retirement assets', *American Economic Review*, vol. 103(2), pp. 690–731.

Chesson, H. and Viscusi, W.K. (2000). 'The heterogeneity of time–risk tradeoffs', *Journal of Behavioral Decision Making*, vol. 13(2), pp. 251–258.

Cohen, J., Ericsson, K.M., Laibson, D. and White, J.M. (2020). 'Measuring time preferences', *Journal of Economic Literature*, vol. 58(2), pp. 299–347.

Coller, M. and Williams, M.B. (1999). 'Eliciting individual discount rates', *Experimental Economics*, vol. 2(2), pp. 107–127.

Croson, R. and Gneezy, U. (2009). 'Gender differences in preferences', *Journal of Economic Literature*, vol. 47(2), pp. 448–74.

Currie, J. (2020). 'Child health as human capital', *Health Economics*, vol. 29, pp. 452–463.

Dal Bó, P. and Fréchette, G.R. (2018). 'On the determinants of cooperation in infinitely repeated games: A survey', *Journal of Economic Literature*, vol. 56(1), pp. 60–114.

de Wit, H., Flory, J.D., Acheson, A., McCloskey, M. and Manuck, S.B. (2007). 'Iq and nonplanning impulsivity are independently associated with delay discounting in middle-aged adults', *Personality and Individual Differences*, vol. 42(1), pp. 111–121.

DellaVigna, S. and Paserman, M.D. (2005). 'Job search and impatience', *Journal of Labor Economics*, vol. 23(3), pp. 527–588.

Dohmen, T., Falk, A., Golsteyn, B., Huffman, D. and Sunde, U. (2017). 'Risk attitudes across the life course', *Economic Journal*, vol. 127(605), pp. F95–F116.

Elder, T.E. (2013). 'The predictive validity of subjective mortality expectations: evidence from the health and retirement study', *Demography*, vol. 50(2), pp. 569–589.

Falk, A., Becker, A., Dohmen, T., Enke, B., Huffman, D. and Sunde, U. (2018). 'Global evidence on economic preferences', *Quarterly Journal of Economics*, vol. 133(4), pp. 1645–1692.

Falk, A., Becker, A., Dohmen, T., Huffman, D. and Sunde, U. (2023). 'The preference survey module: A validated instrument for measuring risk, time, and social preferences', *Management Science*, vol. 69(4).

Falk, A., Deckers, T., Kosse, F., Pinger, P. and Schildberg-Hörisch, H. (2021). 'Socioeconomic status and inequalities in children's iq and economic preferences', *Journal of Political Economy*, vol. 129(9), pp. 2504–2545.

Fehr, E. and Haushofer, J. (2014). 'The psychology of poverty', *Science*, vol. 344(6186), pp. 862–867.

Figlio, D., Giuliano, P. and Ozek, U. (2019). 'Long-term orientation and educational performance', *American Economic Journal: Economic Policy*, vol. 11(4), pp. 272–309.

Fitzenberger, B., Nimczik, J., Mena, G.C. and Sunde, U. (2022). 'Personality traits across the life cycle: Disentangling age, period, and cohort effects', *Economic Journal*.

Frederick, S., Loewenstein, G. and O'Donoghue, T. (2002). 'Time discounting and time preference: A critical review', *Journal of Economic Literature*, vol. XL, pp. 351–401.

Fuchs-Schündeln, N. and Schündeln, M. (2015). ‘On the endogeneity of political preferences: Evidence from individual experience with democracy’, *Science*, vol. 347(6226), pp. 1145–1148.

Gächter, S. and Falk, A. (2002). ‘Reputation and reciprocity: Consequences for the labour relation’, *Scandinavian Journal of Economics*, vol. 104(1), pp. 1–26.

Gallup (2008). Washington, D.C.: Gallup, Inc.

Galor, O. and Özak, O. (2016). ‘The agricultural origins of time preference’, *American Economic Review*, vol. 106(10), pp. 3064–3103.

Ghatak, M. (2015). ‘Theories of poverty traps and anti-poverty policies’, *World Bank Economic Review*, vol. 29(Supplement 1), pp. S77–S105.

Giuliano, P. and Nunn, N. (2021). ‘Understanding cultural persistence and change’, *Review of Economic Studies*, vol. 88(4), pp. 1541–1581.

Giuliano, P. and Sapienza, P. (2020). ‘The cost of being too patient’, *AEA Papers and Proceedings*, vol. 110, pp. 314–318.

Green, L., Fry, A.F. and Myerson, J. (1994). ‘Discounting of delayed rewards: A life-span comparison’, *Psychological Science*, vol. 5(1), pp. 33–36.

Hamermesh, D.S. (1985). ‘Expectations, life expectancy, and economic behavior’, *Quarterly Journal of Economics*, vol. 100(2), pp. 389–408.

Heckman, J.J. (2007). ‘The economics, technology, and neuroscience of human capability formation’, *Proceedings of the National Academy of Sciences*, vol. 104(33), pp. 13250–13255.

Herz, H., Huber, M., Maillard-Bjedov, T. and Tyahlo, S. (2021). ‘Time preferences across language groups: Evidence on intertemporal choices from the swiss language border’, *Economic Journal*, vol. 131(639), pp. 2920–2954.

Huffman, D., Maurer, R. and Mitchell, O.S. (2019). ‘Time discounting and economic decision-making in the older population’, *Journal of the Economics of Ageing*, vol. 14(100121).

Jayachandran, S. and Lleras-Muney, A. (2009). ‘Life expectancy and human capital investments: Evidence from maternal mortality declines’, *Quarterly Journal of Economics*, vol. 124(1), pp. 349–397.

Kang, M.I. and Ikeda, S. (2007). 'Time discounting and smoking behavior: Evidence from a panel survey', *Health Economics*, vol. 23(12), pp. 1443–1464.

Kelley, N.J. and Schmeichel, B.J. (2015). 'Thinking about death reduces delay discounting', *PLOS One*, vol. 10(12:e0144228).

Kemptner, D. and Tolan, S. (2018). 'The role of time preferences in educational decision making', *Economics of Education Review*, vol. 67, pp. 25–39.

Khwaja, A., Silverman, D. and Frank, S. (2007). 'Time preference, time discounting, and smoking decisions', *Journal of Health Economics*, vol. 26(5), pp. 927–949.

Kosse, F., Deckers, T., Pinger, P., Schildberg-Hörisch, H. and Falk, A. (2020). 'The formation of prosociality: Causal evidence on the role of the social environment', *Journal of Political Economy*, vol. 128(2), pp. 434–467.

Kreps, D.M., Milgrom, P., Roberts, J. and Wilson, R. (1982). 'Rational cooperation in the finitely repeated prisoners' dilemma', *Journal of Economic Theory*, vol. 27(2), pp. 245–252.

Kureishi, W., Paule-Paludkiewicz, H., Tsujiyama, H. and Wakabayashi, M. (2021). 'Time preferences over the life cycle and household saving puzzles', *Journal of Monetary Economics*, vol. 124.

Lawless, L., Drichoutis, A.C. and Nayga, R.M.J. (2013). 'Time preferences and health behaviour: a review', *Agricultural and Food Economics*, vol. 1(17).

Lee, A.J., DeBruine, L.M. and Jones, B.C. (2018). 'Individual-specific mortality is associated with how individuals evaluate future discounting decisions', *Proceedings of the Royal Society: B*, vol. 285(20180304).

Lowes, S., Nunn, N., Robinson, J.A. and Weigel, J.L. (2017). 'The evolution of culture and institutions: Evidence from the kuba kingdom', *Econometrica*, vol. 85(4), pp. 1065–1091.

Malmendier, U. and Nagel, S. (2011). 'Depression babies: Do macroeconomic experiences affect risk taking?', *Quarterly Journal of Economics*, vol. 126(1), pp. 373–416.

Malmendier, U. and Nagel, S. (2016). 'Learning from inflation experiences', *Quarterly Journal of Economics*, vol. 131(1), pp. 53–87.

Mischel, W., Shoda, Y. and Rodriguez, M.I. (1989). 'Delay of gratification in children', *Science*, vol. 244(4907), pp. 933–938.

Möhrle, S. and Sunde, U. (2021). ‘Distance to the pre-industrial technological frontier, patience, and economic development’, *Economics Letters*, vol. 201, p. 109788.

Oster, E., Shoulson, I. and Dorsey, E.R. (2013). ‘Limited life expectancy, human capital, and health investments’, *American Economic Review*, vol. 103(5), pp. 1977–2002.

Preston, S.L., Heuveline, P. and Guillot, M. (2001). *Demography – Measuring and Modeling Population Processes*, Oxford: Blackwell Publishing.

Robson, A.J. (2001). ‘The biological basis of economic behavior’, *Journal of Economic Literature*, vol. 39(1), pp. 11–33.

Robson, A.J. and Samuelson, L. (2009). ‘The evolution of time preferences with aggregate uncertainty’, *American Economic Review*, vol. 99(5), pp. 1925–1953.

Sanderson, W.C. and Scherbov, S. (2019). *Prospective Longevity: A New Vision of Population Aging*, Cambridge, Mass.: Harvard University Press.

Smith, V.K., Taylor, D.H. and Sloan, F.A. (2001). ‘Longevity expectations and death: Can people predict their own demise?’, *American Economic Review*, vol. 91(4), pp. 1126–1134.

Steinberg, L., Graham, S., O’Brien, L., Woolard, J., Cauffman, E. and Banich, M. (2009). ‘Age differences in future orientation and delay discounting’, *Child Development*, vol. 80(1), pp. 28–44.

Strulik, H. (2012). ‘Patience and prosperity’, *Journal of Economic Theory*, vol. 147, pp. 336–352.

Sunde, U., Dohmen, T., Enke, B., Falk, A., Huffman, D. and Meyerheim, G. (2022). ‘Patience and comparative development’, *Review of Economic Studies*, vol. 89(5).

Sutter, M., Kocher, M.G., Glätzle-Rützler, D. and Trautmann, S.T. (2013). ‘Impatience and uncertainty: Experimental decisions predict adolescents’ field behavior’, *American Economic Review*, vol. 103(1), pp. 510–531.

Tanaka, T., Camerer, C.F. and Nguyen, Q. (2010). ‘Risk and time preferences: Linking experimental and household survey data from vietnam’, *American Economic Review*, vol. 100(1), pp. 557–571.

van Solinge, H. and Henkens, K. (2018). ‘Subjective life expectancy and actual mortality: results of a 10-year panel study among older workers’, *European Journal of Aging*, vol. 15(2), pp. 155–164.

Yaari, M.E. (1965). 'Uncertain lifetime, life insurance, and the theory of the consumer', *Review of Economic Studies*, vol. 32(2).

# Supplementary Online Appendix

# Life Expectancy, Age, and Patience*

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**Abstract**

This file contains additional information, tables and figures referenced in the manuscript.

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# A Appendix: For Online Publication

## A.1 Data

**Quantitative Survey Item.** The first survey measure for patience is a quantitative, revealed-preference measure of patience that captures respondents' indifference point between a payment today and a payment with 12 months delay. This quantitative item presents the participants with a sequence of five interdependent trade-off questions: *"Suppose you were given the choice between receiving a payment today or a payment in 12 months. We will now present to you five situations. The payment today is the same in each of these situations. The payment in 12 months is different in every situation. For each of these situations we would like to know which you would choose. Please assume there is no inflation, i.e, future prices are the same as today's prices. Please consider the following: Would you rather receive 100 Euro today or $x$ Euro in 12 months?"*. Variation in the amount $x$ provides an indifference point between immediate and delayed pament, which serves as a quantitative measure of patience.[1]

The sequence of survey questions that form the basis for the quantitative patience measure is based on a "tree" logic. Each respondent faced five interdependent choices between receiving 100 euros today or varying amounts of money in 12 months. Responses can be classified into 32 distinct categories, each of which corresponds to an internal rate of return that is associated with (approximate) indifference between immediate and delayed payments, see the experimental validation procedure in **?** for details.

**Qualitative Survey Item.** The second measure is qualitative and captures the respondents' subjective assessment of their patience. In particular, the qualitative survey item asks participants: *"How willing are you to give up something that is beneficial for you today in order to benefit more from that in the future? Please indicate your answer on a scale from 0 to 10, where 0 means you are 'completely unwilling to do so' and a 10 means you are 'very willing to do so'. You can also use any numbers between 0 and 10 to indicate where you fall on the scale, like 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10."*

**Computation of Patience at the Individual Level.** The individual-level index of patience is computed by (i) computing the z-scores of each survey item at

[1] For the time-effective elicitation of the measure in the survey context, a "staircase task" was implemented, in which respondents were given choice alternatives that depended on their previous answers for the task. The precise elicitation protocol is shown in Appendix A.1.

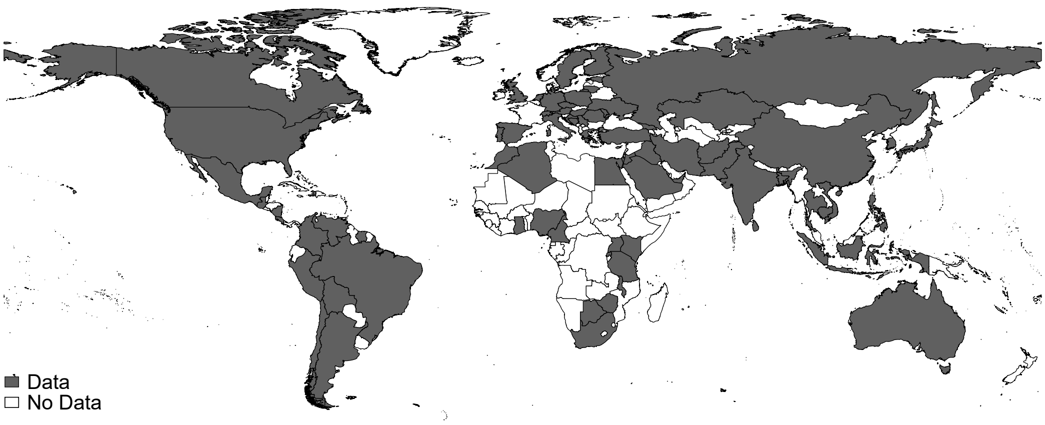
the individual level and (ii) weighing these z-scores using the weights resulting from the experimental validation procedure of **?**. Formally, these weights are given by the coefficients of an OLS regression of observed behavior on responses to the respective survey items, such that the coefficients sum to one. These weights are given by (see above for the precise survey items):

$$\text{Patience } = 0.7115185 \times \text{ Quantitative measure } + 0.2884815 \times \text{ Qualitative item}$$

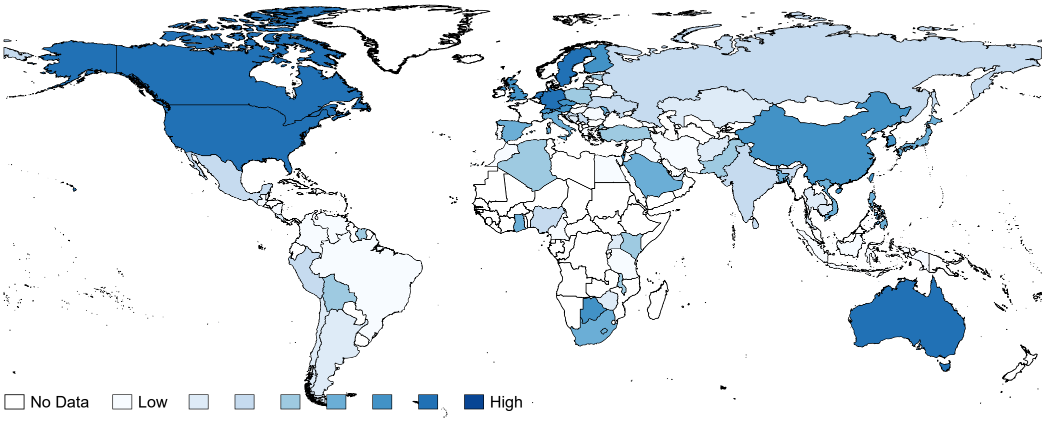
## A.2 Supplementary Figures

Figure A1: World Maps

(a) Data Availability

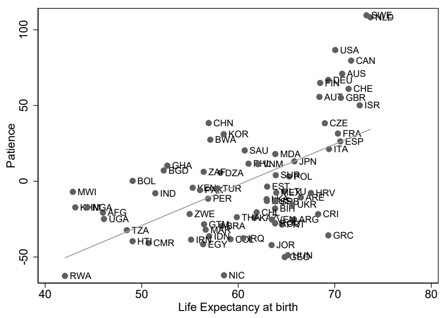



(b) Country-level Patience

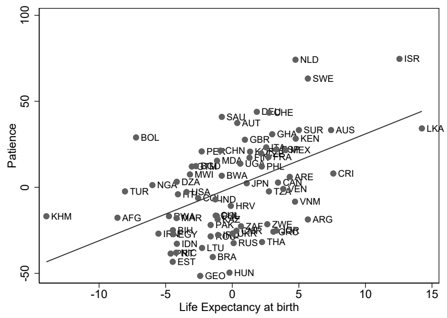



*Notes:* Figure A1(a) provides a world map of countries covered in the data. Figure A1(b) visualizes mean country-level patience across countries.

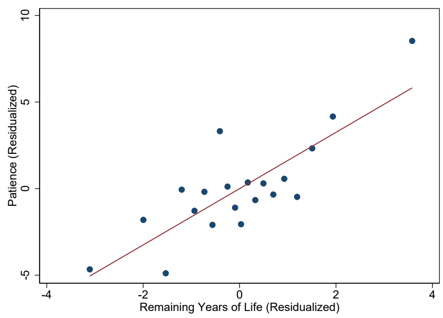
Figure A2: Life Expectancy and Patience at the Aggregate and Individual Level




(a) Raw Data



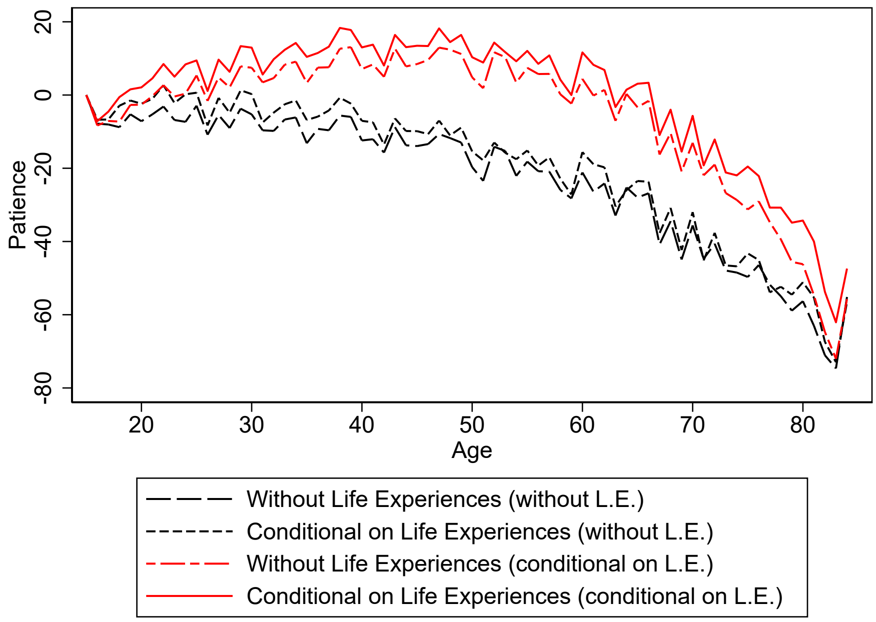

(b) Conditional on Observables




(c) Partial Regression Plot

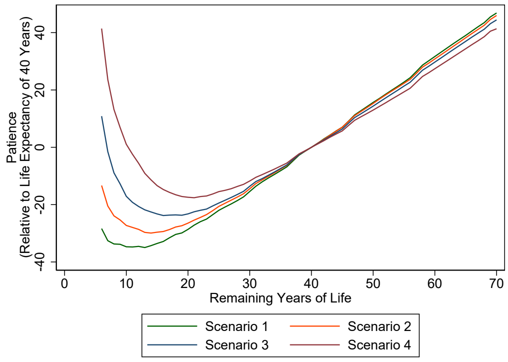
*Notes:* Figure A2(a) illustrates the unconditional associations of country-level patience with life expectancy at birth at the country level and Figure A2(b) shows the analogous association conditional on control variables. Controls include indicators for geographic region, absolute latitude, land suitability for agriculture, average temperature, average precipitation, timing of neolithic revolution, and percentage living in (sub-)tropical zones. Figure A2(c) shows partial regression plots of the association between expected remaining years of life and patience at the individual level after controlling for age and country fixed effects, as in the specification (1) of the respective panels of Table 1. For better visibility, residuals are plotted as a binned scatter plots with 20 bins.

Figure A3: Age and Patience: The Role of Lifetime Experiences




*Notes:* The figure displays the age profile of patience (age fixed effects) for four different specifications of the empirical framework: without controls for life experiences and life expectancy, with controls for life experiences but without life expectancy, with life expectancy but without life experiences, and with controls for both life experiences and life expectancy. Controls for life experiences are as in the specification of Column (8) of Table 3; life expectancy is controlled for by a full set of dummies for expected remaining years of life. The gradients are normalized such that the average individual at age 15 constitutes the reference group normalized to zero.

Figure A4: Longevity, Patience, and Selective Survival




*Notes:* Figure A4 visualizes simulations of the relationship of patience with expected remaining years of life under selective survival of more patient individuals. For each cohort born we assume that patience is distributed normally. Each one-year decrease in expected remaining years of life induces a 0.0163 standard deviation decrease in patience (equal to our baseline estimate in Table 1). For illustration, we further assume that an individual's average dying probability conditional on age equals the world average of age-specific mortality rates. Moreover, we assume that an individual's patience decreases her idiosyncratic dying probability. The different scenarios assume different strengths of this selective survival effect. Specifically, it is assumed that a one standard deviation increase in patience (relative to individuals of the same age) decreases the propensity of dying by 0.1 standard deviations (Scenario 1), 0.15 standard deviations (Scenario 2), 0.25 standard deviations (Scenario 3), 0.5 standard deviations (Scenario 4).

## A.3 Supplementary Tables

Table A1: Summary Statistics: Main Variables

| Baseline Specification | | | | | |
|---|---|---|---|---|---|
| | Mean | Std. Dev. | Min | Max | N |
| Patience | -0.00 | 1.00 | -1 | 3 | 79,433 |
| Remaining years of life | 36.27 | 14.40 | 2 | 72 | 79,433 |
| 1 if female | 0.55 | 0.50 | 0 | 1 | 79,433 |
| Age | 41.70 | 17.40 | 15 | 95 | 79,433 |
| Subj. math skills | 5.18 | 2.82 | 0 | 10 | 78,464 |
| Education level | 1.86 | 0.66 | 1 | 3 | 79,111 |
| Log [Household income p/c] | 7.92 | 1.52 | -4 | 15 | 78,950 |

Table A2: Summary Statistics: Additional Variables

| Additional Variables | Mean | Std. Dev. | Min | Max | N |
|---|---|---|---|---|---|
| Remaining years of life (mortality.org) | 33.29 | 15.41 | 2 | 72 | 25,196 |
| 1/(Probablity of Dying) | 617.99 | 840.90 | 4 | 7,933 | 78,938 |
| Avg. log GDP p/c lifetime | 0.12 | 0.18 | 0 | 10 | 79,433 |
| Avg. institutional quality lifetime | 0.02 | 0.16 | -1 | 10 | 79,433 |
| Avg. democracy lifetime | 0.01 | 0.02 | 0 | 1 | 79,433 |
| Subjective institutional quality | 49.16 | 35.44 | 0 | 100 | 59,467 |
| Avg. societal political violence lifetime | 0.01 | 0.03 | 0 | 1 | 79,433 |
| Avg. interstate political violence lifetime | 0.00 | 0.02 | 0 | 1 | 79,433 |
| Will. to take risks | 0.30 | 99.97 | -187 | 247 | 78,984 |
| Altruism | -0.04 | 99.93 | -261 | 233 | 79,107 |
| Trust | -0.05 | 99.92 | -197 | 168 | 78,056 |
| Positive reciprocity | 0.08 | 99.97 | -384 | 133 | 79,333 |
| Negative reciprocity | 0.23 | 99.90 | -159 | 233 | 77,958 |

Table A3: Life Expectancy and Patience: Inference with two-way clustered S.E.

| | Dependent variable: Patience | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Remaining years of life | 1.63*** | 1.73*** | 1.67*** | 1.68*** | 1.75*** | 1.59*** |
| | (0.368) | (0.391) | (0.380) | (0.394) | (0.437) | (0.438) |
| 1 if female | -13.5*** | -11.5*** | -11.6*** | -10.8*** | -12.4*** | -11.2*** |
| | (2.331) | (2.291) | (2.265) | (2.386) | (2.437) | (2.561) |
| Subj. math skills | | 2.24*** | 2.05*** | 2.22*** | 2.22*** | 2.05*** |
| | | (0.200) | (0.184) | (0.212) | (0.198) | (0.189) |
| Education level | | 8.58*** | 8.63*** | 9.32*** | 8.73*** | 9.71*** |
| | | (1.379) | (1.303) | (1.366) | (1.463) | (1.435) |
| Log [Household income p/c] | | 3.28*** | 3.04*** | 3.47*** | 3.31*** | 3.49*** |
| | | (0.576) | (0.559) | (0.610) | (0.621) | (0.638) |
| Country FE | Yes | Yes | No | Yes | Yes | No |
| Age FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Region FE | No | No | Yes | No | No | Yes |
| Religion FE | No | No | No | Yes | No | Yes |
| Language FE | No | No | No | No | Yes | Yes |
| Observations | 79433 | 77693 | 76793 | 69245 | 71987 | 62691 |
| $R^2$ | 0.161 | 0.172 | 0.218 | 0.176 | 0.184 | 0.232 |

*Notes:* Table A3 presents OLS estimates of a regression of patience on remaining years of life controlling for gender, country fixed effects, age fixed effects and different sets of control variables. In the specifications using within-country region fixed effects, no country fixed effects are included as they are collinear. Patience is standardized to exhibit a standard deviation of 100. Standard errors two-way clustered at country and age level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A4: Life Expectancy and Patience: Results for Different Sub-Samples

| | Dependent variable: Patience in ... | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Europe & CA | Americas | Africa & ME | SE Asia & Pacific | OECD | Non-OECD | Men | Women |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Remaining years of life | 2.34*** | 1.60* | 1.14*** | 3.52*** | 3.67** | 1.14*** | 1.59*** | 3.84*** |
| | (0.745) | (0.784) | (0.364) | (1.025) | (1.524) | (0.401) | (0.557) | (0.665) |
| 1 if female | -22.3*** | -11.5** | -3.21* | -14.1** | -28.3*** | -5.96*** | | |
| | (4.504) | (4.700) | (1.753) | (6.018) | (6.346) | (2.149) | | |
| Subj. math skills | 2.53*** | 1.92** | 1.85*** | 2.63*** | 2.78*** | 2.12*** | 2.82*** | 1.76*** |
| | (0.343) | (0.686) | (0.293) | (0.366) | (0.519) | (0.206) | (0.274) | (0.216) |
| Education level | 14.1*** | 14.8*** | 2.09 | 3.72 | 21.1*** | 4.11*** | 9.64*** | 7.99*** |
| | (2.271) | (3.085) | (1.392) | (2.909) | (2.341) | (1.123) | (1.682) | (1.507) |
| Log [Household income p/c] | 7.86*** | 2.39** | 0.63 | 3.84*** | 8.07*** | 1.95*** | 2.91*** | 3.60*** |
| | (1.102) | (0.933) | (0.889) | (1.100) | (1.138) | (0.544) | (0.736) | (0.712) |
| Country FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Age FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 26312 | 13525 | 21235 | 16621 | 21332 | 56361 | 35364 | 42329 |
| $R^2$ | 0.219 | 0.203 | 0.107 | 0.099 | 0.207 | 0.088 | 0.196 | 0.156 |

*Notes:* Table A4 presents for different sub-samples OLS estimates of a regression of patience on remaining years of life controlling for gender, country fixed effects, age fixed effects and additional controls that include subjective math skills, education level, and log household income per capita. Patience is standardized to exhibit a standard deviation of 100. Standard errors clustered at the country level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A5: Heterogeneity Analysis

| | Dependent variable: Patience | | | | | |
|---|---|---|---|---|---|---|
| | (1) Europe & CA | (2) Americas | (3) Africa & ME | (4) SE Asia & Pacific | (5) OECD | (6) Women |
| Current life expectancy | 1.09*** | 1.68*** | 1.45*** | 1.67*** | 1.30*** | 1.32*** |
| | (0.386) | (0.358) | (0.350) | (0.367) | (0.391) | (0.366) |
| Interaction | 0.39*** | -0.23** | -0.22** | -0.10 | 0.20* | 0.21*** |
| (with characteristic listed in column title) | (0.091) | (0.091) | (0.087) | (0.115) | (0.114) | (0.059) |
| Gender | Yes | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Age FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Education Level | Yes | Yes | Yes | Yes | Yes | Yes |
| Subj. math skills | Yes | Yes | Yes | Yes | Yes | Yes |
| Log [Household income p/c] | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 77693 | 77693 | 77693 | 77693 | 77693 | 77693 |
| $R^2$ | 0.173 | 0.173 | 0.173 | 0.173 | 0.173 | 0.173 |

*Notes:* Table A5 presents OLS estimates of a regression of patience on remaining years of life and its interaction with a characteristic dummy for either Europe & CA, Americas, Africa, ME & SE Asia, Pacific, OECD, Women controlling for gender, country fixed effects, age fixed effects and different sets of control variables as well as all their interactions with the respective characteristic dummy. Patience is standardized to exhibit a standard deviation of 100. Standard errors clustered at the country level in parentheses. $^{***}$ $p < 0.01$, $^{**}$ $p < 0.05$, $^{*}$ $p < 0.1$.

Table A6: Life Expectancy and Patience: Heterogeneity by Income

| | Dependent variable: Patience | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Remaining years of life | 1.7112*** | 1.5658*** | 1.5209*** | 1.4733*** | 1.6346*** | 1.4366*** |
| | (0.394) | (0.403) | (0.400) | (0.408) | (0.422) | (0.432) |
| 2. Income Quintile | 2.4433 | 0.3387 | -0.1767 | 0.4733 | -0.2239 | 0.2930 |
| | (2.502) | (2.465) | (2.360) | (2.638) | (2.553) | (2.684) |
| 3. Income Quintile | 8.5317** | 3.7630 | 4.6217 | 3.6265 | 4.1841 | 6.0291 |
| | (4.013) | (3.787) | (3.843) | (3.938) | (3.919) | (4.110) |
| 4. Income Quintile | 18.3984*** | 12.4492*** | 13.1439*** | 9.8118** | 12.4316*** | 11.8496*** |
| | (3.897) | (3.751) | (3.653) | (3.922) | (3.894) | (3.874) |
| 5. Income Quintile | 21.5701*** | 12.7491*** | 15.0619*** | 9.8648** | 13.5994*** | 13.9902*** |
| | (4.589) | (4.486) | (4.489) | (4.683) | (4.545) | (4.794) |
| 2. Income Quintile × Remaining years of life | 0.0777 | 0.0747 | 0.0791 | 0.0696 | 0.0823 | 0.0740 |
| | (0.056) | (0.056) | (0.054) | (0.059) | (0.057) | (0.061) |
| 3. Income Quintile × Remaining years of life | 0.0406 | 0.0680 | 0.0334 | 0.0889 | 0.0401 | 0.0167 |
| | (0.091) | (0.089) | (0.088) | (0.092) | (0.093) | (0.093) |
| 4. Income Quintile × Remaining years of life | -0.0381 | -0.0227 | -0.0589 | 0.0643 | -0.0435 | -0.0106 |
| | (0.092) | (0.094) | (0.091) | (0.094) | (0.097) | (0.093) |
| 5. Income Quintile × Remaining years of life | -0.0898 | -0.0318 | -0.1156 | 0.0567 | -0.0568 | -0.0549 |
| | (0.124) | (0.124) | (0.124) | (0.124) | (0.129) | (0.132) |
| 1 if female | -13.2854*** | -11.1613*** | -11.2770*** | -10.3436*** | -12.1744*** | -10.8980*** |
| | (2.341) | (2.271) | (2.279) | (2.352) | (2.305) | (2.437) |
| Subj. math skills | | 2.3048*** | 2.0915*** | 2.2767*** | 2.2799*** | 2.0819*** |
| | | (0.213) | (0.193) | (0.222) | (0.213) | (0.195) |
| Country FE | Yes | Yes | No | Yes | Yes | No |
| Age FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Education Level | No | Yes | Yes | Yes | Yes | Yes |
| Region FE | No | No | Yes | No | No | Yes |
| Religion FE | No | No | No | Yes | No | Yes |
| Language FE | No | No | No | No | Yes | Yes |
| Observations | 77944 | 76713 | 75813 | 68258 | 71485 | 62179 |
| $R^2$ | 0.166 | 0.174 | 0.221 | 0.179 | 0.186 | 0.235 |

*Notes:* Table A6 presents OLS estimates of a regression of the combined measure of patience on remaining years of life, household income in quintiles, and their interaction. The combined patience measure has been standardized to exhibit a standard deviation of 100. Controls include a dummy for gender, country fixed effects, age fixed effects, and different sets of control variables. In the specifications using within-country region fixed effects, no country fixed effects are included as they are collinear. Standard errors clustered at the country level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A7: Life Expectancy and Patience: Heterogeneity by Education

| | Dependent variable: Patience | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Remaining years of life | 1.3582*** | 1.4443*** | 1.4207*** | 1.4126*** | 1.4842*** | 1.3464*** |
| | (0.386) | (0.378) | (0.377) | (0.384) | (0.413) | (0.428) |
| Education Level=2 | 2.0322 | -3.4346 | -3.1624 | -2.1007 | -3.5738 | -2.2045 |
| | (2.848) | (2.779) | (2.567) | (2.860) | (2.885) | (2.956) |
| Education Level=3 | 26.0028*** | 16.3761*** | 17.7891*** | 18.2628*** | 16.7852*** | 20.4610*** |
| | (5.601) | (5.676) | (5.263) | (5.867) | (5.804) | (5.701) |
| Education Level=2 $\times$ Remaining years of life | 0.1333* | 0.1617** | 0.1510** | 0.1361* | 0.1565** | 0.1342* |
| | (0.070) | (0.070) | (0.062) | (0.075) | (0.071) | (0.072) |
| Education Level=3 $\times$ Remaining years of life | 0.0314 | 0.0720 | 0.0337 | 0.0652 | 0.0599 | 0.0126 |
| | (0.113) | (0.117) | (0.111) | (0.125) | (0.120) | (0.120) |
| 1 if female | -12.1237*** | -11.0359*** | -11.2078*** | -10.2869*** | -11.9343*** | -10.7915*** |
| | (2.205) | (2.133) | (2.137) | (2.211) | (2.211) | (2.342) |
| Subj. math skills | | 2.2848*** | 2.0905*** | 2.2595*** | 2.2553*** | 2.0838*** |
| | | (0.207) | (0.191) | (0.216) | (0.207) | (0.194) |
| Log [Household income p/c] | | 3.3172*** | 3.0400*** | 3.4819*** | 3.3372*** | 3.4842*** |
| | | (0.558) | (0.547) | (0.578) | (0.603) | (0.620) |
| Country FE | Yes | Yes | No | Yes | Yes | No |
| Age FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Region FE | No | No | Yes | No | No | Yes |
| Religion FE | No | No | No | Yes | No | Yes |
| Language FE | No | No | No | No | Yes | Yes |
| Observations | 79111 | 77693 | 76793 | 69245 | 71987 | 62691 |
| $R^2$ | 0.168 | 0.173 | 0.220 | 0.177 | 0.185 | 0.233 |

*Notes:* Table A7 presents OLS estimates of a regression of the combined measure of patience on remaining years of life, education, and their interaction. Education is measured in three categories: (1) elementary education or less, (2) secondary education or up to 3 years tertiary education, (3) completed four years or more of tertiary education. The combined patience measure has been standardized to exhibit a standard deviation of 100. Controls include a dummy for gender, country fixed effects, age fixed effects, and different sets of control variables. In the specifications using within-country region fixed effects, no country fixed effects are included as they are collinear. Standard errors clustered at the country level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A8: Life Expectancy and Patience: Alternative Measures of Mortality and Instrumental Variables

| | Dependent variable: Patience | | | | | |
|---|---|---|---|---|---|---|
| | Alternative Measures | | Instrument: Remaining years of life in... | | | |
| | | | 2000 | 1990 | 1980 | 1970 |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Remaining years of life (mortality.org) | 1.67** | | | | | |
| | (0.606) | | | | | |
| 1/(Probability of Dying) | | 0.0054*** | | | | |
| | | (0.001) | | | | |
| Remaining years of life (instrumented) | | | 1.63*** | 1.37*** | 1.56*** | 1.90*** |
| | | | (0.363) | (0.394) | (0.457) | (0.419) |
| Gender | Yes | Yes | Yes | Yes | Yes | Yes |
| Subj. math skills | Yes | Yes | Yes | Yes | Yes | Yes |
| Education Level | Yes | Yes | Yes | Yes | Yes | Yes |
| Log [Household income p/c] | Yes | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Age FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 24698 | 77235 | 77693 | 77693 | 77693 | 77693 |
| $R^2$ | 0.219 | 0.173 | 0.173 | 0.173 | 0.173 | 0.173 |
| F | . | . | 1210.8 | 171.8 | 321.7 | 550.4 |

*Notes:* Columns (1) and (2) of Table A8 present OLS estimates of a regression of patience on two measures of longevity controlling for gender, country fixed effects, age fixed effects, development and additional controls that include subjective math skills, education level, and log household income per capita. Columns (3) to (6) present IV estimates of a regression of patience on remaining years of life controlling for the same control variables. Instruments employed are the remaining years of life for a given gender-age-country cell in previous decades (for the first stage see Table A9). Patience is standardized to exhibit a standard deviation of 100. Standard errors clustered at the country level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A9: Life Expectancy and Patience: IV Estimates (First Stage)

| | First Stage<br>Dep. Var.: Remaining years of life (2010) | | | |
|---|---|---|---|---|
| | (3) | (4) | (5) | (6) |
| Remaining years of life 2000 | 0.63$^{***}$<br>(0.049) | | | |
| Remaining years of life 1990 | | 0.78$^{***}$<br>(0.068) | | |
| Remaining years of life 1980 | | | 0.63$^{***}$<br>(0.167) | |
| Remaining years of life 1970 | | | | 0.75$^{***}$<br>(0.074) |
| Gender | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes |
| Age FE | Yes | Yes | Yes | Yes |
| Additional Controls | Yes | Yes | Yes | Yes |
| Education Level | Yes | Yes | Yes | Yes |
| Observations | 77693 | 77693 | 77693 | 77693 |

*Notes:* Table A9 presents the first-stage estimates of the IV regressions in Columns (3) to (6) of Table A8. Additional controls include subjective math skills, education level, and log household income per capita.

Table A10: Life Expectancy and Patience: The Role of Subjective Health Perceptions

| | Dependent variable: Patience | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Remaining years of life | 1.72*** | 1.71*** | 1.65*** | 1.66*** | 1.75*** | 1.57*** |
| | (0.369) | (0.370) | (0.370) | (0.375) | (0.406) | (0.417) |
| Subjective health perceptions | 0.13*** | 0.084*** | 0.087*** | 0.10*** | 0.087*** | 0.11*** |
| | (0.021) | (0.019) | (0.019) | (0.017) | (0.020) | (0.018) |
| Gender | Yes | Yes | Yes | Yes | Yes | Yes |
| Subj. math skills | No | Yes | Yes | Yes | Yes | Yes |
| Age FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Education Level | No | Yes | Yes | Yes | Yes | Yes |
| Log [Household income p/c] | No | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | No | Yes | Yes | No |
| Region FE | No | No | Yes | No | No | Yes |
| Religion FE | No | No | No | Yes | No | Yes |
| Language FE | No | No | No | No | Yes | Yes |
| Observations | 77411 | 75707 | 74807 | 67353 | 70001 | 60799 |
| $R^2$ | 0.151 | 0.161 | 0.209 | 0.165 | 0.174 | 0.222 |

*Notes:* Table A10 presents OLS estimates of a regression of patience on remaining years of life controlling for gender, country fixed effects, age fixed effects, subjective health perceptions and different sets of control variables. Additional controls include subjective math skills, education level, and log household income per capita In the specifications using within-country region fixed effects, no country fixed effects are included as they are collinear. Patience is standardized to exhibit a standard deviation of 100. Standard errors clustered at the country level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A11: Life Expectancy and Patience: The Role of Optimism and Emotional Well-Being

| | Dependent variable: Patience | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Remaining years of life | 1.35*** | 1.36*** | 1.31*** | 1.38*** | 1.38*** | 1.29*** |
| | (0.356) | (0.364) | (0.364) | (0.369) | (0.401) | (0.412) |
| Health index | 0.064*** | 0.045* | 0.047** | 0.059*** | 0.044* | 0.061*** |
| | (0.023) | (0.023) | (0.020) | (0.022) | (0.023) | (0.022) |
| Optimism Index | -0.017*** | -0.014** | -0.013* | -0.012* | -0.014* | -0.013* |
| | (0.006) | (0.006) | (0.007) | (0.007) | (0.007) | (0.007) |
| Positive Experience Index | 0.13*** | 0.092*** | 0.093*** | 0.086*** | 0.099*** | 0.093*** |
| | (0.023) | (0.024) | (0.021) | (0.024) | (0.024) | (0.022) |
| Gender | Yes | Yes | Yes | Yes | Yes | Yes |
| Subj. math skills | No | Yes | Yes | Yes | Yes | Yes |
| Age FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Education Level | No | Yes | Yes | Yes | Yes | Yes |
| Log [Household income p/c] | No | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | No | Yes | Yes | No |
| Region FE | No | No | Yes | No | No | Yes |
| Religion FE | No | No | No | Yes | No | Yes |
| Language FE | No | No | No | No | Yes | Yes |
| Observations | 70962 | 69398 | 68501 | 63543 | 63692 | 56991 |
| $R^2$ | 0.148 | 0.158 | 0.211 | 0.159 | 0.173 | 0.222 |

*Notes:* Table A11 presents OLS estimates of a regression of patience on remaining years of life controlling for gender, country fixed effects, age fixed effects, subjective health perceptions, optimism as measured by an optimism index that measures respondents' positive attitudes about the future (in terms of certain aspects of life getting better or worse), emotional well-being as measured by a positive experience index (affirmative answers to a set of five questions related to feeling rested, respected, joyful, interesting activities and smiling), and different sets of control variables. Additional controls include subjective math skills, education level, and log household income per capita In the specifications using within-country region fixed effects, no country fixed effects are included as they are collinear. Patience is standardized to exhibit a standard deviation of 100. Standard errors clustered at the country level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A12: Life Expectancy at Birth and Patience

| | Dependent variable: Patience | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Remaining years of life | 1.684*** | 1.807*** | 1.731*** | 1.725*** | 1.826*** | 1.609*** |
| | (0.385) | (0.390) | (0.391) | (0.395) | (0.425) | (0.436) |
| Life expectancy at birth | -0.108 | -0.299* | -0.253 | -0.301* | -0.299 | -0.273 |
| | (0.157) | (0.175) | (0.169) | (0.177) | (0.194) | (0.200) |
| Gender | Yes | Yes | Yes | Yes | Yes | Yes |
| Subj. math skills | No | Yes | Yes | Yes | Yes | Yes |
| Age FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Education Level | No | Yes | Yes | Yes | Yes | Yes |
| Log [Household income p/c] | No | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | No | Yes | Yes | No |
| Region FE | No | No | Yes | No | No | Yes |
| Religion FE | No | No | No | Yes | No | Yes |
| Language FE | No | No | No | No | Yes | Yes |
| Observations | 79433 | 77693 | 76793 | 69245 | 71987 | 62691 |
| $R^2$ | 0.161 | 0.173 | 0.220 | 0.177 | 0.185 | 0.233 |

*Notes:* Table A12 presents OLS estimates of a regression of patience on remaining years of life as well as life expectancy at birth controlling for gender, country fixed effects, age fixed effects, and additional controls that include subjective math skills, education level, and log household income per capita. Patience is standardized to exhibit a standard deviation of 100. Standard errors clustered at the country level in parentheses. $^{***}$ $p < 0.01$, $^{**}$ $p < 0.05$, $^{*}$ $p < 0.1$.

Table A13: Longevity and Savings at the Individual Level

| | Dependent variable: Saved last year | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Remaining years of life | 0.012*** | 0.010** | 0.010** | 0.010** | 0.009** | 0.010** |
| | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) |
| Gender | Yes | Yes | Yes | Yes | Yes | Yes |
| Subj. math skills | No | Yes | Yes | Yes | Yes | Yes |
| Age FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Education Level | No | Yes | Yes | Yes | Yes | Yes |
| Log [Household income p/c] | No | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | No | Yes | Yes | No |
| Region FE | No | No | Yes | No | No | Yes |
| Religion FE | No | No | No | Yes | No | Yes |
| Language FE | No | No | No | No | Yes | Yes |
| Observations | 15388 | 14981 | 14981 | 14492 | 11556 | 11071 |
| $R^2$ | 0.079 | 0.143 | 0.194 | 0.147 | 0.166 | 0.219 |

*Notes:* Table A13 presents OLS estimates of a regression of an indicator for whether the individual saved last year on remaining years of life controlling for gender, country fixed effects, age fixed effects and different sets of control variables. In the specifications using within-country region fixed effects, no country fixed effects are included as they are collinear. Standard errors clustered at the country level in parentheses. $^{***}$ $p < 0.01$, $^{**}$ $p < 0.05$, $^{*}$ $p < 0.1$.

Table A14: Longevity and Savings at the Individual Level: Probit Estimates

| | Dependent variable: Saved last year | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Remaining years of life | 0.036*** | 0.031*** | 0.034*** | 0.032*** | 0.029** | 0.032*** |
| | (0.010) | (0.010) | (0.011) | (0.011) | (0.011) | (0.012) |
| Gender | Yes | Yes | Yes | Yes | Yes | Yes |
| Subj. math skills | No | Yes | Yes | Yes | Yes | Yes |
| Age FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Education Level | No | Yes | Yes | Yes | Yes | Yes |
| Log [Household income p/c] | No | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | No | Yes | Yes | No |
| Region FE | No | No | Yes | No | No | Yes |
| Religion FE | No | No | No | Yes | No | Yes |
| Language FE | No | No | No | No | Yes | Yes |
| Observations | 15364 | 14953 | 14490 | 14453 | 11530 | 10589 |

*Notes:* Table A14 presents Probit estimates of a regression of an indicator for whether the individual saved last year on remaining years of life controlling for gender, country fixed effects, age fixed effects and different sets of control variables. In the specifications using within-country region fixed effects, no country fixed effects are included as they are collinear. Standard errors clustered at the country level in parentheses. $^{***}$ $p < 0.01$, $^{**}$ $p < 0.05$, $^{*}$ $p < 0.1$.

Table A15: Life Expectancy and Patience: Experience Effects (Robustness 1: At Birth)

| | Dependent variable: Patience | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Remaining years of life | 1.367*** | 1.439*** | 1.443*** | 1.545*** | 1.566*** | 1.241*** |
| | (0.390) | (0.365) | (0.359) | (0.362) | (0.358) | (0.386) |
| Log GDP p/c at birth | 3.291* | | | | | 2.071 |
| | (1.805) | | | | | (1.560) |
| Inst. quality at birth | | 0.033 | | | | 0.048 |
| | | (0.139) | | | | (0.174) |
| Democracy at birth | | | -0.042 | | | -1.309 |
| | | | (1.722) | | | (2.050) |
| Societal pol. violence at birth | | | | -0.455 | | -0.425 |
| | | | | (0.360) | | (0.350) |
| Interstate pol. violence at birth | | | | | 0.168 | 0.209 |
| | | | | | (0.671) | (0.537) |
| Gender | Yes | Yes | Yes | Yes | Yes | Yes |
| Subj. math skills | Yes | Yes | Yes | Yes | Yes | Yes |
| Age FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Education Level | Yes | Yes | Yes | Yes | Yes | Yes |
| Log [Household income p/c] | Yes | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 77693 | 77693 | 77693 | 77693 | 77693 | 77693 |
| $R^2$ | 0.173 | 0.173 | 0.173 | 0.173 | 0.173 | 0.173 |

*Notes:* Table A15 presents OLS estimates of a regression of patience on remaining years of life controlling for gender, country fixed effects, age fixed effects, development and institutional quality experienced at birth. Additional controls include subjective math skills, education level, and log household income per capita. Patience is standardized to exhibit a standard deviation of 100. Standard errors clustered at the country level in parentheses. $^{***}$ $p < 0.01$, $^{**}$ $p < 0.05$, $^{*}$ $p < 0.1$.

Table A16: Life Expectancy and Patience: Experience Effects (Robustness 2: At Age 15)

| | Dependent variable: Patience | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Remaining years of life | 1.627*** | 1.573*** | 1.588*** | 1.444*** | 1.478*** | 1.451*** |
| | (0.370) | (0.359) | (0.357) | (0.359) | (0.360) | (0.365) |
| Log GDP p/c at age 15 | -0.267 | | | | | -0.857 |
| | (1.337) | | | | | (1.332) |
| Inst. quality at age 15 | | 0.157 | | | | 0.094 |
| | | (0.134) | | | | (0.190) |
| Democracy at age 15 | | | 1.808 | | | 0.420 |
| | | | (1.626) | | | (2.183) |
| Societal pol. violence at age 15 | | | | -0.712*** | | -0.701*** |
| | | | | (0.262) | | (0.264) |
| Interstate pol. violence at age 15 | | | | | -0.318 | -0.250 |
| | | | | | (0.510) | (0.523) |
| Gender | Yes | Yes | Yes | Yes | Yes | Yes |
| Subj. math skills | Yes | Yes | Yes | Yes | Yes | Yes |
| Age FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Education Level | Yes | Yes | Yes | Yes | Yes | Yes |
| Log [Household income p/c] | Yes | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 77693 | 77693 | 77693 | 77693 | 77693 | 77693 |
| $R^2$ | 0.173 | 0.173 | 0.173 | 0.173 | 0.173 | 0.173 |

*Notes:* Table A16 presents OLS estimates of a regression of patience on remaining years of life controlling for gender, country fixed effects, age fixed effects, development and institutional quality experienced at age 15. Additional controls include subjective math skills, education level, and log household income per capita. Patience is standardized to exhibit a standard deviation of 100. Standard errors clustered at the country level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.