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Longevity and Lifetime Education: Global Evidence from 919 Surveys

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Longevity and Lifetime Education: Global Evidence from 919 Surveys

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Data from 919 household surveys conducted between 1960 and 2012 spanning 147 economies are used to evaluate the relationship between rising life expectancy at birth and lifetime years of schooling for successive birth cohorts between 1905 and 1988. We find significant positive effects of increased life expectancy at birth on lifetime completed years of schooling in 95% of the surveys with significant negative effects found in only 2.3%. Rising life expectancy at birth for a birth cohort has intergenerational benefits in that their children's schooling also increases. Rising life expectancy at birth since 1905 can explain 70% of the rising completed years of schooling for those birth cohorts.

Key Words: life expectancy, lifetime education, cohort, human capital, Ben-Porath, identification

JEL: J10; I15; O15;

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Longevity and Lifetime Education: Global Evidence from 919 Surveys

1. Introduction

By 2015, world life expectancy at birth was 73.8 years for women and 69.6 years for men, more than double the average life expectancy in 1900 (UN 2017, Kinsella and Velkoff, 2001). A long-held theoretical model in economics explains why greater longevity would also increase lifetime human capital investment (Ben-Porath, 1967; Heckman, 1976; Becker, 1993). An increase in the human life span brings economic benefits to individuals and economies: lifetime earnings would rise because better health allows people to work more years and more hours per year, raises productivity per hour of work, and induces higher savings and more investments in physical and human capital. Analyses of cross-economy and individual-level data generally find that increases in life expectancy raise lifetime earnings, but their impact on schooling levels has been mixed.

The contrasting results from these studies motivate us to reexamine the relationship afresh using a different identification strategy applied to cohort-specific data from a large number of surveys in developing economies. This paper aims to establish a causal relationship between increases in life expectancy at birth and the completed years of schooling of cohorts born between 1905 and 1988 in 147 economies.

Unlike other cross-economy studies which we review below, our study uses data on completed years of schooling from 919 household surveys rather than estimates of schooling levels based on school enrollment data from population censuses. We adopt a birth-cohort approach that matches cohort-specific completed years of schooling with cohort-specific life expectancy at birth, allowing us to exploit between-cohort, within-economy variations in life expectancy at birth and schooling. In this approach, we incorporate data on parents' life expectancy to control for the intergenerational link, and use individual-level data on schooling attainment to examine the causal link. Finally, we undertake regional and economy-specific analyses to compare the effect of life-expectancy at birth on schooling across income regions and economies.

In 95% of the surveys, we find positive and statistically significant effects of life expectancy at birth on lifetime years of schooling. In only 2.3% of the surveys is the relationship negative and statistically significant. The effects are important economically. We find that an additional year of life expectancy at birth increases years of schooling for that birth cohort by 0.11 to 0.15 years. In addition, that one-year increase in life expectancy will increase the years of schooling of the children of that birth cohort by 0.025 years. Applying these estimates to changes in life expectancy since 1905, we conclude that rising life expectancy at birth accounts for about 70% of the rising years of schooling worldwide.

The next section reviews the recent studies that link life expectancy to schooling, followed by a section on the theoretical framework that guides our empirical approach. Section 4 describes the survey data we use and defines the variables. Sections 5 and 6 report the findings from our basic empirical model and from the extensions of that model, respectively. The final section compares our results with those of other studies and draws implications for policy.

2. Relevant Literature

Recent studies have provided conflicting evidence regarding the Ben-Porath prediction that greater life expectancy increases human capital investment.[1] The principal challenge for these studies has been to establish causality, not just correlation. Studies have addressed this

[1] Earlier studies, such as Kalemli-Ozcan, Ryder and Weil (2000), have been cited and reviewed thoroughly by recent studies included here (e.g., Bleakley, 2010b; Cutler et al., 2010; Cervellati and Sunde, 2009). Here we focus on studies undertaken in the last decade.

challenge using a variety of approaches. Acemoglu and Johnson (2007) used the dates of international health interventions and public health improvements in the 1940s and the variation across 47 economies in pre-intervention disease mortality rates to estimate economy-specific measures of the decline in mortality to define an instrumental variable for changes in life expectancy in an economy. The authors do not find a significant effect of the predicted mortality reduction on per-capita economic growth or on years of schooling. One reason given for this finding is that increased life expectancy also boosted population growth, exerting pressure on resources for human capital investments.[2] Bloom, Canning, and Fink (2014) argued that the Acemoglu-Johnson finding was due to omitted variable bias, the result of excluding an initial life expectancy measure for each economy. Without controlling for this initial health variable, changes in life expectancy at birth which were largest in the poorest economies appeared to produce lower economic growth in those economies.

Other studies have also used the timing of health interventions and geographic variation in pre-intervention health measures as the source of exogenous change in estimating a causal relationship between life expectancy and schooling using individual-level data rather than economy-level data. Bleakley (2010a) applied this quasi-experimental approach to data on malaria prevalence rates in the US, Brazil, Colombia and Mexico. He compared the cohorts based on the pre-eradication malaria burden in their place of birth and their year of birth relative to the malaria-eradication campaigns. Cohorts born after the campaign and in areas with high pre-campaign malaria burden would have had more exposure to the benefits of the eradication programs, compared with those cohorts born before the eradication campaign. Early-life malaria

[2] Unexpectedly large cohorts will face depressed earnings from a crowding of more individuals into the market, particularly if different birth cohorts are not perfect substitutes in production. To the extent that the potential for crowding in is expected, individuals in cohorts with rising life expectancy will moderate their human capital investment decisions to reflect anticipated depreciated earnings per unit of human capital.

infection is expected to affect schooling levels because the disease stunts fetal development, impairs cognitive ability, and raises school absenteeism. The author found significant positive effects on adult earnings and literacy in all three economies, but years of schooling only rose significantly in Colombia.

In a similar study that focused on India, Cutler et al. (2010) compared outcomes across pre- and post-eradication-campaign cohorts in areas with varying pre-campaign prevalence. Their differences-in-differences estimates revealed no relative gains in either literacy levels or primary school completion in areas that experienced the largest reductions in malaria. Only when the authors distinguished between the most and least malarious areas did they find a positive effect of the campaign on primary completion and literacy. Lucas's (2010) study of women born before and after a malaria eradication campaign in Sri Lanka and Paraguay found that women born after the malaria intervention gained more years of schooling and improved their literacy.[3]

Other studies have examined how information regarding life expectancy affect human capital. For example, Oster, Shoulson and Dorsey (2013) used knowledge of Huntington's Disease, a life-shortening genetic illness, to show that individuals who test positive for the disease were 30 percentage points less likely to complete college. There were no differences in high school completion since testing occurred later in life after high school completion. The estimated elasticity of demand for education with respect to life expectancy was around 1.0.[4]

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[3] Miguel and Kremer (2004) found that deworming drugs raised completed schooling primarily by reducing student absence rates. Benefits also extended to the surrounding community because there was lower transmission of infections. Unclear was how much of the increased schooling was due to the physiological effect of reducing helminth infections and how much was due to the Ben-Porath effect.

[4] This study provides a clearer test of the Ben-Porath hypothesis than those studies that have used weather conditions (Maccini and Yang, 2009) or randomized nutrition programs (Maluccio et al., 2009) to measure changes in health status. For example, Maccini and Yang (2009) found that the amount of rainfall around the time of birth was linked to the health, education, and socioeconomic outcomes of Indonesian adults born between 1953 and 1974. The effect could be due to better nutrition and health from improved harvests, but it could be also due to better incomes from greater agricultural productivity.

Several reasons have been proposed to explain why the cross-economy and individual-level studies have not shown a consistently positive causal relationship between life expectancy and years of schooling, despite the positive results for lifetime earnings. One reason is that better child health signaled by increased life expectancy at birth raises the productivity of child labor as well as later adult labor, even without more years of schooling. This is consistent with the positive impact on literacy that Bleakley (2010a), Cutler et al. (2010) and Lucas (2009) find. Another possible reason is suggested by Pitt et al. (2012): In economies where returns to schooling are limited, the positive effect of better health on ability to perform physical labor ("brawn") is enough to increase lifetime earnings without raising time in school.

Lorentzen, McMillan and Wacziarg (2008) use changes in adult mortality rates rather than in infant and child mortality or life expectancy at birth to measure an economy's health status. They argue that premature death of an adult destroys that person's accumulated human capital, incurring a more immediate and significant economic loss than would an infant death. In both their OLS and structural models, the authors find a significant effect of adult mortality on human capital investment, measured as enrollment rates at the secondary level, but the higher enrollment rates do not translate into faster economic growth. To deal with the problem of endogeneity, they use three sets of exogenous variables (malaria ecology, climate variables and geographic features) and a 3SLS methodology which uses excluded variables as instruments.

In contrast, Hazan (2012) found a significant relationship between life expectancy at birth and years of schooling but not between life expectancy at age 5 and years of schooling. In cross-economy studies, life expectancy at birth is the preferred measure both because mortality rates are higher for newborns and infants than for older children and because declines in infant and child mortality are thought to result more from exogenous health interventions than from parental investments in their children's health. Cohen and Leker (2014) found that life expectancy at birth was a decisive factor for schooling decisions related to younger cohorts but not for those cohorts who had already completed their schooling.

Hazan (2009) argued that the relevant measure of life expectancy was the expected total working hours over a person's lifetime, not life expectancy at birth or adult mortality. He argued that the Ben-Porath model would require a positive correlation between longevity and expected lifetime work hours. He did not find evidence of that positive correlation in data on U.S. men born between 1840 and 1970 and all American individuals born between 1890 and 1970. In response, Cervellati and Sunde (2013) argued that an increase in expected lifetime labor supply is neither a necessary nor sufficient condition for higher life expectancy to induce an increase in schooling. They documented that the observed fall in labor supply in the US was due to cohorts spending more time in school, delaying entry into the labor market, and consuming more leisure made affordable by the higher earnings.

Our strategy makes several departures from past studies. First, we base our analysis on 919 household surveys containing information on completed schooling rather than estimates of schooling based on enrollment data. Our strategy is to relate life expectancy at birth for an economy-birth-year cohort to the average education that cohort will ultimately attain. This level of detail will allow us to exploit between-cohort, within-economy variations in life expectancy at birth and schooling. In addition to examining how own life expectancy affects schooling, we also examine intergenerational effects of life expectancy gains by incorporating the effect of changing life expectancy at birth of the parental cohort on the lifetime schooling of their children.[5] Our contribution will be to assess how common are violations of the Ben-Porath hypothesis across

[5] We see this as a plausible reason for the Lorentzen, McMillan and Wacziarg (2008) finding that adult mortality affects the schooling of younger cohorts.

this large set of tests and to demonstrate the distribution of estimated schooling effects of life expectancy around the world. In the next section, we lay out our empirical strategy.

3. Theoretical Motivation

The theoretical motivation of this paper comes from Ben-Porath's model (1967) as most recently expostulated by Bleakley's "horizon triangle" (2017). Our empirical framework is built on the hypothesis that individuals use the expected length of life at birth as a measure of future health to plan their future human capital investments. Here we illustrate the various ways that an improvement in health can affect lifetime years of schooling.

Let the expected health at the time of birth for individual *i* be summarized by life expectancy at birth (l_{i0}). Improved health at the time of birth will alter the expected length of productive life which increases potential lifetime earnings. If health and time in school (S_{it}) are complementary inputs in the production of health, improved health will also increase the human capital that can be produced per year of schooling. The expected lifetime benefits from additional time in school at age *t* can be summarized by the marginal benefit equation $B(l_{i0}, S_{it}, P_{it}, q, \varepsilon_{it})$ where P_{it} is a vector of parental inputs and *q* an index of school quality that are inputs into the human capital production process. The unobserved term ε_{it} represents individual-specific productivity in producing human capital that are uncorrelated with health, parental or schooling inputs. The function *B* can be viewed as the impact of an additional year of schooling at time *t* on lifetime earnings or utility.

It is optimal to continue investing time in school until $B = C$, the marginal cost of an additional year of schooling. The cost of education depends on monetary costs of schooling (p_{it}), and the opportunity cost of time spent in school equal to the wage the child could earn given past investments in human capital $W(l_{i0}, P_{i\_t}, S_{i\_t}, Y_{it})$ where the notation *_t* reflects parental and school time investments before age *t*. The index Y_{it} reflects the state of the labor market for workers with skill that are close substitutes for *i* with larger values indicating stronger demand for similarly skilled workers. The opportunity cost of schooling is rising in all past accumulations of human capital, so the marginal cost of schooling $C(p_{it}, W(l_{i0}, P_{i\_t}\ , S_{i\_t}\ , Y_{it}))$ is rising in both direct and opportunity cost of schooling. We further assume that the marginal benefit from schooling is subject to diminishing returns ($\frac{\partial B}{\partial S_{it}} < 0$). Because the opportunity cost of schooling is rising in years of schooling, $\frac{\partial C}{\partial S_{i\_t}} > 0$.

We can illustrate how changes in expected health at the time of birth will alter expected time spent in formal schooling using Figure 1. Consider two health states, one with a good draw and the other with a bad draw on life expectancy at birth. Note that at the time of birth, all planned parental inputs are conditioned on the parents' endowment at the time of birth, P_{i0}, and all subsequent parental inputs will be endogenous. Similarly, all planned trajectories for the direct and opportunity costs of schooling will be based on information at the time of birth. Therefore, all other factors affecting the marginal benefit and marginal cost of schooling are the same across the two health states. The parents will plan for the child to remain in school as long as the marginal benefit exceeds the cost. The good health state raises the marginal benefit per year of schooling because of the complementarity between health and productivity in school, but also because the child will have a longer potential time to productively exploit human capital. At the same time, the good health state has a higher opportunity cost of an additional year of schooling because of the faster accumulation of human capital. The present value of lifetime earnings, given by the area under the marginal benefit curve, rises as a result of the increase in life expectancy at birth. However, the greater share of the benefits from improved child health will come from greater efficiency in the production of human capital per year of schooling (illustrated by the change in the height of the marginal benefit curves shaded by diagonal lines), and only a modest share of the increased lifetime income will come from the induced increase in years of schooling (illustrated by the cross-hatched area between $S*$ and $S**$.[6] Consequently, any response of years of schooling to increased life expectancy at birth will understate the induced increase in human capital resulting from the improved health.

The case we illustrate in Figure 1 shows expected time in school increasing as life expectancy rose, but that requires that the induced increase in marginal benefit from schooling is greater than the induced increase in the marginal opportunity cost from schooling. The opposite could have happened, in which case the child would spend less time in school in the good health state. Ultimately, which effect dominates is an empirical question we plan to resolve with evidence from 147 economies.

4. Empirical Framework

Our empirical specification will focus on the schooling response to life expectancy at birth. To show why, note that equating the marginal benefit and marginal cost of schooling yields the relationship

$$S_{it} = f(l_{i0}, q, P_{it}, p_{it}, P_{i\_t}, S_{i\_t}, Y_{it}, \varepsilon_{it}) \ ,$$

but as suggested by our previous discussion, P_{it}, p_{it}, P_{i_t} , S_{i_t} and Y_{it} will all be endogenously determined by information obtained as the child ages. Some of the reduced form effect of life expectancy at birth will be found through these other factors whose values will depend in part on life expectancy at birth and in part on new information revealed over time.

To make this point more precise, consider the projection of the cost of schooling at time *t* on information available at the time of birth.

[6] This point was made by Bleakley (2007, 2010b).

$$p_t = E(p_t|\Omega_0) + \xi_t$$

Innovations in the cost of schooling after time 0 will be uncorrelated with information known at the time of birth. This will be true for the other factors P_{it}, P_{i_t}, S_{i_t} and Y_{it} as well. For this reason, we propose to measure the effect of life expectancy on completed schooling using only information known at the time of birth. Note that even later innovations in life expectancy can endogenously reflect investments by the parents and will generate biased inference regarding the effect of life expectancy on schooling.

We limit our samples to individuals who are of sufficient age that they have completed their schooling. For individual *i* in cohort *j* and economy *c*, consider the specification

$$S_{ijc} = \gamma_1 LE_{jc0} + \gamma_2 LE_{jcP} + \gamma_M M_{ijc} + \gamma_U U_{ijc} + \alpha_c + a_j + \alpha_Y + \alpha_{jc} + \varepsilon_{ijc}. \quad (1)$$

The dependent variables in the above equation, S_{ijc} is the completed years of schooling for individual *i* in birth cohort *j* and economy *c*. The key exogenous variable LE_{jc0} is the average life expectancy at birth for individuals in cohort *j* and economy *c*. The coefficient γ_1 will provide the change in completed years of schooling for every one year increase in life expectancy. The other key independent variable is LE_{jcP}, taken as the life expectancy at birth for the parents of individuals in cohort *j* and economy *c*. We use the life expectancy for birth cohorts 25 years prior as the parents' life expectancy at birth.[7] We know that increases in the parents' life expectancy at birth will increase their lifetime earnings, whether from more schooling, more human capital accumulated per year of schooling, or more years of productive work, and so we should find that some of that increased parental wealth is transferred to their children in the form of greater human capital investments (γ_2 >0).[8] We also control for the fraction of the birth

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[7] We also experimented with life expectancy at birth 20 and 30 years prior as our measure of the parents' health endowment. In practice, life expectancy at birth 20, 25, and 30 years prior were highly correlated.
[8] See Becker and Tomes (1979, 1986).

cohort that is male in the survey and the fraction that reside in urban areas to capture differences in reward to schooling across genders and across urban and rural regions.

The error terms include α_c, an economy-specific fixed effect that holds constant the level of economic development and other political, social and economic attributes that are common across birth cohorts; α_Y, a fixed effect for the year of the survey that controls for any economic, political or health shocks that are common across states; and a_j, a fixed effect for the year of birth that is controls for health innovations and pandemics as well as other factors that would affect a birth cohort across economies. The error term ε_{ijc} represents the purely random factors that affect years of completed schooling.

The remaining variation that we use to identify our life expectancy effects is due to variation across cohorts within an economy. The possible bias in our estimate is due to α_{jc}, a shock to completed schooling that is specific to birth cohort *j* within the economy. Our estimate of γ_1 will be biased if this shock is correlated with changes in life expectancy for the cohort, as might be the case if an economy always introduces improvements in public health with improvements in school quality.

We apply this model to two units of observation. Our most comprehensive data set aggregates completed schooling decisions to the birth cohort level within an economy. For a subset of these economies, we also have data on individual completed years of schooling. The latter data set allows us additional controls for the possible bias related to the economy-cohort specific fixed effect α_{jc} we discussed above. As we will show, our conclusions are not sensitive to the inclusion or exclusion of the controls for this potential bias.

We cluster the standard error, ε_{ijc}, at the survey level to correct for correlated errors across birth cohorts *j* within economy c. We weight the observations to reflect the cell share of the total population in the economy. We further weighted the data by the square root of the cell-size to correct for differences in measurement error variance between thin and thick cell samples.

5. Data

This study uses the World Bank's *International Income Distribution Database*, a harmonized collection of 919 household surveys from 147 economies. A list of the economies and total number of surveys from each economy is presented in table A1 in the Appendix. The surveys were conducted between 1960 and 2012 with 78% of the surveys collected on or after 2000. The database includes economies from all regions and income groups. Of the 147 economies, 32 are from industrialized nations, 16 from Asia and the Pacific, 20 from Central Asia and Eastern Europe, 23 from Latin America, 10 from the Middle East and North Africa, 8 from South Asia, and 38 from Sub-Saharan Africa. From each survey, we include individuals in the age range 25 to 65 so that they are likely to have completed their schooling. The upper bound of age 65 is chosen to avoid the selection issues related to mortality.

Our observations are aggregated to birth-year cohorts from each survey in each economy. This approach allows us to access the full set of data, as many of the data sets are privileged and not open to use by non-Bank researchers. The 919 surveys totaling 44.6 million individuals in the age range 25-65 are placed in one of 3,583 economy survey-birth year cohorts. There are up to 87 birth-year groups per economy with birth years ranging from 1901 to 1987. We further subdivide the birth cohorts by urban versus rural residence and by gender. Our analysis requires information on each birth-cohort's average completed years of schooling, proportion living in urban or rural residence, and gender. [9] All of these variables are harmonized to be measured consistently across surveys, economies, cohorts, genders, and regions of the economy. We also

[9] We will not know where an individual was at the time of birth and so we will have some mismatch between urban and rural residence during the survey versus birth-place.

compile information on the surveyed population versus the total population for each birth cohort in order to construct the sample weights in our regression analysis.

Our key independent variable "Life Expectancy at Birth" is compiled from the United Nation's Population database and "Gap Minder".[10] "Gap Minder" constructs a measure of life expectancy at birth for almost 200 economies back to 1900 by compiling pre-1950 data on mortality rates from the Human Mortality Database and the United Nations Population Division's *World Population Prospects*.[11]

For robustness checks, we also compile life expectancy at ages 5 and 10. Because life expectancy at older ages will reflect parental investments in their children's health and human capital in response to updated information on the cohort's health, these measures are endogenous, but are used to compare our findings to previously published studies. Life expectancy at ages 5 and 10 are published by the Population Division of the United Nations Department of Economic and Social Affairs.[12]

Figure 2 illustrates how life expectancy evolves globally across cohorts in our sample. Both life expectancy and years of schooling decreased through the first 35 years of the century and then both series reversed and rose for the rest of the century. The regional scatterplots in Figure 3 indicate that all regions experienced similar rising trends in life expectancy at birth across cohorts, so the apparent decline in life expectancy for the first third of the century in Figure 2 was due to the inclusion of economies with lower average life expectancy and schooling and was not a true decrease in life expectancy. In Latin America and the Caribbean, life

[10] The UN maintains a rich database on various socio-economic indicators http://data.un.org/Default.aspx.
[11] In the case where no estimates are available, they rely on simple model of interpolation and extrapolation to reach an approximate measure. Although "Gap Minder" admits that quality of life expectancy at birth data would vary across economies for the period before 1950, our extensive search suggests that this is the best available information covering such a wide set of economies for a long period before 1950.
[12] Various region, gender and age specific life expectancy data is available at http://esa.un.org/wpp/Excel-Data/mortality.htm The data are reported for 5-year birth cohorts rather than specific birth cohorts, and so we used the nearest age match.

expectancy at birth was only 68.6% of that in the developed economies, but this rose to 90.5% by the 1990s. Sub-Saharan Africa has had a more modest success in narrowing the gap in life expectancy. The gap narrowed by only 24% due to reversals in life expectancy attributable to the AIDS epidemic.

In the survey specific analysis, we utilize all 919 surveys. That means that the same cohort may show up multiple times across surveys. Since cohort-specific schooling does not change within an economy, the repeated cohort observations are redundant and would overweight repeated cohorts. To correct this, we include only one observation for each economy-birth cohort in our cross-economy analysis. We use information from the oldest survey from each economy. If multiple surveys are available in an economy, we use the most recent survey to add in the birth cohorts that are not included in the earlier economy survey(s).[13]

6 Results

In this section, first we report the survey specific estimates. In a following subsection we analyze the results from pooling the surveys in a cross-economy analysis.

6.1 Survey by survey estimates

Table 1 summarizes the results of the regressions of specification (1) performed on each of the 919 surveys across 147 economies. The identification comes from within survey, across cohort variation in life expectancy at birth.[14]

The impact of life expectancy at birth on completed years in school is quite consistent across surveys and regions. Life expectancy at birth had a positive and statistically significant

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[13] For example, Germany has two surveys in our survey-pool, one in 2005 and the other in 2012. The youngest cohort in the former survey was born in 1980 while in the later survey the youngest was born in 1987. Since the cohorts who were born between 1980 and 1987 were under 25 during the survey of 2005, we only include these new cohorts from the second survey for Germany in our sample.

[14] Not all regressions included the controls for urban/rural differences either because only urban data was collected or because regional information was not collected.

impact on years of schooling in 95% of the surveys. Only in 2.3% of the surveys was there a negative estimated effect of life expectancy on schooling, and in only 3 of the 919 regressions was the coefficient negative and statistically significant.

A simple average of life expectancy coefficients across these 919 surveys shows that for each additional year of gain in life expectancy at birth, individuals spent approximately 0.155 years in school. Figure 4 presents region specific kernel distributions of the coefficients of life expectancy at birth obtained from survey-specific regressions. The region-specific median value of the coefficient, as indicated in the graph, reveals that the highest median life expectancy effect is observed in Latin America, while the lowest in Central Asia and Eastern Europe.[15] Over 97% of the estimates are positive and the median estimates for the regions vary from a low of 7.3% in Eastern Europe and Central Asia to 17.4% in South America.

6.2 Estimates from the regression on pooled surveys

As reported in table 2, life expectancy at birth is positively associated with schooling. The coefficients of life expectancy at birth, γ_1, imply that a one-year increase in life expectancy at birth increases years in school in the range of 0.13 to 0.15 years. Reflecting our discussion in section 4, we acknowledge that cohort-specific fixed factors could bias the estimates. We control for such cohort-specific fixed effects in two different ways. In specification IV, dummy variables defining five-year birth cohorts are incorporated into the estimation.[16] In specification V, birth year cohort fixed effects are introduced. All the estimates suggest that an additional year of schooling results from about 7.5 years greater life expectancy at birth. We also see some modest evidence of a small positive effect of parent's life expectancy on their children's schooling.

[15] For comparison, the distribution of all survey-specific estimates shows a median life expectancy effect of 0.148.
[16] While constructing the five-year birth cohorts, we collapse all individuals aged 25-65 into 13 different five-year birth cohorts. Since the number of observations before 1930 is small, they are grouped into a cohort spanning more than five years. Similarly, all individuals, who were born during 1985-87, were collapsed to form the last cohort spanning only 3 years.

6.3 Heterogeneity across groups

The effect of life expectancy at birth might differ across groups. We investigate this separately by male, female, urban and rural groups. Table 3 presents the group-specific results. The estimates are similar to those from the pooled sample. An additional year of life expectancy at birth adds 0.15 years of schooling for women, 0.11 years of schooling for men, and 0.13 additional years for both urban and rural residents. An additional year of parental life expectancy translates to a small increase in schooling for daughters and for children in both urban and rural markets.

Life expectancy at birth might affect the schooling decision of birth-cohorts differently across regions. Therefore, we extend the empirical exercise by seven regions based on the World Bank classification of economies based on income and region.[17] The results in table 4 reveal that although life expectancy effects are consistently positive and statistically significant, they vary in magnitude across regions. The coefficient of life expectancy at birth shrinks for all regions once we control for birth-cohort fixed effects. The estimates suggest that, compared to other regions, cohorts in the Middle East and North Africa spent more time in school in response to a rise in life expectancy at birth. Consistent with what we observe in survey specific estimates, the life expectancy effect is smaller for East Europe and Central Asia. However, the life expectancy effect for South Asia is not significant after including birth-year specific fixed effect. The effect of parents' life expectancy generally remains positive but the estimates lose significance in the smaller samples.

[17] World Bank classifies the developing economies into six regions: "East Asia and Pacific", Eastern Europe and Central Asia", "Latin America and Caribbean", "Middle East and North Africa", "South Asia" and "Sub-Saharan Africa". We added to this the pool of industrialized economies into "High Income Economies". For World Bank classification please see http://data.worldbank.org/about/country-and-lending-groups

6.4 Life expectancy at older ages

Hazan (2012) argues that life expectancy at birth exhibits more variation across economies and cohorts due to high infant and child mortality. He suggests that life expectancy at age five will be more appropriate to capture true effect of health on human capital investment decisions. Although the model laid out in section 4 shows that life expectancy at ages 5 or 10 are endogenous because they will reflect parental decisions on health investments, it is still useful to examine the sensitivity of our estimates to alternative estimates of life expectancy. As life expectancy at exact ages is not available before 1950 for many economies, we use samples of birth cohorts beginning in 1945 and 1940. The life expectancies are only available for birth cohorts in 5-year age ranges.

Table 5 reports that the effect of life expectancy at higher ages on time spent in school is consistently positive and statistically significant, unlike Hazan's (2012) finding of no relationship. A one-year gain in life expectancy at age five, ten, and fifteen increases time in school by 0.185 years, 0.17 years, and 0.129 years, respectively. Parents' life expectancy turns out to be positive and statistically significant in specifications with life expectancy at birth, but not consistently for life expectancy at higher ages. Note that the value of parental life expectancy falls, at least in precision, as we measure life expectancy at higher ages, which probably indicates that parents' endowment is not as crucial as they are in early childhood.

6.5 Robustness checks

This section incorporates several economy-cohort specific measures to check robustness of the effects of life expectancy at birth on completed years of schooling. To investigate the quality of institutions and political regimes at the time of one's birth, we utilize polity measure that ranks economies by their strength of democratic institutions. We use Polity IV data, which assigns a polity score to 167 economies which as of 2013 has a population of more than 500,000.[18] Although the data goes back to 1800 for some economies, for many economies the polity constructs start after their independence. For a few economies, we impute the missing polity information by the polity score of their origin economy prior to the split, for example, all of the Post-Soviet states and states formed after the dissolution of former Yugoslavia and Czechoslovakia.[19]

It is also possible that birth year is correlated with unusually good or bad weather that may affect the cohort's availability of food or income. We add time series data on economy averages of yearly temperature and precipitation produced and maintained by the Climate Research Unit (CRU) at the University of East Anglia, UK.[20] Table 6 reports the results. Specification I incorporates two weather measures while specifications II and III include the quality of governance measure. Since the polity variable is missing for many birth cohorts, specification II includes only the observations with polity scores while specification III includes all the observations with a dummy variable indicating the presence or absence of a polity score. The addition of weather or polity measures does not alter our conclusion that increased life expectancy at birth increases lifetime completed years of schooling.

[18] The data and documentation is available at http://www.systemicpeace.org/inscrdata.html (*accessed on October 8th, 2014*). The polity scale varies from "*strongly autocratic*" coded as -10 to "*strongly democratic*" coded as 10.

[19] Belize, though included in our sample does not have any polity data. In some cases, we could not use the available polity data since two economies have been consolidated into one, and the surveys do not identify respondents by the origin. For example, in surveys from Germany, we could not utilize cohorts born after 1945 since the surveys do not identify individuals born between 1946 and 1987 by place of birth, i.e., whether one was born in West or the Eastern part. We exclude cohorts born before 1976 in Vietnam, and all cohorts born in Yemen for similar reason.

[20] The original weather data (CRU TS 3.21) reports values for each month and each box on a 0.5 degree latitude/longitude grid. CRU assigned each box to a single country. For each country CRU calculated the weighted mean of the values from its constituent grid boxes for each month in turn. Each grid box was weighted by surface area, using the cosine of the latitude. The seasonal and annual values are the means of their constituent months. The CRU TS dataset prioritizes completeness, and has no missing data over land. Where observations are unavailable, the 1961-90 monthly climatic mean is used as a substitute. In data sparse regions of the world, this can lead to repeated values, and this can show up in derived products such as CRU CY.

As an additional robustness check, we use individual level observations from 173 of the original surveys to control for possible endogeneity in life expectancy at birth. While we cannot observe individual life expectancy at birth, we do know the average cohort life expectancy at birth, $LE_{jc} = \frac{\sum_{i=1}^{N} LE_{ijc}}{N}$, for *N* individuals in cohort *j* and economy c. This average is exogenous to the individuals *i* in that cohort. Consequently, the group mean life expectancy can be used as an instrumental variable for actual life expectancy.[21] We report the equivalent specifications of equation 1 using this endogeneity correction in table 7. The estimates confirm that an additional year of life expectancy at birth increases schooling by 0.11 years and that the effect is positive and statistically significant for males and females and for rural and urban residents. It also confirms that increases in life expectancy at birth of the parents further increases the schooling of their children across all these groups.

7 Discussion & Conclusion

This study covers a wide group of economies, extensive time range, and exploits the cross-cohort variation within an economy to identify the impact of life expectancy at birth on human capital accumulation. We find that a one-year increase in life expectancy at birth increases completed years of schooling over the lifetime by between 0.11 and 0.15 years. This is comparable to the estimates of 0.11 years in Sri Lanka (Jayachandran and Lleras-Muney 2009), and 0.17 years in a cross-section of economies (Hansen, 2013).

In our sample, life expectancy at birth and completed years of schooling increase by 31 years and 5 years respectively for the youngest cohorts compared to the oldest birth cohorts. Our

[21] In the above specifications, $LE_{ijc} = LE_{jc} + \mu_{ij}$, which states that individual i's life expectancy at birth in the country c deviates from cohort j's mean life expectancy by μ_{ij}, which is by construction orthogonal to mean. Since μ_{ij} will be contained in the error term, the condition, $Cov(\varepsilon_{ict}, LE_{jc}) = 0$, must hold. Royalty (2000) has used state tax rate as an instrument for marginal tax rate in explaining employees' health insurance eligibility. Similarly, a series of studies following Ruhm (2000) exploited variation in state or county level unemployment rate while explaining individual health behavior during a recession.

estimates imply that gain in life expectancy at birth explains at least 70% of this rise in schooling years. Alternatively, Goldin and Katz (2009) have characterized the 100 years ending in 1980 as a time when the U.S. led the world in human capital investments. Life expectancy at birth in the U.S. rose by 28 years from 1880 to 1980 and years of schooling for the 1980 birth cohort was about 6.5 years greater than that of the 1880 birth cohort. Our estimates suggest that rising life expectancy at birth in the U.S. explains 4 of the 6.5 years of increased schooling or 62% of the education century.

We have argued that life expectancy at birth is the appropriate indicator of life-time health endowment and that the proper method to test the effect of health on lifetime human capital is to use information available at the start of life. As the child ages, parents will adjust investments in the child's schooling and health jointly as new information on the economy, the environment, technology, public policy and any number of other confounding factors become known. Although our estimates using life expectancy at ages five or ten do not alter our conclusions, the coefficients on life expectancy at the higher ages must reflect the correlation of these health investments with other decisions that affect the parent's income, time allocation, and other inputs into the child's schooling.

As an example of this point, Halla and Zweimuller (2013) found that Austrian parents responded to the Chernobyl Accident by lowering fertility and reducing labor force participation in order to compensate for possible health concerns faced by their children. The changes in numbers of children and time allocation will affect their children's education and their children's life expectancy at ages 5, 10, and so on. It would not be correct to attribute changes in education to the changes in life expectancy as both are responding to a common external shock rather than being causally related.

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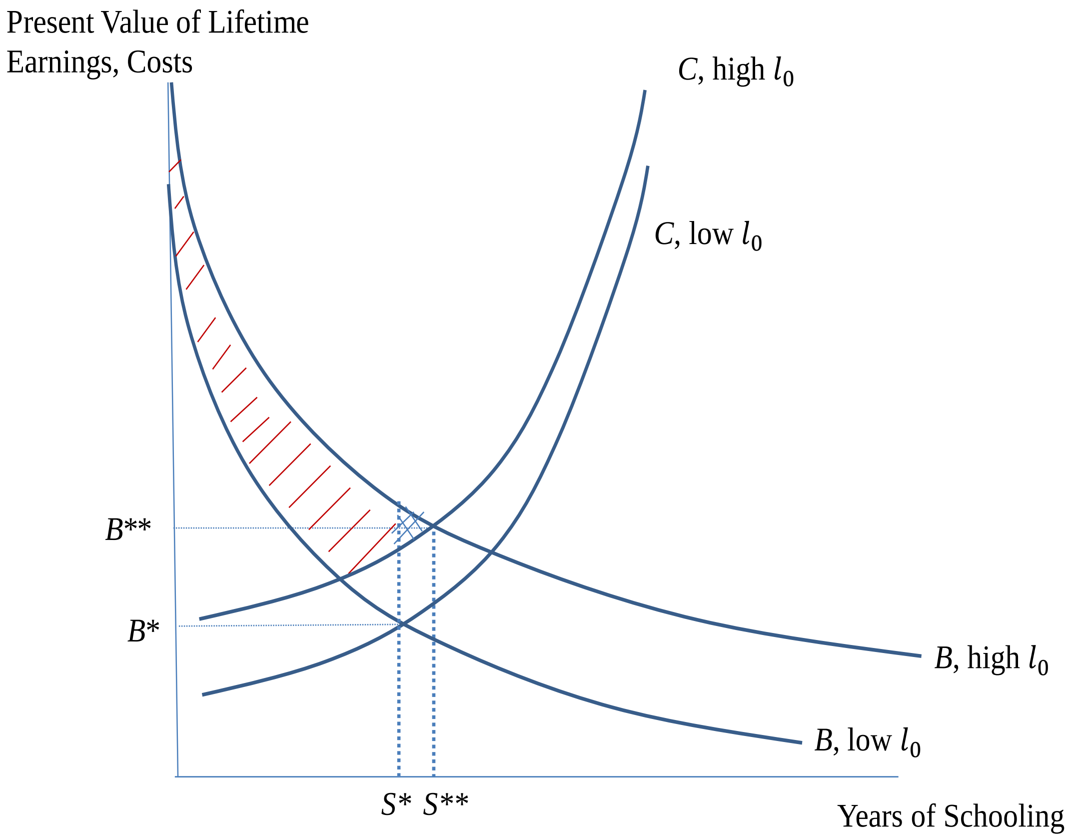


Figure 1: Benefits and Costs of Schooling in the Presence of Health Improvement. l_0 represents life expectancy at birth, B and C are respectively the marginal cost and benefit of schooling, and S is years of schooling.

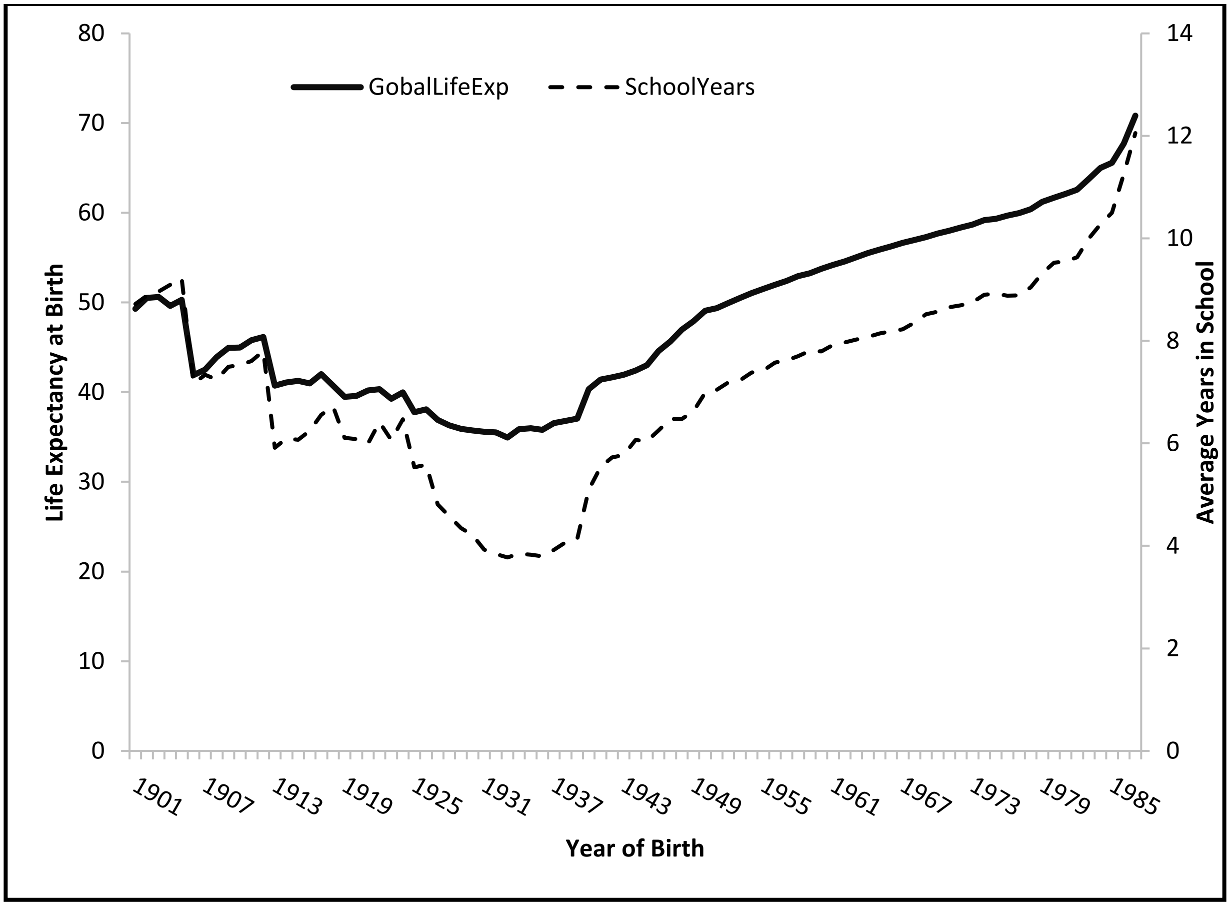


Figure 2: How Life Expectancy at Birth and Average Years in School Evolves Overtime

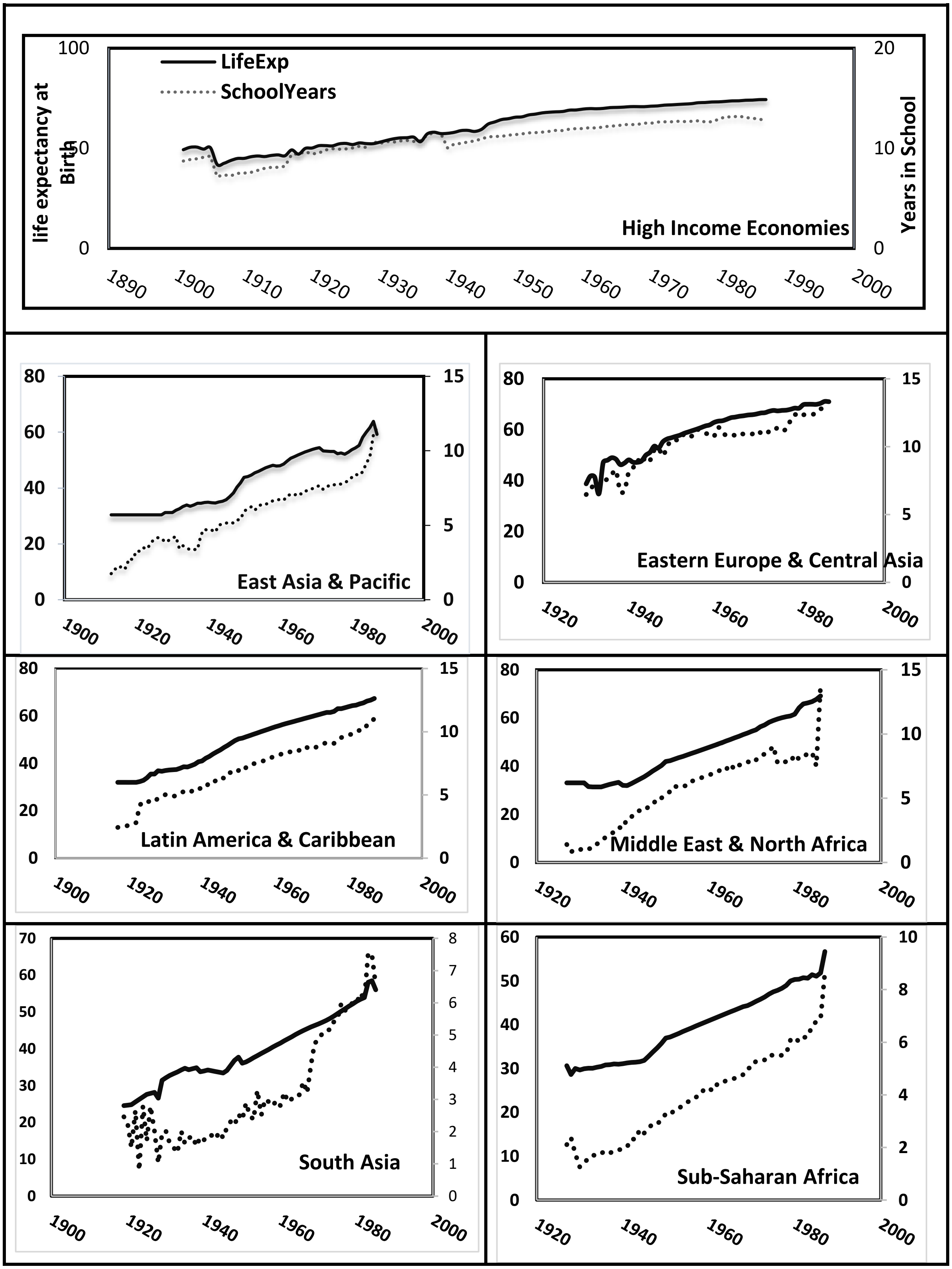
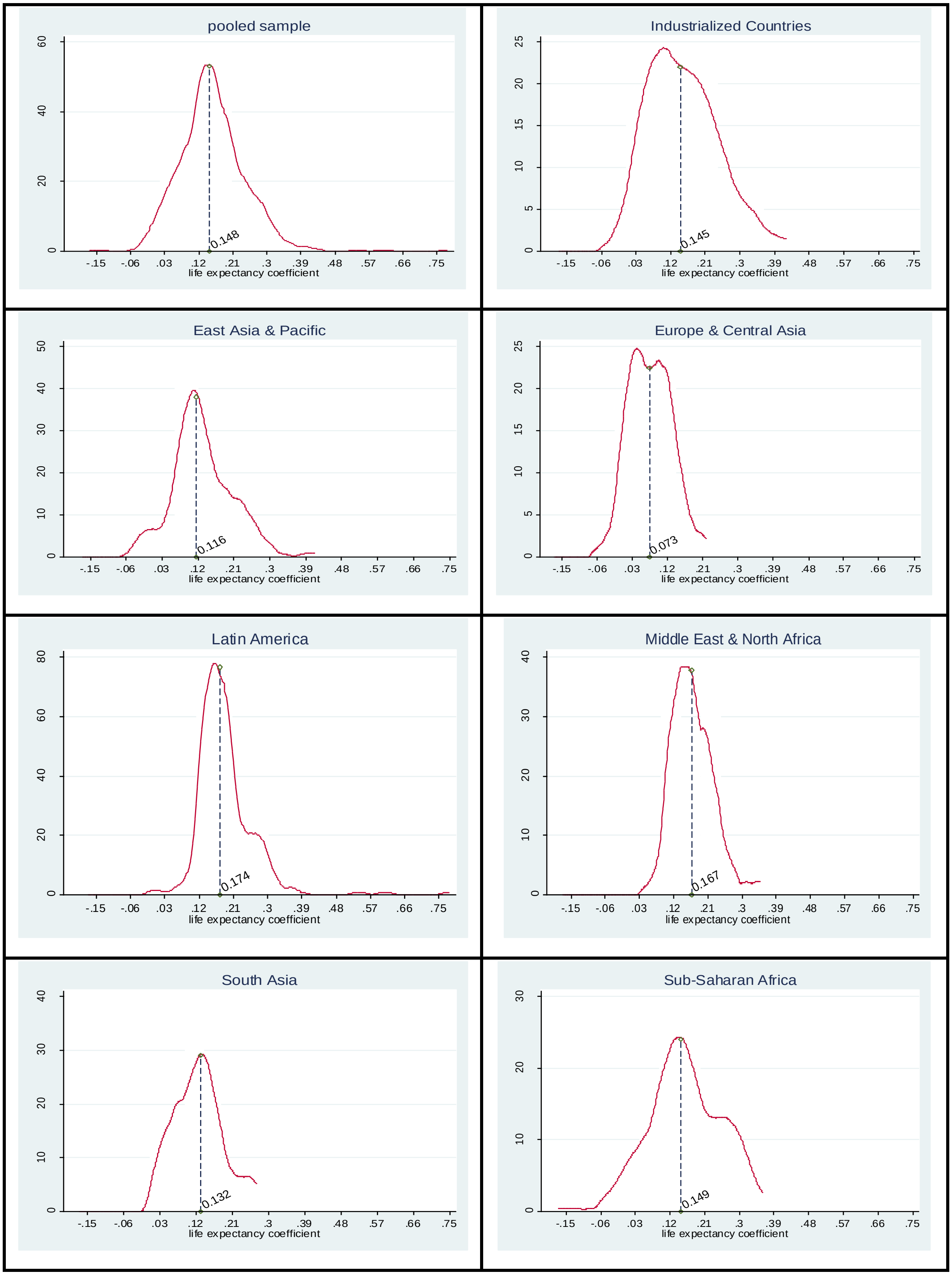


Figure 3: Life Expectancy at Birth and Average Years in School across Region and Time



Note: Median effect is indicated by the vertical line.

Figure 4: Kernel Density of Life Expectancy Effects on Years in School across Regions

Table 1: Survey Specific Estimates of Life Expectancy at Birth Effect on Schooling

Region	Number of Surveys	Positive		Negative		Life expectancy Effects on Schooling			
		Significant	*insignificant*	*significant*	*insignificant*	*Mean*	*Std. Dev.*	*Min*	*Max*
High Income Economies	239	226	8	0	5	0.154	0.092	-0.017	0.420
Asia & Pacific	78	71	3	1	3	0.132	0.076	-0.022	0.413
Central Asia & Eastern Europe	93	82	6	0	5	0.076	0.054	-0.041	0.218
Latin America	292	290	2	0	0	0.187	0.074	0.010	0.777
Middle East and North Africa	33	33	0	0	0	0.172	0.055	0.077	0.348
South Asia	49	49	0	0	0	0.128	0.062	0.034	0.27
Africa	135	123	5	2	5	0.16	0.093	-0.14	0.36
Total	919	874	24	3	18				
%		95.1%	2.6%	0.3%	2.0%				

Table 2: Life Expectancy at Birth and Education

	I	II	III	IV	V
% Urban		5.671***	5.655***	5.668***	5.671***
		[1.965]	[1.727]	[1.066]	[1.021]
% Male		1.671*	1.575**	1.269	1.323*
		[0.919]	[0.755]	[0.839]	[0.785]
Life Expectancy at Birth	0.153***	0.140***	0.138***	0.133***	0.134***
	[0.008]	[0.007]	[0.010]	[0.025]	[0.026]
Parents Life Expectancy			0.003	0.028	0.030*
			[0.025]	[0.017]	[0.018]
Cohort FE				YES	
Birth-Year FE					YES
Survey FE	YES	YES	YES	YES	YES
Constant	0.237	-3.211**	-3.162*	-3.635**	-3.821**
	[0.436]	[1.573]	[1.672]	[1.445]	[1.643]
N	6959	6143	5688	5688	5688
adj. R-square	0.985	0.984	0.984	0.985	0.985

Note: Significance level can be read as * p<0.1, ** p<0.05, *** p<0.01.

Table 3: Life Expectancy and Schooling across Male, Female, Urban, and Rural Group

	I		II		III		IV		V		VI	
	URBAN	RURAL	URBAN	RURAL	URBAN	RURAL	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Life Expectancy at Birth	**0.146*** **	**0.140*** **	**0.127*** **	**0.129*** **	**0.127*** **	**0.130*** **	**0.119*** **	**0.159*** **	**0.109*** **	**0.154*** **	**0.111*** **	**0.154*** **
	[0.010]	[0.009]	[0.021]	[0.021]	[0.022]	[0.023]	[0.009]	[0.011]	[0.024]	[0.026]	[0.026]	[0.028]
% Urban							5.771***	4.308***	5.609***	4.197***	5.599***	4.187***
							[1.643]	[1.155]	[1.137]	[0.735]	[1.022]	[0.739]
% Male	3.611***	3.067***	3.900***	3.299***	3.929***	3.246***						
	[0.568]	[0.700]	[0.948]	[0.955]	[0.965]	[0.931]						
Parents Life Expectancy	0.00	0.030*	0.024*	0.036**	0.027*	0.039**	-0.01	0.02	0.02	0.037*	0.02	0.039*
	[0.020]	[0.016]	[0.014]	[0.017]	[0.015]	[0.018]	[0.026]	[0.024]	[0.016]	[0.019]	[0.017]	[0.020]
Cohort FE			YES	YES					YES	YES		
Birth Year FE					YES	YES					YES	YES
Survey FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constant	-0.575	-2.79***	-0.431	-2.520**	-0.583	-2.624*	-0.317	-3.99***	-0.764	-4.267**	-0.932	-4.343**
	[0.953]	[0.760]	[1.243]	[1.256]	[1.335]	[1.377]	[1.555]	[1.274]	[1.536]	[1.835]	[1.678]	[1.931]
N	6377	6286	6377	6286	6377	6286	5681	5685	5681	5685	5681	5685
adjusted R-square	0.985	0.99	0.986	0.991	0.986	0.991	0.975	0.985	0.978	0.986	0.978	0.986

Note: Significance level can be read as * $p<0.1$, ** $p<0.05$, *** $p<0.01$. We estimate each specification for each group separately. An estimation on the appended male and female sample with an interaction of male-female indicator and life expectancy at birth shows that life expectancy coefficient statistically differs across male and female group. No such difference is found for the urban-rural sample.

Table 4: Region Specific Life Expectancy Effects on Schooling

	I							II						
	High Income Group	Asia & Pacific	Central Asia & Eastern Europe	Latin America	Middle East and North Africa	South Asia	Sub-Saharan Africa	High Income Group	Asia & Pacific	Central Asia & Eastern Europe	Latin America	Middle East and North Africa	South Asia	Sub-Saharan Africa
% Urban	-2.97	12.4***	7.5***	4.88***	11.7**	19.0***	6.57***	-6.2***	10.5***	6.73***	4.71***	9.97***	17.14***	5.76***
	[1.872]	[2.266]	[1.846]	[1.101]	[4.547]	[2.99]	[1.021]	[2.242]	[1.509]	[1.680]	[1.102]	[3.655]	[3.392]	[1.018]
% Male	-2.2***	3.63***	1.108	0.22	3.59**	0.029	3.1***	-3.2***	3.05***	0.477	0.456	4.6***	-0.07	3.6***
	[0.751]	[1.268]	[0.919]	[0.611]	[1.778]	[0.626]	[0.575]	[0.973]	[0.769]	[1.152]	[0.545]	[1.633]	[1.008]	[0.597]
Life Expectancy at Birth	**0.10*** **	**0.11*** **	**0.08*** **	**0.13*** **	**0.20*** **	**0.08*** **	**0.14*** **	**0.07*** **	**0.07*** **	**0.04** **	**0.08*** **	**0.15*** **	0.028	**0.07*** **
	[0.029]	[0.010]	[0.024]	[0.009]	[0.022]	[0.025]	[0.013]	[0.024]	[0.013]	[0.023]	[0.018]	[0.023]	[0.035]	[0.024]
Parent's Life Expectancy	-0.002	0.021	0.03***	0.04***	0.041**	0.07***	0.034**	-0.06**	0.012	0.012	0.027	0.028	0.039	0.018
	[0.009]	[0.024]	[0.012]	[0.013]	[0.018]	[0.023]	[0.016]	[0.024]	[0.023]	[0.014]	[0.019]	[0.021]	[0.027]	[0.020]
Birth-Year FE								YES	YES	YES	YES	YES	YES	YES
Survey FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	5688	5688	5688	5688	5688	5688	5688	5688	5688	5688	5688	5688	5688	5688

Note: Significance level can be read as * p<0.1, ** p<0.05, *** p<0.01.The region specific analysis adopted the World Bank classification based on income and region. We estimate each specification with an interaction of each of the control with region dummies to extract region specific estimates of life expectancy at birth. In specification II we control for birth-year specific fixed effect to control for differences in environment across birth cohorts.

Table 5: Life Expectancy at Higher Ages

	I	II	III	IV	V	VI
	LE at Birth	LE at 5	LE at Birth	LE at 10	LE at Birth	LE at 15
% Urban	5.865***	4.613***	5.875***	4.452***	5.805***	4.550***
	[1.214]	[1.536]	[1.131]	[1.494]	[1.095]	[1.495]
% Male	1.38	0.723	1.33	0.347	1.349	0.082
	[1.015]	[1.122]	[0.954]	[1.280]	[0.885]	[1.383]
Life Expectancy at Birth	**0.160*** **		**0.146*** **		**0.138*** **	
	[0.026]		[0.026]		[0.026]	
Life Expectancy at 5		**0.185** **				
		[0.075]				
Life Expectancy at10				**0.170*** **		
				[0.062]		
Life Expectancy at 15						**0.129** **
						[0.052]
Parents life Expectancy (25 years lag of Life Expectancy at Birth)	0.040***	0.052*	0.035**	0.044	0.029*	0.037
	[0.015]	[0.029]	[0.015]	[0.029]	[0.017]	[0.031]
Constant	-5.67***	-7.50	-4.714***	-5.56	-4.05**	-2.48
	[1.662]	[4.799]	[1.600]	[3.457]	[1.575]	[2.645]
Cohort FE	YES	YES	YES	YES	YES	YES
Survey FE	YES	YES	YES	YES	YES	YES
N	4453	4453	4982	4982	5302	5302
adj. R-square	0.987	0.981	0.985	0.979	0.985	0.978

Note: To facilitate comparison, we estimate life expectancy at birth effect in the sample for which data on life expectancy at higher ages are available. Standard errors are in brackets. Significance level can be read as * p<0.1, ** p<0.05, *** p<0.01.

Table 6: Effect of Life Expectancy at Birth in the Presence of Weather and Polity Scores

	(I) Weather	(II) Polity Data	(III) Incorporating Sample without Polity Data
% Urban	5.679***	4.941***	5.496***
	[1.058]	[1.257]	[1.096]
% Male	1.237	0.363	1.537**
	[0.831]	[0.870]	[0.759]
Life Expectancy at Birth	**0.132*****	**0.150*****	
	[0.024]	[0.021]	
Have Polity Data			0.882**
			[0.410]
(Do not have polity Data)* Life Expectancy at Birth			**0.145*****
			[0.026]
(Have polity Data)* Life Expectancy at Birth			-0.013
			[0.008]
(Have polity Data)*Polity Score		-0.029	-0.019
		[0.036]	[0.031]
(Have polity Data)* Life Expectancy at Birth*Polity Score		0.001	0.000
		[0.001]	[0.001]
Parents Life Expectancy	0.028	0.036*	0.033**
	[0.017]	[0.020]	[0.016]
Average Precipitation	-0.08	-0.076	-0.076
	[0.052]	[0.047]	[0.050]
Average Temperature	0.049***	0.021	0.041**
	[0.019]	[0.021]	[0.018]
Average Temperature*Average Precipitation	0.001	0.001	0.001
	[0.001]	[0.001]	[0.001]
Constant	-2.930*	-3.294*	-4.085**
	[1.648]	[1.810]	[1.680]
N	5602	3960	5602
Adjusted R Square	0.985	0.987	0.985

Note: All specifications incorporate cohort and survey fixed effects. Standard errors are in brackets. Significance level can be read as * p<0.1, ** p<0.05, *** p<0.01. Excluding weather variables and utilizing only polity score increase our sample size by around 700 observations, however, this does not change the estimates that we observe in specification II.

Table 7: Life Expectancy at Birth Effects on Schooling, Individual Level analysis

	POOLED	FEMALE	MALE	RURAL	URBAN
Urban	-2.141***	-2.247***	-2.007***		
	[0.099]	[0.098]	[0.100]		
Gender	0.486***			0.715***	0.337***
	[0.054]			[0.060]	[0.048]
Life Expectancy at Birth	**0.114*****	**0.090*****	**0.138*****	**0.117*****	**0.097*****
	[0.009]	[0.009]	[0.010]	[0.009]	[0.009]
Parents Life Expectancy	0.029***	0.028***	0.028***	0.026***	0.033***
	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]
Constant	2.259***	4.290***	0.698	-0.463	3.346***
	[0.606]	[0.598]	[0.663]	[0.568]	[0.640]
Birth Year Fixed Effect	YES	YES	YES	YES	YES
Survey Fixed Effect	YES	YES	YES	YES	YES
N	3953161	1901176	2051985	1512968	2440193
adjusted R-square	0.54	0.482	0.604	0.623	0.406
F	55.882	42.613	64.098	50.979	41.7

Note: Standard errors are in brackets. Significance level can be read as * p<0.1, ** p<0.05, *** p<0.01. Standard errors are clustered at the survey-cohort (survey specific birth-year) level.

APPENDIX

Table A1: List of Economies and Number of Surveys from Each Economy

Economy	Number of Surveys	Percent	Economy	Number of Surveys	Percent
Afghanistan	2	0.22	Lebanon	2	0.22
Angola	2	0.22	Liberia	1	0.11
Albania	4	0.44	Sri Lanka	16	1.74
Argentina	20	2.18	Lesotho	1	0.11
Armenia	1	0.11	Lithuania	8	0.87
Australia	10	1.09	Luxembourg	9	0.98
Austria	9	0.98	Latvia	9	0.98
Azerbaijan	1	0.11	Morocco	2	0.22
Burundi	1	0.11	Moldavia	2	0.22
Belgium	8	0.87	Madagascar	5	0.54
Benin	1	0.11	Maldives	2	0.22
Burkina Faso	5	0.54	Mexico	13	1.41
Bangladesh	3	0.33	Macedonia	3	0.33
Bulgaria	9	0.98	Mali	2	0.22
The Bahamas	1	0.11	Malta	4	0.44
Bosnia-Herzegovina	2	0.22	Myanmar	2	0.22
Belarus	1	0.11	Mongolia	7	0.76
Belize	6	0.65	Mozambique	2	0.22
Bolivia	14	1.52	Mauritania	3	0.33
Brazil	28	3.05	Mauritius	12	1.31
Bhutan	2	0.22	Malawi	2	0.22
Botswana	1	0.11	Namibia	1	0.11
Canada	3	0.33	Niger	4	0.44
Switzerland	2	0.22	Nigeria	4	0.44
Chile	11	1.2	Nicaragua	5	0.54
China	1	0.11	Holland	8	0.87
Cote d'Ivoire	2	0.22	Norway	9	0.98
Cameroon	2	0.22	Nepal	5	0.54
Colombia	12	1.31	Pakistan	11	1.2
Comoros	1	0.11	Panama	19	2.07
Cape Verde	2	0.22	Peru	16	1.74
Costa Rica	21	2.29	Philippines	10	1.09
Cyprus	7	0.76	Papua New Guinea	3	0.33
Czech Republic	8	0.87	Poland	8	0.87
Germany	8	0.87	Puerto Rico	5	0.54
Djibouti	1	0.11	Portugal	9	0.98
Denmark	9	0.98	Paraguay	15	1.63
Dominican Republic	14	1.52	Romania	7	0.76
Ecuador	18	1.96	Russia	14	1.52
Spain	9	0.98	Rwanda	4	0.44
Estonia	9	0.98	Senegal	4	0.44
Ethiopia	9	0.98	Solomon Islands	2	0.22

Table A1 Continued					
Economy	**Number Of Surveys**	**Percent**	**Economy**	**Number Of Surveys**	**Percent**
Finland	9	0.98	Sierra Leone	2	0.22
Fiji	1	0.11	El Salvador	15	1.63
France	9	0.98	Serbia	2	0.22
Micronesia, Fed. Sts.	1	0.11	Sao Tome and Principe	2	0.22
Gabon	1	0.11	Surinam	1	0.11
United Kingdom	8	0.87	Slovakia	9	0.98
Georgia	1	0.11	Slovenia	8	0.87
Ghana	4	0.44	Sweden	9	0.98
Guinea	2	0.22	Swaziland	2	0.22
Gambia, The	1	0.11	Syria	2	0.22
Greece	9	0.98	Chad	1	0.11
Guatemala	6	0.65	Togo	2	0.22
Guyana	1	0.11	Thailand	19	2.07
Honduras	20	2.18	Tajikistan	1	0.11
Croatia	3	0.33	Turkmenistan	1	0.11
Haiti	1	0.11	East Timor	2	0.22
Hungary	9	0.98	Tonga	1	0.11
Indonesia	13	1.41	Tunisia	3	0.33
India	8	0.87	Turkey	20	2.18
Ireland	6	0.65	Tanzania	10	1.09
Iran, Islamic Rep.	1	0.11	Uganda	4	0.44
Iraq	1	0.11	Ukraine	5	0.54
Iceland	9	0.98	Uruguay	19	2.07
Italy	9	0.98	USA	7	0.76
Jamaica	5	0.54	Venezuela	12	1.31
Jordan	8	0.87	Vietnam	7	0.76
Kazakhstan	1	0.11	West Bank and Gaza	12	1.31
Kenya	2	0.22	Yemen, Rep.	1	0.11
Kyrgyzstan	1	0.11	South Africa	26	2.83
Cambodia	5	0.54	Zaire	1	0.11
Kiribati	1	0.11	Zambia	4	0.44
Lao PDR	3	0.33			
Total Number of Economies 147; Total Number of Surveys 919					