ERF Conference on Education, Health and Worker Productivity
(Koç University)

Does Lower Socio-Economic Status Make You Sick? Two-Period Life Cycle Model and Evidence from Turkey

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Motivation

- Turkey has undergone substantial changes in health policy and retirement schemes.
- There are huge socio-economic disparities among regions and these socio-economic inequalities are major challenges for health and public policies.
- Improvement in health, rise in life expectancy and increase in old population lead essential changes in life cycle behavior of individuals (consumption patterns, labor supply, health care and retirement decisions).
- Aging populations impose great financial pressure on social security systems.

- Looking at the socio-economic differences only at certain ages would lead to incomplete impression.
- Socioeconomic disparities in health do not follow a simple explanation.

AIM: Bring a life-cycle perspective in analyzing the effect of socio-economic differences on health in Turkey.

Questions

- How does health differ by SES over life cycle?
- Do SES disparities narrow or widen as people age?
- What dimensions of SES matter?
- Does differences in health reflect causation from SES to health?

Data

- Turkstat Survey of Income and Living Conditions (SILC) 2010.
- Information on housing and economic situation of the household, demographic characteristics, education, health, employment and income.
- 12106 households, 45389 household members.
- After excluding individuals with incomplete data and below 25 we have 25503 individuals of whom 12310 are men and 13193 are women.

SES Gradient in Health

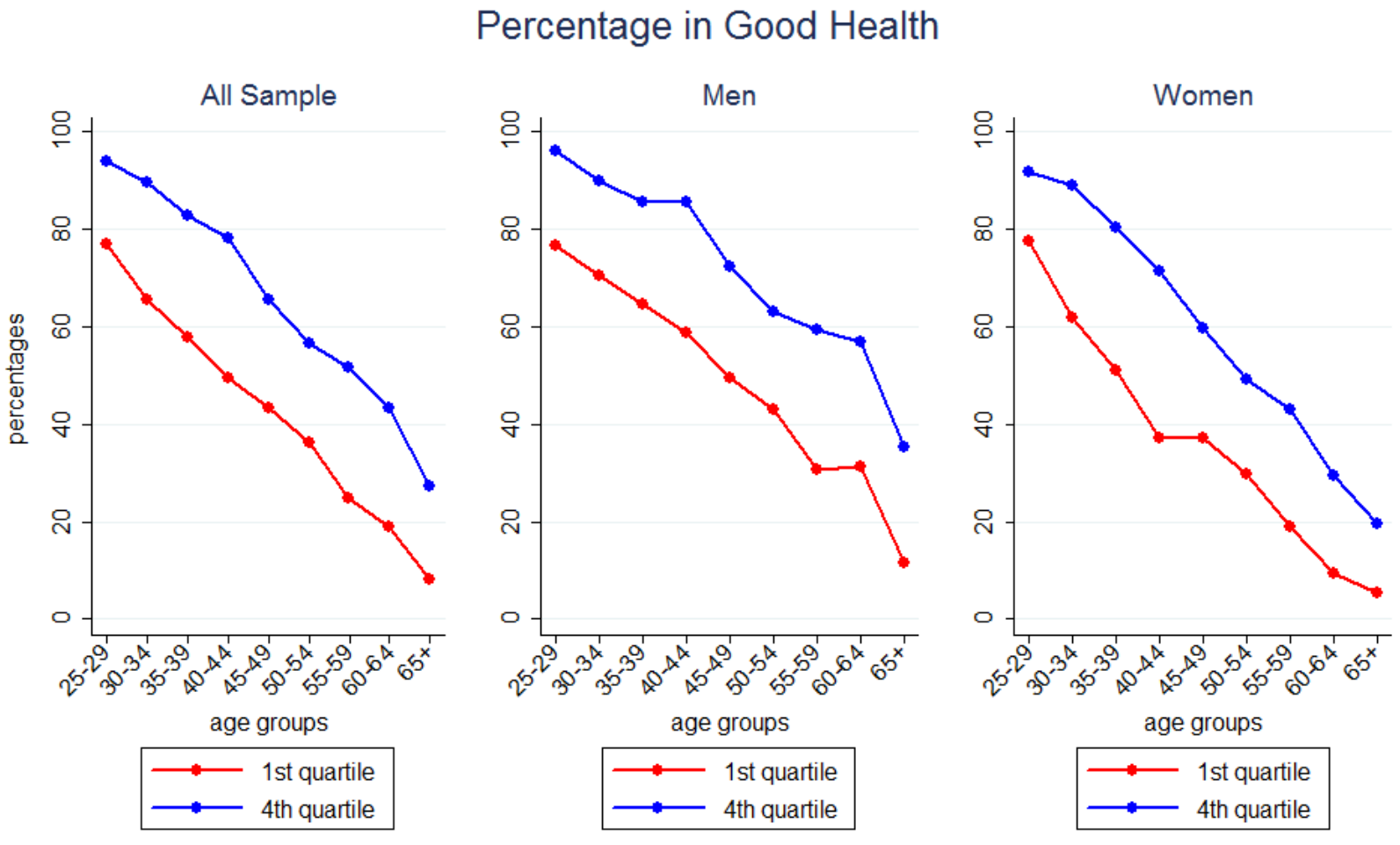
- Life cycle behavior of SES gradient in health in Turkey
- Aim here is not to determine the causality from SES to health, but to form a precursor analysis.
- Three approaches:
  1. Cumulative Advantage Hypothesis
  2. Age-As-Leverer Hypothesis
  3. Compromise Hypothesis

- Three issues:

  1. Cohort Effects
  2. Selective Mortality
  3. Justification Bias

Self Assessed Health by Income

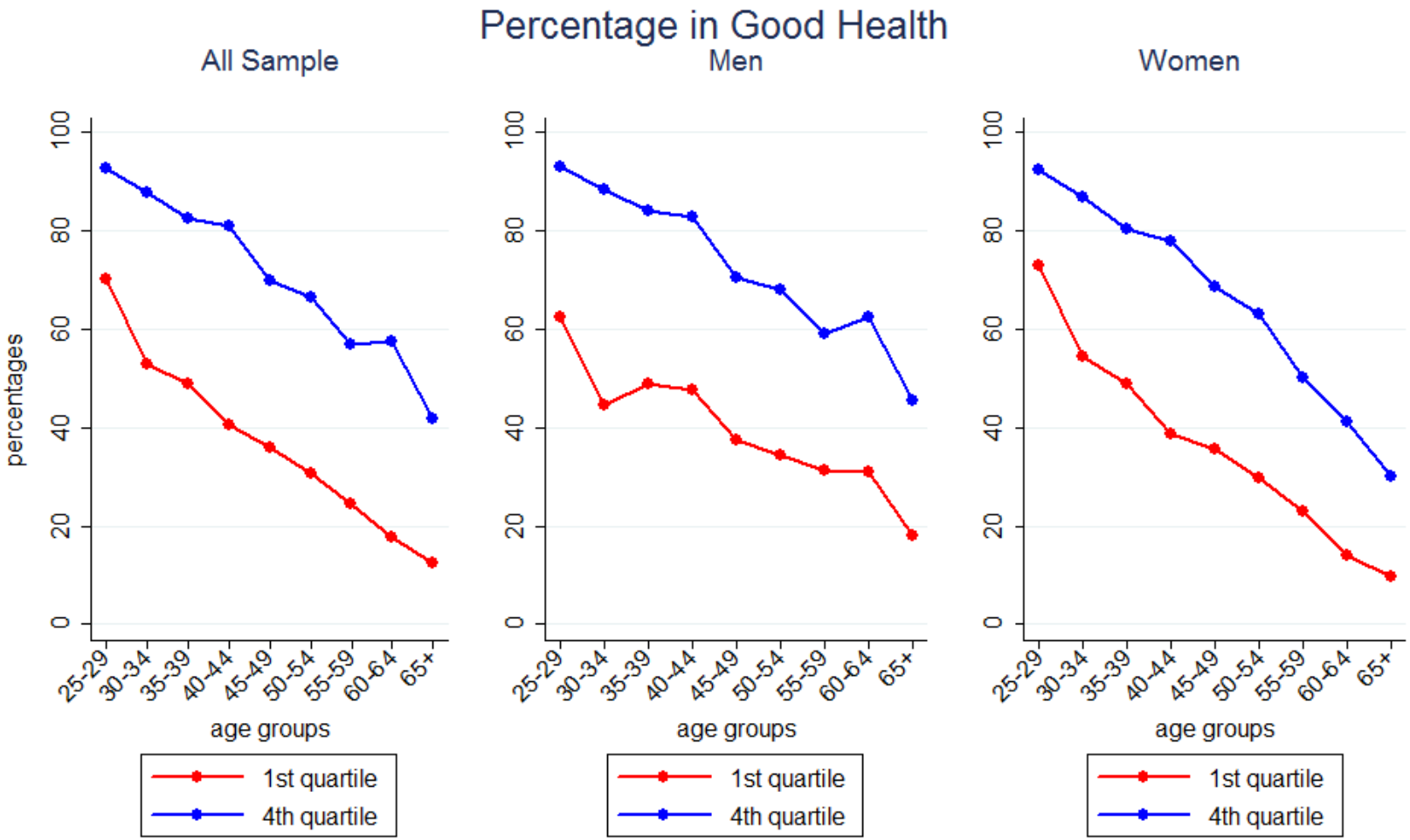
Self Assessed Good Health by Age According to Income Quartiles and Gender



Source: Turkstat SILC 2010 and author's calculations. Percentages are adjusted by sample weights.

Self Assessed Health by Education

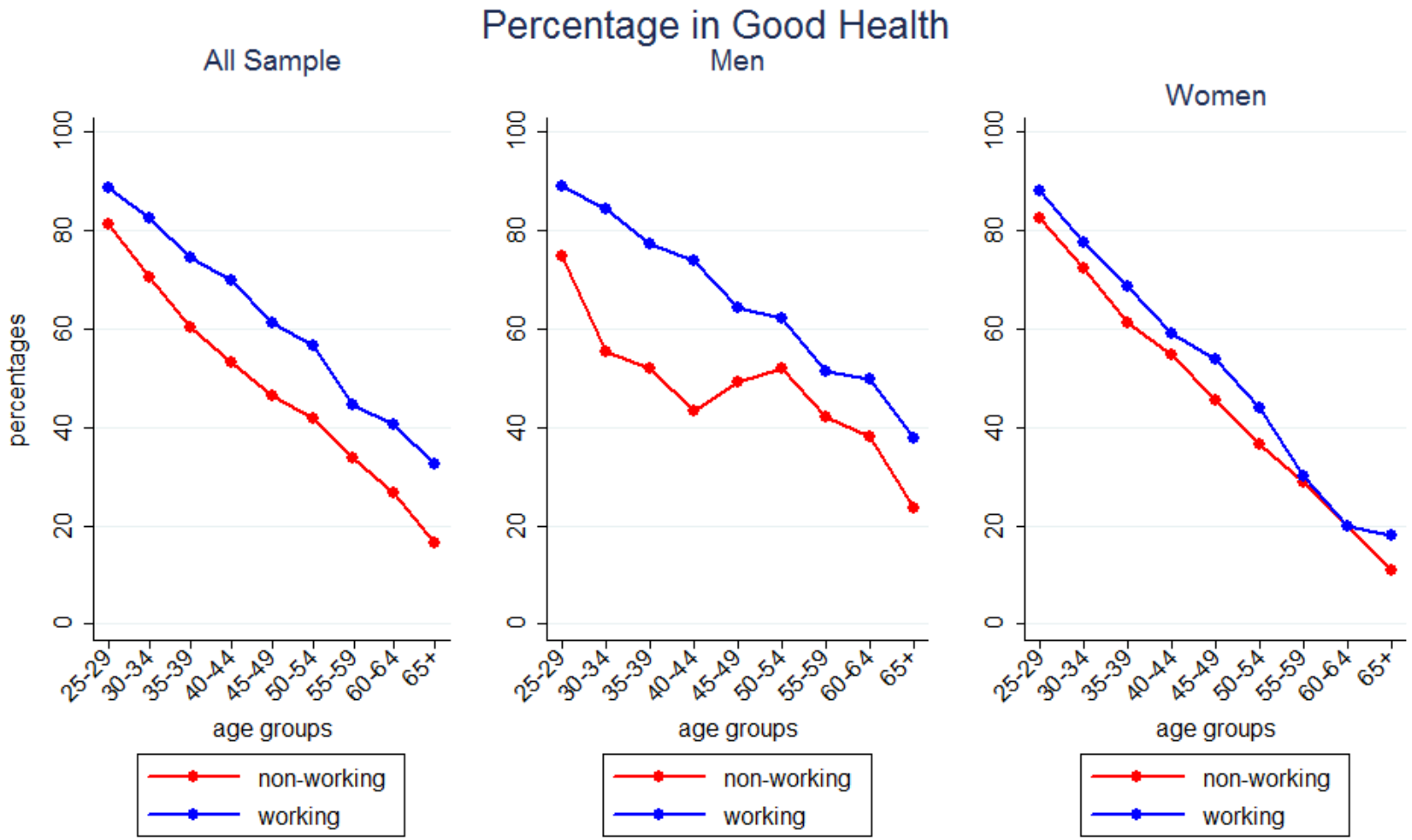
Self Assessed Good Health by Age According to Education Quartiles and Gender



Source: Turkstat SILC 2010 and author's calculations. Percentages are adjusted by sample weights.

Self Assessed Health by Work Status

Self Assessed Good Health by Age According to Work Status and Gender



Source: Turkstat SILC 2010 and author's calculations. Percentages are adjusted by sample weights.

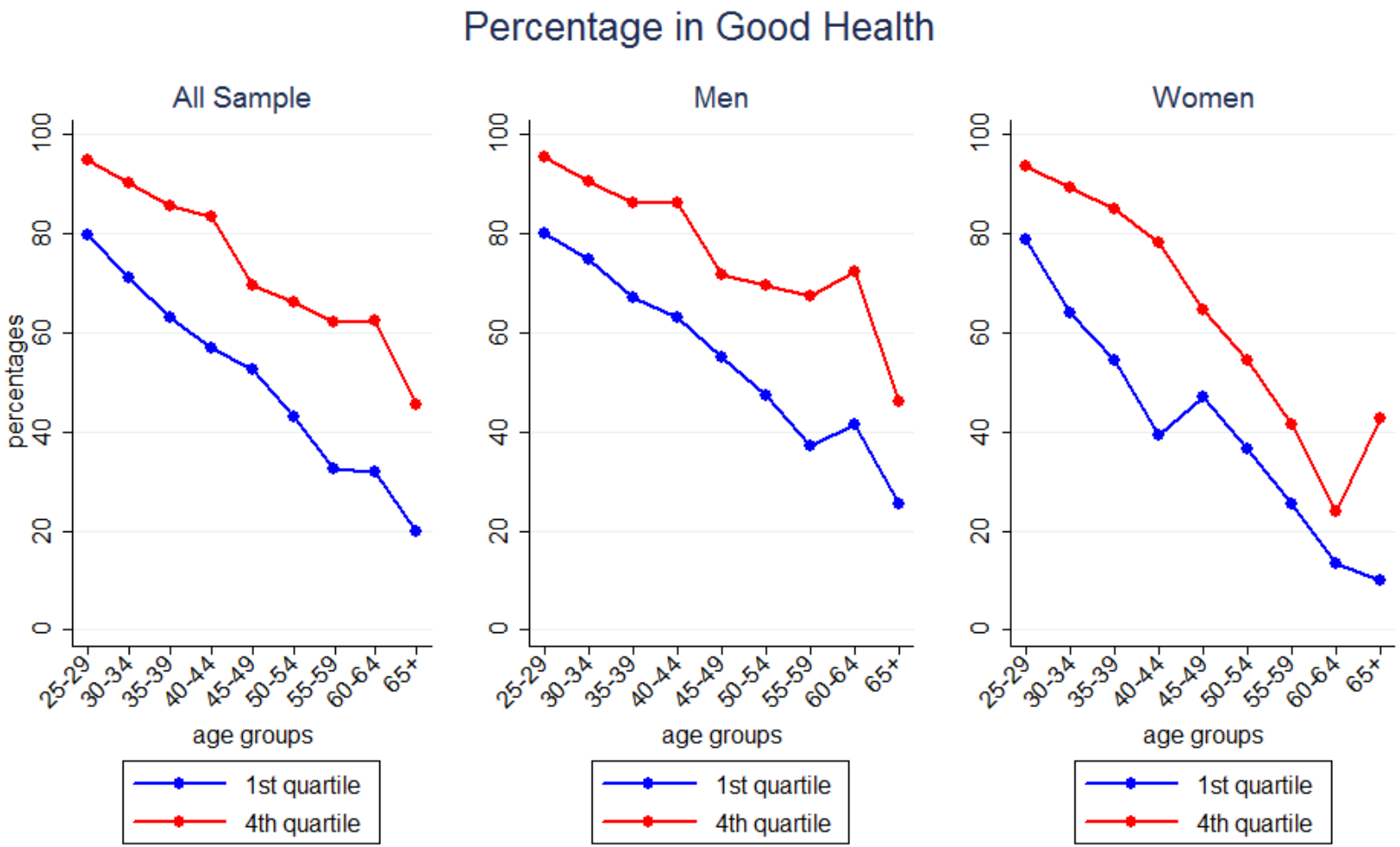
Self Assessed Health by Work Type

Self Assessed Good Health by Age According to Work Type and Gender

Source: Turkstat SILC 2010 and author's calculations. Percentages are adjusted by sample weights.

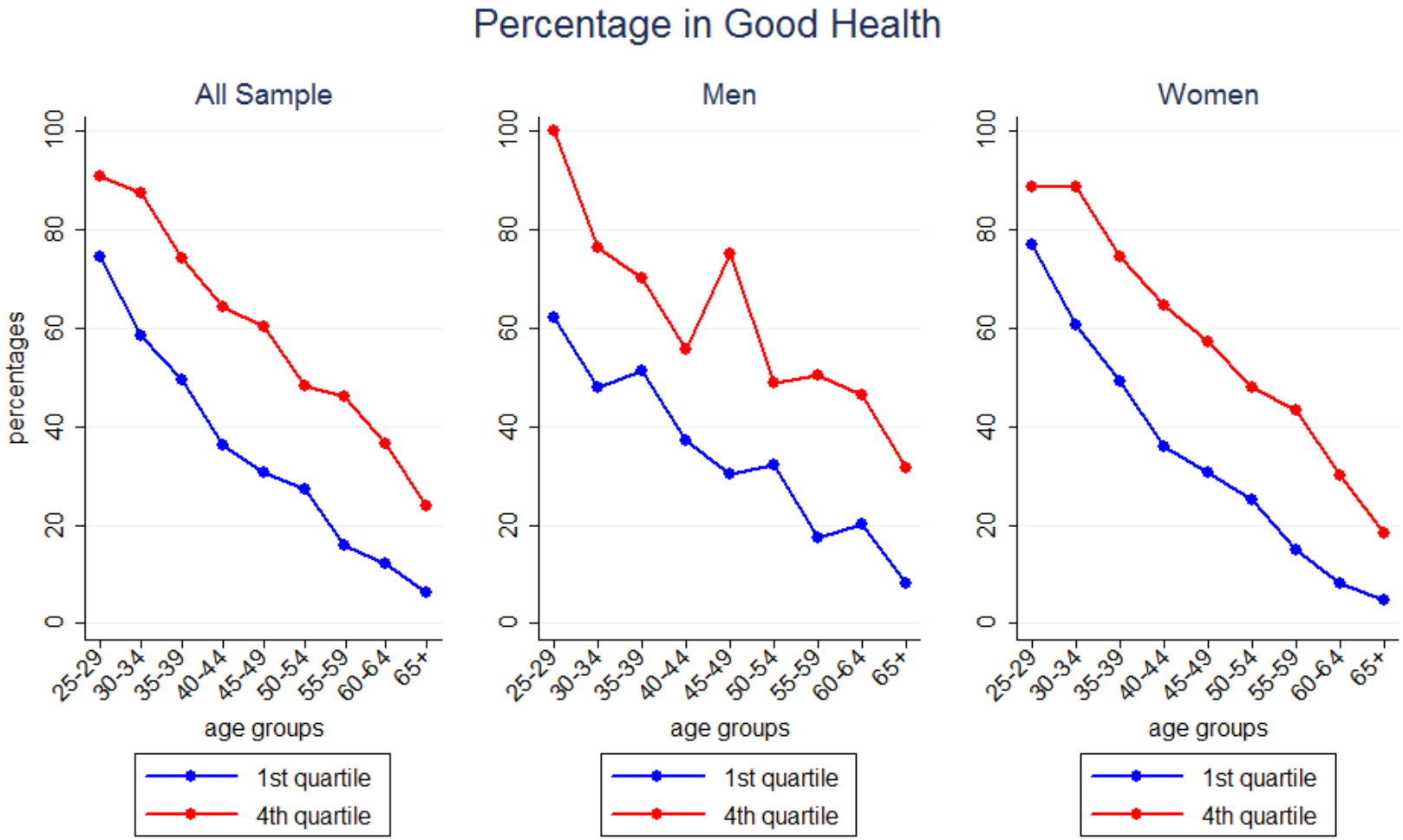
How Much Work Status Matter?

Self Assessed Good Health of Working Individuals by Age According to Income Quartiles



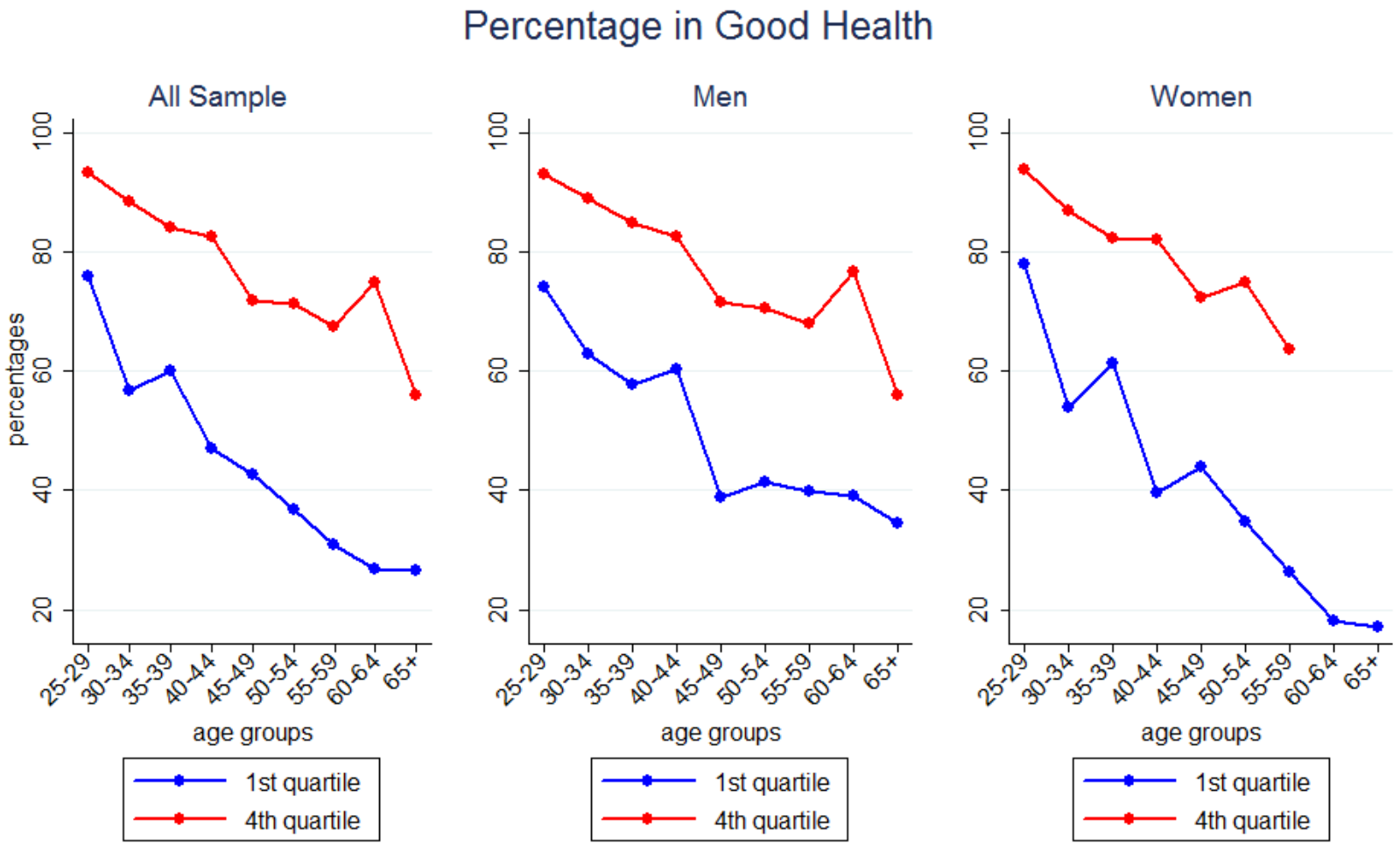
Source: Turkstat SILC 2010 and author's calculation. Percentages are adjusted by sample weights.

Self Assessed Good Health of Non-Working Individuals by Age According to Income Quartiles



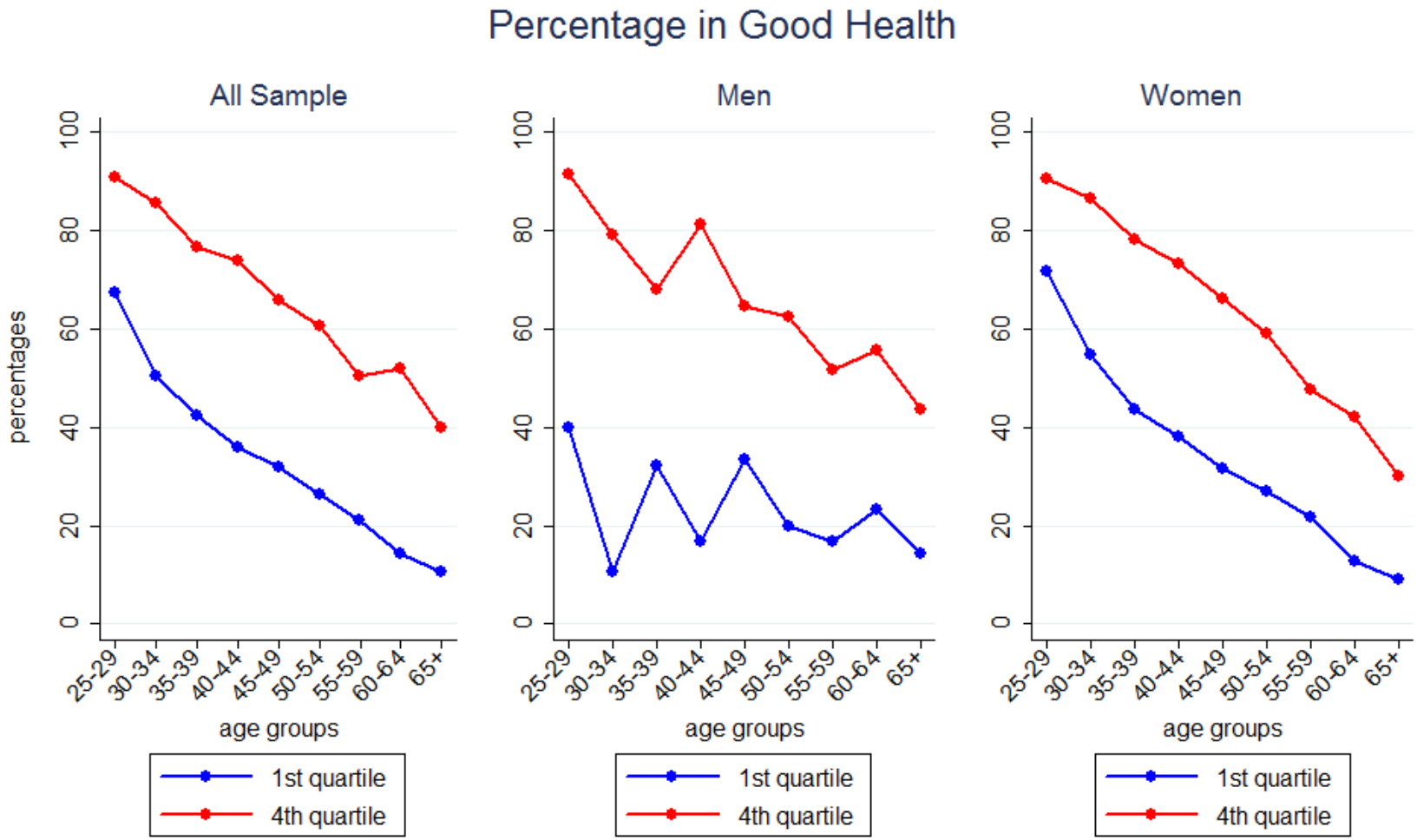
Source: Turkstat SILC 2010 and author's calculations. Percentages are adjusted by sample weights.

Self Assessed Good Health of Working Individuals by Age According to Education Quartiles



Source: Turkstat SILC 2010 and author's calculations. Percentages are adjusted by sample weights.

Self Assessed Good Health of Non-Working Individuals by Age According to Education Quartiles



Source: Turkstat SILC 2010 and author's calculations. Percentages are adjusted by sample weights.

Two-Period Life Cycle Model Assumptions

- Risk averter individuals try to maximize their life-time utility by working in the first period and they retire in the second period.
- Utility depends on consumption and health status.
- $u(c, h)$ is concave in all arguments; that is $u_c > 0$, $u_h > 0$, $u_{cc} < 0$ and $u_{hh} < 0$.
- Utility function is time-separable.

- In the first period:
  - Receive education, e_1.
  - Individuals work and receive an income w_1.
  - Working hours, n_1, fixed through the period.
  - Save for retirement, s_1.
  - Spend for medical services, m_1.
  - Receive non-labor income, y_1.
- In the second period:
  - Individuals retire and consume their savings from the first period.
  - Continue to invest their health by making medical expenses, m_2.
  - Die when health status falls below a certain level.
- Prices of consumption, medical services and education are normalized to 1.

- Utility function:
  $U = log(c_1) + log(h_1) + \beta log(c_2) + \beta log(h_2)$
- Intertemporal budget constraint:
  $c_1 + \frac{c_2}{1+r} = w_1 n_1 + y_1 - e_1 - m_1 - \frac{m_2}{1+r}$
- Health investment function in the first period:
  $h_1 = \bar{h} - \delta\bar{h} + \psi m_1 + \phi w_1 n_1 - \tau n_1 + \sigma y_1 + \epsilon e_1$
- Health investment function in the second period:
  $h_2 = h_1 - \delta h_1 + \psi m_2$

- Inter-temporal budget constraint that respects both financial and health identities:

$$c_1 + \frac{c_2}{1+r} =$$
$$w_1 n_1 + y_1 - e_1\left(\frac{h_1 - \bar{h} + \delta\bar{h} - \phi w_1 n_1 + \tau n_1 - \sigma y_1 - \epsilon e_1}{\psi}\right) - \left(\frac{h_2 - h_1 + \delta h_1}{\psi(1+r)}\right)$$

- The problem:

$$\text{max. } U = log(c_1) + log(h_1) + \beta log(c_2) + \beta log(h_2)$$

subject to

$$c_1 + \frac{c_2}{1+r} =$$
$$w_1 n_1 + y_1 - e_1\left(\frac{h_1 - \bar{h} + \delta\bar{h} - \phi w_1 n_1 + \tau n_1 - \sigma y_1 - \epsilon e_1}{\psi}\right) - \left(\frac{h_2 - h_1 + \delta h_1}{\psi(1+r)}\right)$$

- Health and consumption functions:

$$[6] \qquad h_1 = \frac{(1+r)[w_1 n_1(\phi+\psi)+y_1(\psi+\sigma)+e_1(\epsilon-\psi)-\tau n_1+\bar{h}(1-\delta)]}{2(r+\delta)(1+\beta)}$$

$$[7] \qquad h_2 = \frac{\beta(1+r)[w_1 n_1(\phi+\psi)+y_1(\psi+\sigma)+e_1(\epsilon-\psi)-\tau n_1+\bar{h}(1-\delta)]}{2(1+\beta)}$$

$$[8] \qquad c_1 = \frac{[w_1 n_1(\phi+\psi)+y_1(\psi+\sigma)+e_1(\epsilon-\psi)-\tau n_1+\bar{h}(1-\delta)]}{2(1+\beta)\psi}$$

$$[9] \qquad c_2 = \frac{\beta(1+r)[w_1 n_1(\phi+\psi)+y_1(\psi+\sigma)+e_1(\epsilon-\psi)-\tau n_1+\bar{h}(1-\delta)]}{2(1+\beta)\psi}$$

Responses of Consumption and Health to Parameter Changes

increase in parameter	h_1	h_2
r	falls	rises
ϕ	rises	rises
ψ	ambiguous	ambiguous
δ	falls	falls
β	falls	rises
τ	falls	falls
ϵ	rises	rises
σ	rises	rises

Comparative Statics

Health Functions

- $\frac{\partial h_1}{\partial w_1} = \frac{(1+r)(\phi+\psi)n_1}{2(r+\delta)(1+\beta)} > 0$
- $\frac{\partial h_1}{\partial n_1} = \frac{(1+r)[w_1(\phi+\psi)-\tau]}{2(r+\delta)(1+\beta)}$ ambiguous
- $\frac{\partial h_1}{\partial \bar{h}} = \frac{(1+r)(1-\delta)}{2(r+\delta)(1+\beta)} > 0$
- $\frac{\partial h_1}{\partial e_1} = \frac{(1+r)(\epsilon-\psi)}{2(r+\delta)(1+\beta)}$ ambiguous
- $\frac{\partial h_1}{\partial y_1} = \frac{(1+r)(\psi+\sigma)}{2(r+\delta)(1+\beta)} > 0$

- $\frac{\partial h_2}{\partial w_1} = \frac{\beta(1+r)[n_1(\psi+\phi)]}{2(1+\beta)} > 0$
- $\frac{\partial h_2}{\partial n_1} = \frac{\beta(1+r)[w_1(\phi+\psi)-\tau]}{2(1+\beta)}$ ambiguous
- $\frac{\partial h_2}{\partial \bar{h}} = \frac{(1+r)(1-\delta)\beta}{2(1+\beta)} > 0$
- $\frac{\partial h_2}{\partial e_1} = \frac{\beta(1+r)(\epsilon-\psi)}{2(1+\beta)}$ ambiguous
- $\frac{\partial h_2}{\partial y_1} = \frac{\beta(1+r)(\psi+\sigma)}{2(1+\beta)} > 0$

Estimated Equation

$$H_i = f(X_i'\beta_1 + SES_i'\beta_2) + \epsilon_i$$

where $H_i = 1$ if good health

$H_i = 0$ if bad health

Marginal Effects-All Sample (Work Hours as Labor Status Indicator)

Dep. Var:SRH	LPM	Probit	IV-LPM	IV-Probit
age 35-44	-0.1160***	-0.1302***	-0.1156***	-0.1312***
	(0.0094)	(0.0097)	(0.0084)	(0.0088)
age 45-54	-0.2327***	-0.2323***	-0.2353***	-0.2382***
	(0.0107)	(0.0102)	(0.0124)	(0.0144)
age 55-64	-0.3601***	-0.3331***	-0.3700***	-0.3489***
	(0.0151)	(0.0137)	(0.0190)	(0.0199)
age 65+	-0.4407***	-0.4012***	-0.4922***	-0.4655***
	(0.0223)	(0.0207)	(0.0375)	(0.0411)
male	0.0766***	0.0719***	0.1385***	0.1466***
	(0.0092)	(0.0090)	(0.0308)	(0.0388)
urban	-00027	-0.0060	0.0208***	0.0178***
	(0.0090)	(0.0089)	(0.0088)	(0.0090)
living quartiles	-0.0003	-0.0002	0.0009***	0.0010***
	(0.0003)	(0.0003)	(0.0002)	(0.0002)
2nd education quartile	0.0856***	0.0565***	0.1330***	0.1061***
	(0.0132)	(0.0121)	(0.0149)	(0.0147)
3rd education quartile	0.1377***	0.1058***	0.2103***	0.1826***
	(0.0183)	(0.0177)	(0.0205)	(0.0224)
4th education quartile	0.1536***	0.1312***	0.2024***	0.1767***
	(0.0165)	(0.0157)	(0.0176)	(0.0165)
blue collar	-0.0134	-0.0137	-0.0599***	-0.0643***
	(0.0095)	(0.0093)	(0.0139)	(0.0160)
income	0.0836***	0.0836***	0.0838***	0.0840***
	(0.0068)	(0.0067)	(0.0072)	(0.0069)
work hours	0.0006**	0.0005**	-0.0064***	-0.0076***
	(0.0002)	(0.0002)	(0.0025)	(0.0032)
Observations	12666	12666	12666	12666
R-squared	0.1629	0.1377	0.1626	0.1376

Standard errors in parentheses
***p<0.01, **p<0.005, p<0.1

Marginal Effects-All Sample (Employment as Labor Status Indicator)

Dep. Var:SRH	LPM	Probit	IV-LPM	IV-Probit
age 35-44	-0.1162***	-0.1302***	-0.1087***	-0.1228***
	(0.0094)	(0.0097)	(0.0094)	(0.0096)
age 45-54	-0.2324***	-0.2318***	-0.2162***	-0.2155***
	(0.0107)	(0.0102)	(0.0100)	(0.0119)
age 55-64	-0.3583***	-0.3311***	-0.3361***	-0.3084***
	(0.0150)	(0.0137)	(0.0149)	(0.0122)
age 65+	-0.4315***	-0.3932***	-0.4153***	-0.3748***
	(0.0223)	(0.0206)	(0.0215)	(0.0195)
male	0.0689***	0.0644***	0.0666***	0.0609***
	(0.0091)	(0.0090)	(0.0092)	(0.0081)
urban	-00024	-0.0055	0.0162	-0.0127
	(0.0090)	(0.0089)	(0.0099)	(0.0087)
living quartiles	-0.0003	-0.0002	0.0008***	0.0009***
	(0.0003)	(0.0003)	(0.0002)	(0.0002)
2nd education quartile	0.0811***	0.0531***	0.1158***	0.0864***
	(0.0132)	(0.0121)	(0.0135)	(0.0122)
3rd education quartile	0.1323***	0.1021***	0.1830***	0.1510***
	(0.0183)	(0.0177)	(0.0174)	(0.0190)
4th education quartile	0.1446***	0.1239***	0.2220***	0.1996***
	(0.0165)	(0.0157)	(0.0169)	(0.0138)
blue collar	-0.0133	-0.0136	-0.0328***	-0.0324***
	(0.0094)	(0.0093)	(0.0094)	(0.0086)
income	0.0807***	0.0809***	0.0811***	0.0813***
	(0.0068)	(0.0067)	(0.0065)	(0.0067)
employed	0.0760***	0.0633***	0.0743***	0.0624***
	(0.0124)	(0.0116)	(0.0152)	(0.0120)
Observations	12666	12666	12666	12666
R-squared	0.1649	0.1393	0.1646	0.1391

Standard errors in parentheses
***p<0.01, **p<0.005, p<0.1

Comparison Between Intensive and Extensive Margins of Labor

	LPM	Probit	IV-LPM	IV-Probit
Effect of 1 hour increase in work hours (Intensive margin of labor)	0.0006**	0.0005**	-0.0064***	-0.0076***
Effect of 2 percent increase in employment (Extensive margin of labor)	0.0015***	0.0012***	0.0015***	0.0012***

***p<0.01, **p<0.005, p<0.1

Conclusion

- Income, education and work gradients in health exist.
- Cumulative advantage hypothesis operates until middle ages, then age-as-leverer hypothesis kicks in.
- Women's health status is worse than men and pace of deterioration is higher.
- Age is the main determinant of health satisfaction followed by educatipon and income
- Reverse causality in income is not a major issue.
- Extensive margin of labor is the main driving force when endogeneity correction is not applied.
- Under endogeneity correction extensive margin of labor leads an increase in the probability of good health, while intensive margin of labor causes the probability of good health to fall.