

Health, Education and Labour Market Outcomes in Bangladesh

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BIDS Research Almanac

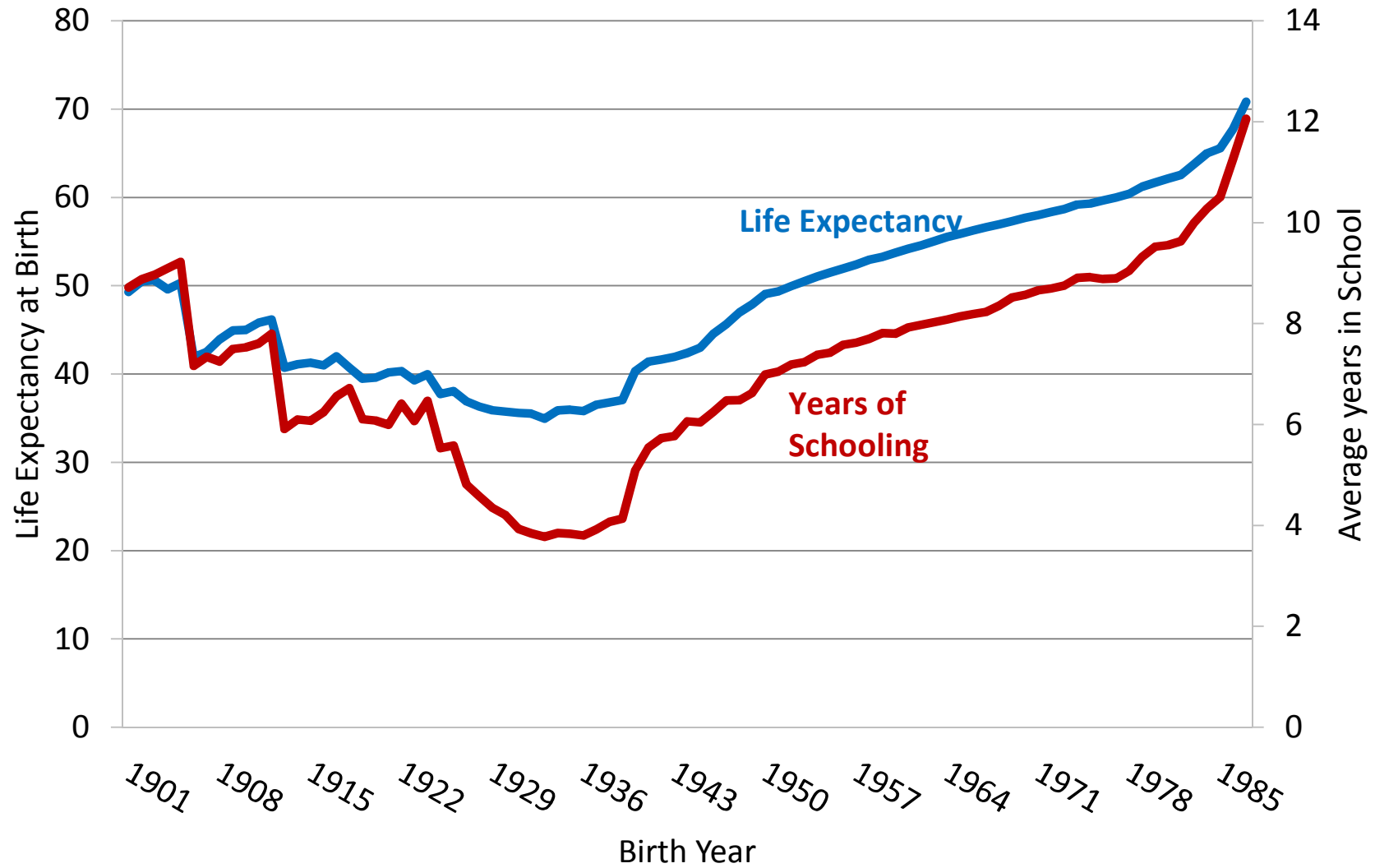
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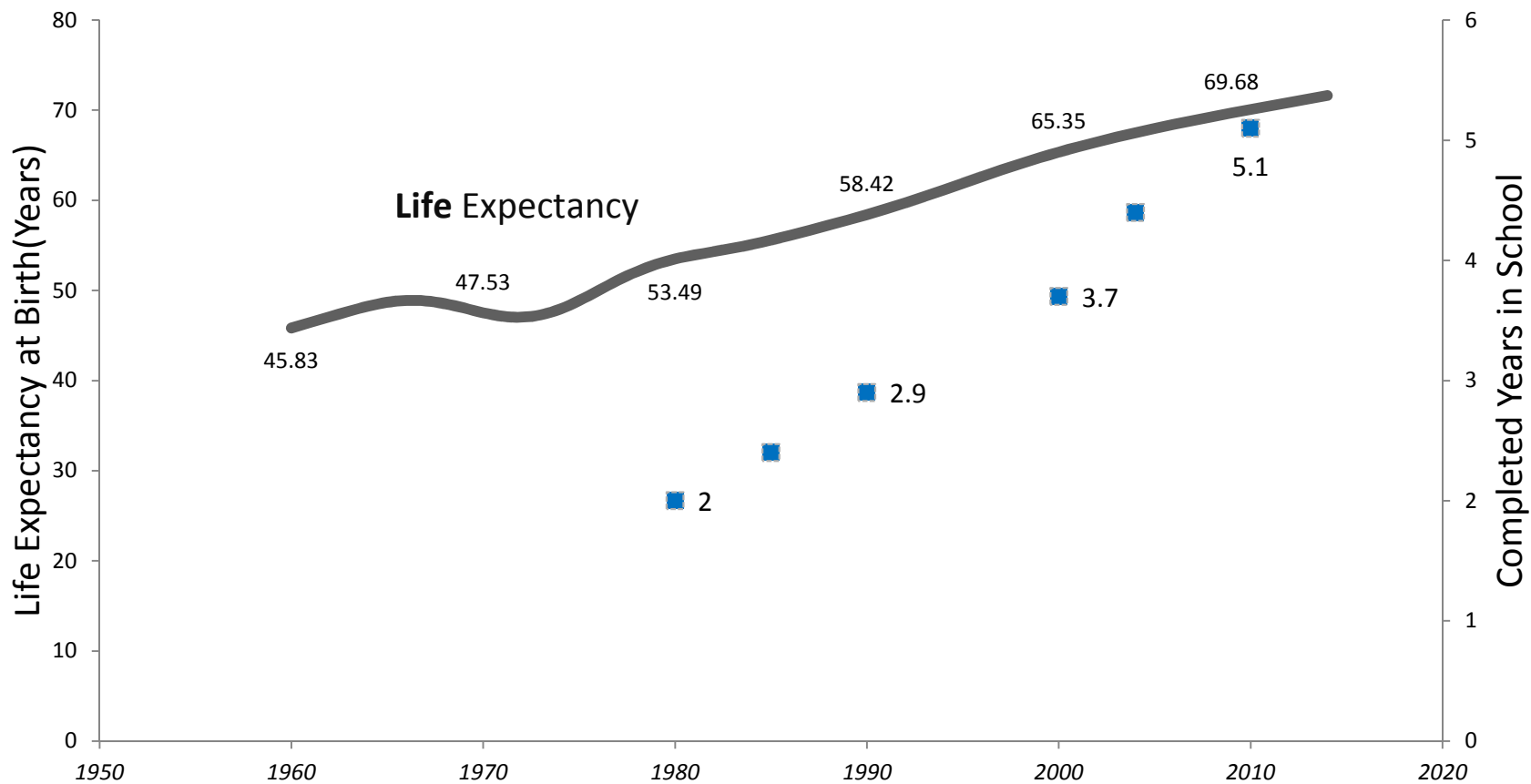
Health is Wealth

- *“Longer life spans provide additional incentives to acquire more education as investments in future earnings. Parents invest more in their children. More on-the-job training becomes worthwhile. The additional health capital and the other forms of human capital tend to increase the productivity of workers. Longer life spans result in more years of participation in the labor force, and bring about a reduction in ‘sick time’. Better health and vitality of workers in turn lead to more productivity per man hour at work”.*

– **Theodore W. Schultz(1980)**, Nobel Lecture

Life Expectancy and Schooling by Birth Cohort, World Averages





Both Life Expectancy at Birth and Completed Mean Years of Schooling has improved overtime in Bangladesh.

Relationship among Health, Education, and Earnings

- Role of Health on human capital
 - Ben Porath (1967)
 - Becker (1993)
 - Heckman (1976)
- Consistent evidence that improved health increases human capital.
 - Acemoglu & Johnson(2006,2007),
 - Hazan (2009, 2012)
- Macroeconomic evidence is mixed
- General equilibrium effects?
- Weak data?

Research Question

- Does Life Expectancy at Birth Affect
 - Completed Years of School?
 - Labour Force Participation?
 - Lifetime Earnings?
- Life Expectancy at Birth- Indicator of Health
- Empirical Exercise
- Household Income and Expenditure Survey(2010)
- 5% Sample from Population Census, 2011
- Other Data, from World Bank

- Focus on better data based on household surveys
- Focus on Birth cohorts
- Allow for heterogeneity
- Differentiate between men and women
- Differentiate between urban and rural
- Test for consistency
 - Effect on Labour Force Participation, &
 - Effect on lifetime earnings

Theory following Heckman(1976)

Human Capital Production: $\dot{H}(t) = F[I(t)H(t), D(t)] - \sigma H(t)$

Investment of time and goods net of depreciation

Asset Accumulation: $\dot{A}(t) = rA(t) + RH(t)[1 - I(t) - L(t)] - PD(t) - PX(t)$

Return on past assets plus labor income minus expenditures on goods and human capital investment goods

Discounted lifetime utility: $\int_0^T e^{-\rho t} U[X(t), L(t)H(t)] dt$

Utility depends on consumer goods and effective leisure

Lifetime optimization with endogenous variables

$$L(t), I(t), X(t), D(t), \lambda(t), \mu(t)$$

$$\begin{aligned} J(t): & e^{-\rho t} U[X(t), L(t)H(t)] \\ & + \lambda(t) \{ rA(t) + RH(t)[1 - I(t) - L(t)] - PD(t) - PX(t) \} \\ & + \mu(t) \{ F[I(t)H(t), D(t)] - \sigma H(t) \} \end{aligned}$$

$\lambda(t)$ marginal utility of assets; $\mu(t)$ marginal utility of human capital

$$\begin{aligned} g(t) &= \frac{\mu(t)}{\lambda(t)} = \frac{R}{(\sigma + r)} [1 - e^{(\sigma+r)(t-T)}] \\ &= \frac{\mu(0)}{\lambda(0)} e^{(\sigma+r)t} + \frac{R}{(\sigma + r)} [1 - e^{(\sigma+r)t}] \end{aligned}$$

Law of motion for asset and human capital accumulation

Defines the reduced form solution for the endogenous variables at the time of birth

$$E[H(t)|\Omega_0] = f^H(r, \sigma, P, R, H_0, A_0, T, g(t)) \quad \forall t \in [0, T]$$

$$g(t) = \frac{\mu(0)}{\lambda(0)} e^{(\sigma+r)t} + \frac{R}{(\sigma+r)} [1 - e^{(\sigma+r)t}]$$

Human capital equivalent of the Frisch labor supply equation

Implication: innovations to planned path of human capital will be based on information orthogonal to Ω_0 .

Propositions from the Model

When life expectancy, T , increases

- **The shadow value of human capital in terms of wealth, $g(t)$, increases.**
- **Human capital stock $H(t)$ accumulated by time t increases in every period t .**
- **Lifetime labor income increases.**
- **Leisure in human capital adjusted efficiency units, $HL(t)$, increases. But measured hours of leisure, $L(t)$, may increase or decrease.**

$$E[H(t)|\Omega_0] = f^H(r, \sigma, P, R, H_0, A_0, T, g(t)) \forall t \in [0, T]$$

$$g(t) = \frac{\mu(0)}{\lambda(0)} e^{(\sigma+r)t} + \frac{R}{(\sigma+r)} [1 - e^{(\sigma+r)t}]$$

Empirical specification:

$$S_{ijt} = \gamma_0 + \gamma_L LE_{j0} + \gamma_R \mathbf{X}_{ijt} + \gamma_Z \mathbf{Z}_{j0} + \delta_r + \varepsilon_{ijt}$$

Fixed effects for region r

Cohorts aged after 15 to insure schooling completion

Source of variation is across cohorts within the country

Life Expectancy at Birth and Schooling

$$S_{ijt} = \gamma_0 + \gamma_L LE_{j0} + \gamma_R X_{ijt} + \gamma_Z Z_{j0} + \delta_r + \varepsilon_{ijt}$$

	Base	Pool	Male	Female	Rural	Urban	Female Born Before 1980	Prime Age
life Expectancy at Birth	0.16*** (0.004)	0.17*** (0.019)	0.052 (0.031)	0.23*** (0.026)	0.146*** (0.036)	0.18*** (0.02)	0.232*** (0.034)	0.166*** (0.02)
Individual and HH control	NO	YES	YES	YES	YES	YES	YES	YES
Other Controls at the Time of Birth	NO	YES	YES	YES	YES	YES	YES	YES
5-Yr Dummies	NO	YES	YES	YES	YES	YES	YES	YES
Regional FE	NO	YES	YES	YES	YES	YES	YES	YES

Individual and HH controls: Rural-Urban, Religion, Gender, Disability, Marital Status, Household Amenities etc. Birth-Period Control: Weather, and Economic Variables

Participation in LabourForce

$$LFP_{ijt} = \gamma_0 + \gamma_L LE_{j0} + \gamma_R X_{ijt} + \gamma_Z Z_{j0} + \delta_r + \varepsilon_{ijt}$$

	BASE	POOL	MALE	FEMALE	URBAN	RURAL	PRIME AGE MALE
life Expectancy at Birth	-0.004*** (0.0004)	0.005** (0.004)	0.012*** (0.004)	0.011 (0.007)	0.003 (0.01)	0.01*** (0.004)	0.007* (0.004)
Individual and HH control	NO	YES	YES	YES	YES	YES	YES
Other Controls at the Time of Birth	NO	YES	YES	YES	YES	YES	YES
5-Yr Dummies	NO	YES	YES	YES	YES	YES	YES
Regional FE	NO	YES	YES	YES	YES	YES	YES

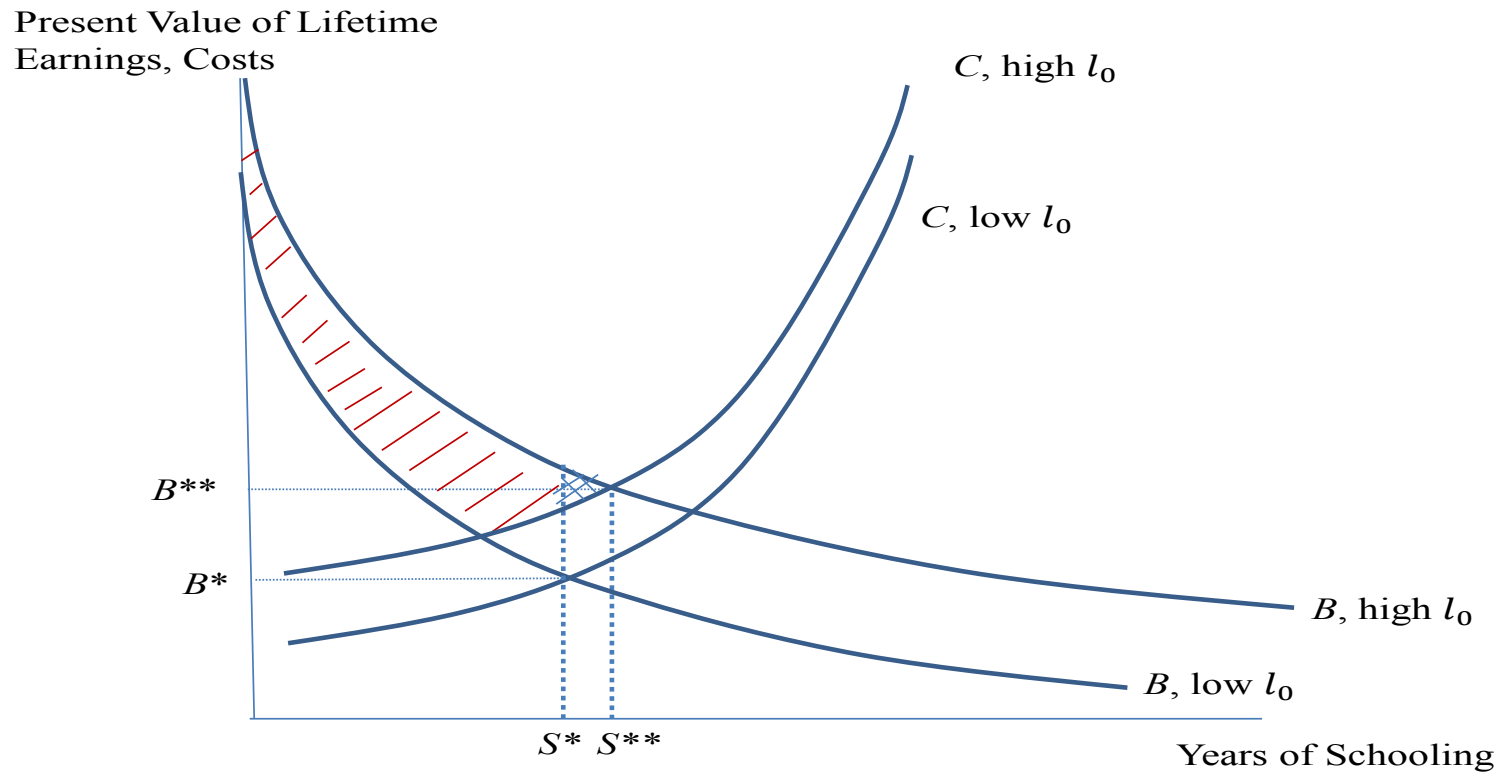
Individual and HH controls: Rural-Urban, Age, Religion, Gender, Disability, Marital Status, Relationship to Household Head, Household Amenities etc. Birth-Period Control: Weather, and Economic Variables

Lifetime Earnings

$$Y_{ijt} = \gamma_0 + \gamma_L LE_{j0} + \gamma_R \mathbf{X}_{ijt} + \gamma_Z \mathbf{Z}_{j0} + \delta_r + \varepsilon_{ijt}$$

	POOL	MALE	FEMALE	RURAL	URBAN
life Expectancy at Birth	0.009 (0.017)	0.012 (0.022)	-0.017 (0.022)	0.002 (0.017)	0.002 (0.037)
Individual and HH control	YES	YES	YES	YES	YES
Other Controls at the Time of Birth	YES	YES	YES	YES	YES
5-Yr Dummies	YES	YES	YES	YES	YES
Regional FE	YES	YES	YES	YES	YES

Brain vs. Brawn



Benefits and Costs of Schooling in the Presence of Health Improvement

Does *Health* Really Have any Impact on *Male Schooling*?

Population and Housing Census, Bangladesh, 2011

	BASE	POOL	MALE	FEMALE	RURAL	URBAN	PRIME AGE MALE
life Expectancy at Birth	0.129***	0.107***	-0.04***	0.206***	0.139***	0.012**	-0.033***
Individual and HH control	NO	YES	YES	YES	YES	YES	
Other Controls at the Time of Birth	NO	YES	YES	YES	YES	YES	
5-Yr Dummies	NO	YES	YES	YES	YES	YES	
Regional FE	NO	YES	YES	YES	YES	YES	

Individual and HH controls: Rural-Urban, Religion, Gender, Disability, Marital Status, Relationship to Household Head, Household Amenities etc. Birth-Period Control: Weather, and Economic Variables

Results in Brief

- **Gains in Life Expectancy at Birth increases Years in School**
 - Consistent evidence that increased life expectancy by 1 year increases schooling by 0.11-0.17 years
 - Higher for Female and Rural residents
- **Some Evidence of Higher Participation in Labor Force**
 - Increased life expectancy by 1 year increases labor Force Participation by 0.5%.
 - Mainly for Male
- **Consistently No Effect on Lifetime Earnings**

- During the period of 1980-2010
 - Completed Years of Schooling increased by 3.1 years.
 - Life Expectancy at Birth increased by approx. 16 years.
- The estimated Life Expectancy at Birth Effect implies that
 - Almost 50% - 80% of increased schooling is due to gain in life expectancy at birth.
- Rethink the link between SDG Goal 3 and 4
 - Goal 3: Ensure healthy lives and promote well-being for all at all ages
 - Goal 4: Ensure inclusive and equitable quality education and
- Importance of investment in infant and child health for long run human development.
- Health is an important avenue to catch up the developed nations.
- *Better Source for Wage Data?*

Thank You for Your Patience

Individual vs. Cohort Life Expectancy

- Cannot observe individual life expectancy at birth; Observe cohort life expectancy at birth.

- $LE_j = \frac{\sum_{i=1}^N LE_{ij}}{N}$.

- $LE_{ij} = LE_j + \mu_{ij}$.

- Individual i 's life expectancy at birth 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, $Cov(\varepsilon_{it}, LE_{jc}) = 0$, must hold.
- Group mean is often used as an instrument to resolve *endogeneity* issue in individual level empirical analysis.
 - Royalty (2000) has used state tax rate as an instrument for marginal tax rate in explaining employees' health insurance eligibility.
 - Ruhm(2000) exploited state or county level unemployment rate while explaining health behavior during a recession.

- Heckman (1976) extended the model to allow both time and financial investments into human capital production and to allow agents to choose labor supply and the consumption of goods and leisure over the life cycle.
- Acemoglu and Johnson (2006, 2007) found no effect of increasing life expectancy due to improved control of infectious disease on schooling. They argued that because cohort size increases with improved length of life, returns to human capital may fall due to rising labor supply outpacing any growth in demand for skills

- Hazan (2009) argued that the Ben Porath model required an increase in lifetime labor supply for the gain in life expectancy to increase investment in human capital. He found that American men born between 1840 and 1970 actually reduced lifetime labor supply, from which he concluded that life expectancy has either a negligible or possibly even a negative effect on investments in education.
- His subsequent analysis (Hazan 2012) found no correlation between life expectancy at age 5 and schooling. However, other analyses of similar country-level data still retain the positive correlation between life expectancy and schooling (Cervellati and Sunde 2013; Hansen 2013; and Cohen and Leker 2014).