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

Abstract

People at low socio-economic status (SES) suffer a heavier burden of poor health than their better-off counterparts. However SES is not a one dimensional concept and knowing which aspect of it affects health and how much more rapidly health declines for some individuals than others over life cycle are key to policy debate for building retirement schemes and social security systems. In this respect by using cross section data from 2010 for Turkey, the contribution of this study to the literature is three-fold: i) we depict SES gradient in health over life course by using different aspects of SES such as income, education and work status. ii) we develop a basic two-period life cycle model that accounts for the effects of SES on health. iii) we try to test our two-period model by estimating endogeneity corrected equations.

Results show that the bottom of SES hierarchy in Turkey are in much worse health than those at the top and average health among men is better than women. The health gradient exists whether income, education, work status or work type are used as indicators of SES. We observe relatively wide SES gradient in health in middle-ages and narrowing of it in old ages implying some mixture of *cumulative advantage hypothesis* and *age-as-leveler hypothesis* operates through life cycle. Second, our two-period theoretical setting shows that both labor and non-labor income have positive effects on health whereas the impact of education and work status depend on the relative sizes of the model parameters. Parameters being crucial in determination of health status would explain the differences among ages and genders. Lastly, estimation results present that age is the main determinant of health followed education and income. Furthermore reverse causality in income is not a major issue. Comparison between intensive and extensive margins of labor indicates that it is the change in employment, not work hours that changes the probability of good health when endogeneity correction is not applied. On the other hand when we estimate endogeneity corrected equations, the sign of intensive margin of labor becomes negative whereas the sign of extensive margin of labor stays positive.[1]

Keywords: socio-economic status, health gradient, life-cycle model, endogeneity

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1. Introduction

Since the seminal work of Grossman (1972) health is extensively regarded as an important part of human capital and Grossman Model has become the standard model to study health demand and health determinants. Many aspects of health determinants have been studied such as how health differs by socio-economic status (SES) over life cycle and which dimensions of SES matter- financial aspects like income or wealth or nonfinancial aspects such as education. These studies address the strong relationship between health and socio-economic conditions in which individuals live and work both in rich and poor countries (Kunst and Mackenbach, 1994; Smith, 2004; Smith, 2007; Van Doorslaer et al., 2008; Van Kippersluis et al., 2010; Willson et al., 2007). Socio-economic inequalities in health are a major challenge for health policy, not only because most of these inequalities can be considered unfair, but also because a reduction in the burden of health problems in disadvantaged groups offers excessive potential for improving the average health status of the population as a whole (Kunst and Mackenbach, 1994).

Turkey has undergone substantial changes in health policy and retirement schemes in the last decades and debate goes on the age limit in retirement and pension systems. Two retirement reforms were passed in 1999 and 2008 that aim to regulate the retirement and work patterns and to increase retirement age. Additionally, three social security systems have been merged under one system which covers the whole population. These changes offer the importance of understanding fundamental relationships between education, occupation, work and health in order to form an efficient public policy concerning retirement, pensions, health financing, health and social care. Comprehending the nature of the relationship between SES and health in a developing country as Turkey becomes crucial in policy designs and improving socio-economic and health status of whole population.

In this respect main objective of this study is to bring a life-cycle perspective in analyzing the effect of socio-economic differences on health in Turkey with the help of two-period life cycle model that incorporates socio-economic status as a determinant of health. The empirical analysis is based on data from Turkish Statistical Institute (Turkstat) Survey of Income and Living Conditions (SILC) 2010. Using a cross-section survey has some drawbacks such as it lacks information on selective mortality and cohort differences in the social, health and economic conditions experienced at a given age but still provides useful information on effect of SES on health over life cycle.

The rest of the study is organized as follows: Second section gives review on literature. Third section gives information about the data and SES gradient in health. In the fourth section we present a two period-life cycle setting in order to provide a structure on the relationship between SES and health. Fifth section presents the estimation methodology and results which are aimed to test the theoretical model and provide information about the underlying mechanisms. Lastly sixth section concludes.

2. Literature Review

Health is extensively regarded as an important part of human capital since the seminal work of Grossman. Grossman (1972) proposes the first model for demand for health capital in which health can be viewed as a durable capital stock which produces an output of healthy time and health capital differs from other types of human capital. Grossman (1972) assumes that health of individuals depreciate over time and can be increased by investment in health. Investment in health is produced by household production functions that depend on education and time. Muurinen (1982) uses a generalized version of Grossman's original model and argues that health is demanded for its utility consequences (relief or pain) and for its functional capacity consequences (better performance of necessary tasks) and the separation of health benefits are treated not as alternatives but as complemantaries. Muurinen and Le Grand (1985) argue that the most important building block of health behavior is the notion of a durable good which produces a flow of services over several periods of time, depreciates and can be increased with investment. According to Muurinen and Le Grand (1985) labor input of individuals has a price and this price is an important part of the total cost of medical care use and may vary from one individual to another, hence explains the differences in use behavior.

Kemna (1987) examines relationship between schooling and health and theoretical model allows schooling to affect health directly and indirectly through choice of work environment and other market inputs in health production. Leibowitz (2004) incorporates the effect of non-medical uses of time and the role of community level inputs on health and the role of investments in health development in childhood into basic Grossman model. Galama and Kapteyn (2011) relax the assumption that individuals can adjust their health stock to Grossman's optimal level instantaneously. They do not restrict an individual's health path to Grossman's optimal solution but allow for corner solutions where the optimal response for healthy individuals is to not consuming medical goods and services for some period of time.

By using intertemporal model of Grossman (1972), Case and Deaton (2005) discuss multiple causal links between health income and education, third factors that affect both health and socioeconomic status, and that contribute to the correlation between them. Their results suggest that self-reported health worsens with age and that it does so much more rapidly among those at the bottom of the income distribution. Ettner (1996) estimates the structural impact of income on different measures of health status such as self-assessed health status, work and functional limitations, bed days, average daily consumption of alcohol, and scales of depressive symptoms and alcoholic behavior. According to estimation results increases in income significantly improve physical and mental health but also rises alcohol consumption.

Ross and Wu (1996) examines whether education based gap in health rises with age and according to results the SES gap in health diverges with age. Beckett (2000) examines whether the educational differences in self-reported chronic and serious conditions converge in old ages. The results show that age is positively and linearly related to the probability of reporting more health conditions and years of education is negatively related to chronic conditions. Mackenbach et al. (2002) compare inequalities in morbidity and mortality among Western Europe countries and conclude that inequalities in health exist all over Europe.

Lynch (2003) investigates how cohort structures the influence of education on life-course health trajectories. The results show the effect of education is increasing in magnitude across birth cohorts, and that the life-course effect is quadratic in cross-sectional data but can be modeled as linear and is increasing in panel data. Herd (2006) examines whether functional inequalities grow, stagnate, diminish, or disappear in old age and provides support for age-as leveler hypothesis. In a detailed study Smith (2004) examines the different dimensions of SES-health relationship by looking at the both directions from SES to health and from health to SES. Smith (2004) finds out that new serious health events have a quantitatively large impact on work, income, and wealth. Smith (2007) also discusses the life cycle component of health-SES gradient by focusing on the dimensions of SES that effect health such as financial aspects (income, wealth) and non-financial aspects (education) and concludes that education plays the most important role.

Deaton (2007) investigates the relationship between life, health satisfaction, national income, age and life expectancy by using 2006 Gallup World Poll. According to Deaton (2007) national income moderates the impact of aging on self-reported health but these affects are much pronounced in poor countries than in rich countries. Willson et al. (2007) investigate how multiple dimensions of socio-economic status are related to health differences as people age. Their study is consistent with a path-dependent process of cumulative advantage. Cutler et al. (2008) focus on four dimensions of socioeconomic status; education, financial resources, rank, and ethnicity. Among all age groups, each additional year of schooling is associated with a clear and consistent improvement in self-reported health status and income is protective for all age groups, with the association strongest at lower levels of household income.

Van Doorslaer et al. (2008) investigate SES-health gradient in The Netherlands and compare the results to those of US. They show that socio-economic differences in health widen until middle age before narrowing in later years of life. Additionally they determine very similar pattern in the gradients both in

The Netherlands and United States. Van Kippersluis et al. (2009) examine the evolution of health and income-related health inequality over life cycle across generations in 11 EU countries. They disentangle age and cohort effects for the mean level of self-reported health as well as for overall and income-related health inequality. According to results in most countries, there is a steady decrease in mean health from early adulthood until around the age of 50 and the deterioration in health generally levels off in middle-age before accelerating rapidly beyond the age of 70. In another study Van Kippersluis et al. (2010) adopt a life cycle perspective in the evolution of SES gradient in health for The Netherlands. Their conclusions are similar to Van Doorslaer et al. (2008) in which socio-economic differences in health widen until middle age and then starts to narrow as individuals age.

3. Socio-Economic Status Gradient in Health

3.1 Income, Education and Work Status Gradients in Health

The data is from the wave of Turkstat Income and Living Conditions Survey (SILC) of Turkey for the year 2010. Since the analysis is focused on adults, we exclude people under 25. We use self-reported health status as a health indicator categorized as good and bad health. In this section we depict evolution of SES gradient in health be using income quartiles, education quartiles, work status and work type as indicators of SES. However information reported here does not reveal anything about the direction of causality, but presents a precursor analysis of the structure.

Literature is divided between three approaches on the evolution of socioeconomic gradient in health over life cycle. According to *cumulative advantage hypothesis* the differences in health by SES are established in life and subsequently widen as the economic and health disadvantages of less privileged interact and accumulate (Willson et al., 2007). On the other hand, *age-as-leveler hypothesis* suggests that deterioration in health is an inevitable part of the process of aging, with the result that SES-health gradient narrows at older ages (Beckett, 2000). A *compromise scenario*, is that cumulative advantage operates though middle age, with the SES-health gradient widening until around retirement age, before it narrows in old age as the biological determinants kick in (Van Doorsler et al., 2008).

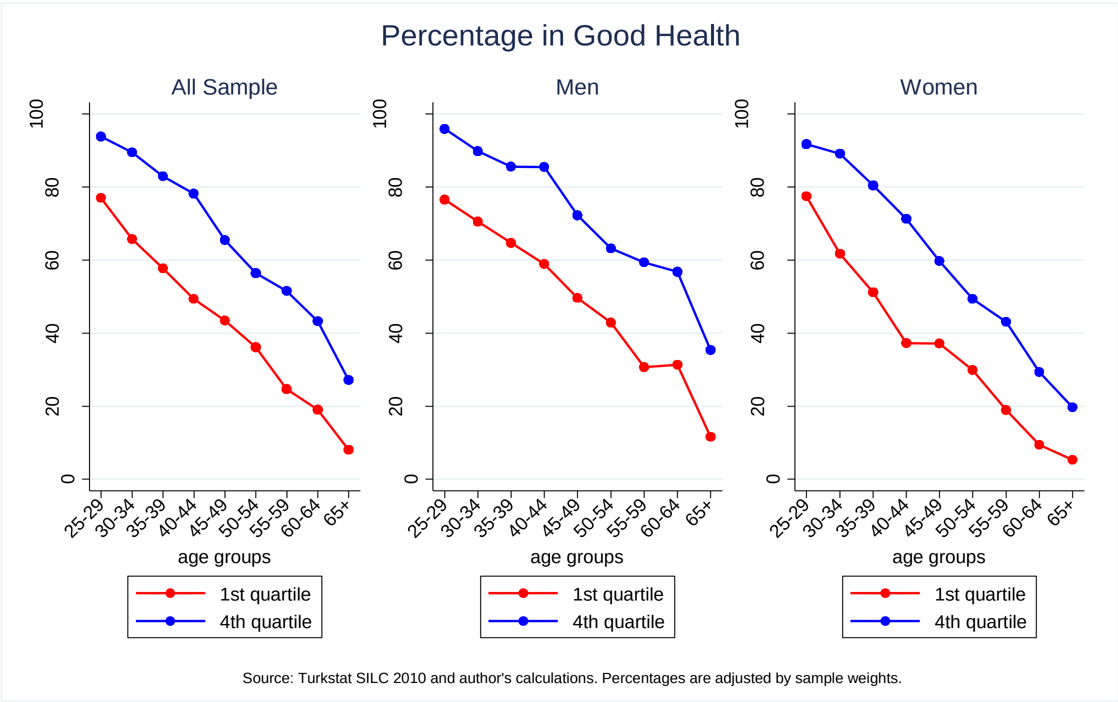
However there are important points remarkable in the process of analysis conducted here. One limitation of cross section data is that cohort effects may confound life cycle patterns. The strength of the relationship between SES and health may increase across cohorts (Van Doorslaer et al., 2008). Cohort effects can be covered by taking them explicitly into account by pooling the data or by following a single cohort as it ages (Willson et al. 2007, Herd 2006, Van Doorslaer et al. 2008). Due to data limitations we cannot observe cohort effetcs, however we believe that analysis applied here still gives an informative structure of the SES-health gradient in Turkey.

Another limitation would be due to selective mortality. At older ages the most robust of the lower socioeconomic groups survive given that mortality is correlated with SES. This situation can explain why socioeconomic differences in health among those surviving in old ages appear to narrow (Smith 2007; Van Kipperluis et al. 2010, Van Doorslaer et al. 2008, Lynch 2003). In other words less healthy people who are socioeconomically disadvantaged are more likely to die at relatively younger ages which will obscure the SES-health gradient. Once again due to data limitations we cannot observe selective mortality explicitly.

“Justification bias” would also be an issue in assessing SES-Health gradient. For a given true but unobserved health state individuals will report health differently depending on conceptions of health in general, expectations for own health, financial incentives and strategic behavior (Bago d’Uva et al. 2006). For example people who are early retired would exaggerate their poor health status in order to justify early exit from the labor force. However the existence of justification bias does not cause a crucial problem if the format of it is random.

Income is attributed as the first indicator of socio-economic status (SES). Income is the household income per capita adjusted by OECD equivalence scale in which 1 is assigned for the head of household, 0.5 for each other person if he/she is older than 14 and 0.3 if he/she is younger than 14. First income quartile represents the lowest quartile (lowest income group), whereas the fourth income quartile represents the highest quartile (highest income group). Figure 1 shows self-reported good health according to income quartiles. One can regard percentages in the Figure 1 as conditional probability: *Probability(good health/1st quartile & age & gender)*.

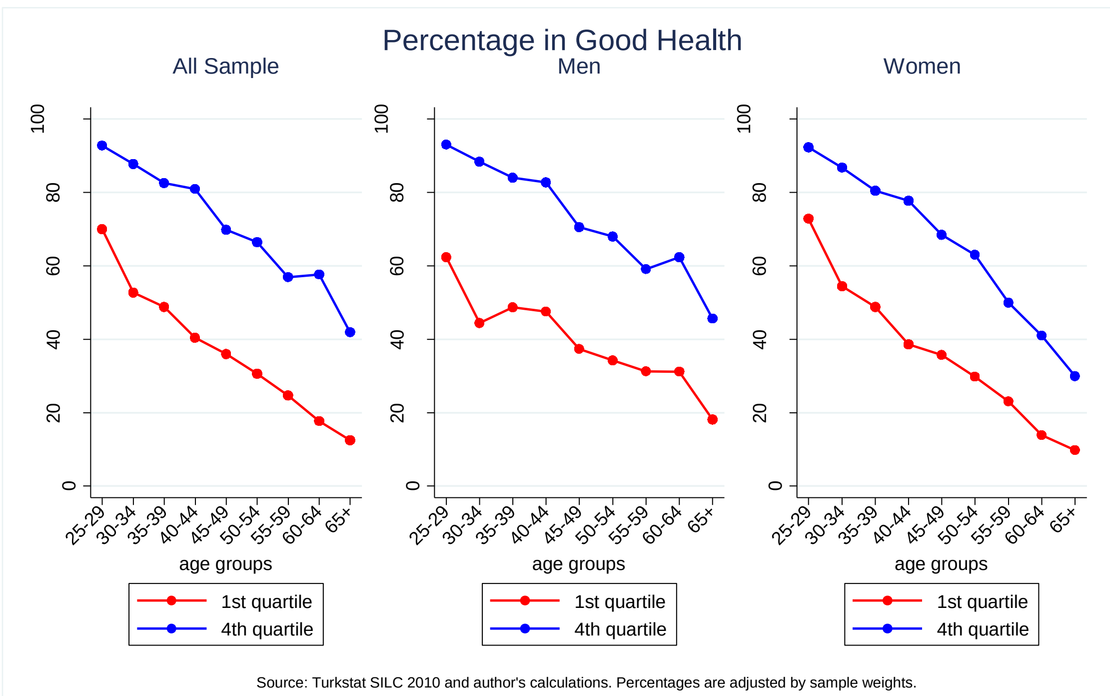
Figure 1: Self-Reported Good Health by Age According to Income Quartiles and Gender



Although the income gradient is obvious, we observe different patterns for men and women. Despite the fact that starting points of first (bottom) and fourth (top) income quartiles are very close to each other, the rate of deterioration, which is given by the slope of the curves, is greater for women. For men income gradient stays almost the same in young ages and income differences in health diverges at the beginning of the middle ages before it starts to converge after age of 64. On the other hand, the divergence in health starts immediately at young ages but convergence begin to occur at around age 45 for women. The immediate divergence for women would be due to justification bias and/or social roles. About 60% of men aged 40-44 in first income quartile report good health, whereas the same rate is reached at 50-59 age group for fourth income quartile. About 38% of women aged 40-44 in first income quartile report good health and this ratio is attained somewhere between 55-59 and 60-64 age groups for women who are in the fourth income quartile. Additionally one striking feature of the figure for men is the modest increase in share of good health in first income quartile between the age groups 55-59 and 60-64 which would be due to selective mortality which leaves healthier men in the sample. As mentioned before, the pattern of divergence in middle ages before the convergence in old ages could reflect cumulative advantage hypothesis operates until middle-ages which is overtaken by age-as leverer hypothesis in which biological factors kick in at older ages. However these patterns could also be due to cohort effects and selective mortality confounding the cumulative advantage at advanced ages.

Another important component of socio-economic status is education. Figure 2 presents self-reported good health according to education quartiles. First quartile includes illiterate individuals, second quartile includes primary education, third quartile refers to secondary education and fourth quartile involves individuals who have completed high school and university or higher education. As in the income gradient, men always report better health in every education and age category. For men widening of education gradient from young ages up to late middle age is immediately apparent. The magnitude of education gradient is biggest at the age group 30-34. About 50% of men aged 40-44 report good health in the first (bottom) education quartile whereas this ratio is reached at the age 65+ for men in fourth (top) education quartile. Similar structure is also valid for women; about 40% of women aged 40-44 in the bottom education quartile report good health while this proportion is attained after age 60-64 for the top education quartile. The magnitude of education gradient for women is smaller than men in almost every age group. Moreover, strong education gradient is observed for women which remains slightly stable through younger and early middle-ages and then starts to narrow in late middle ages. Slight increase in good health between the age groups 55-59 for men and 60-64 for women for both first and fourth education quartiles would be due to selective mortality. In comparison with the picture for the income gradient in Figure 1, the size of the education gradient is larger both for men and women. The relative bigger magnitude of education gradient with respect to income gradient is probably due to the fact that at younger and middle ages education provides a better indicator of social background than income. Furthermore, despite the narrowing of the education gradient at older ages, it still remains larger than the income gradient. A plausible explanation would be cumulative advantage of educationally favored individuals. Additionally, unlike income, education is not responsive to health changes.

Figure 2: Self-Reported Good Health by Age According to Education Quartiles and Gender



The theory predicts that individuals with physically demanding jobs will result in higher depreciation rates and will have a higher relative health decline over the life cycle (Grossman, 1972). Occupation is less predetermined than education, but is more so than income, offering another opportunity to examine whether the widening of income gradient until old ages may be influenced by the impact of health on work activity (Van Doorslaer, et al., 2008). In this respect we also present the evolution of self-reported health through life cycle according work status, and work type in Figure 3 and Figure 4 respectively. Figure 3 shows the percentages in good health according to work status. Working category includes individuals who are employed full-time, non-working category refers to the individuals who are both unemployed and out of labor force. The most remarkable observation is the widening of the gradient

Figure 3: Self-Reported Good Health by Age According to Work Status

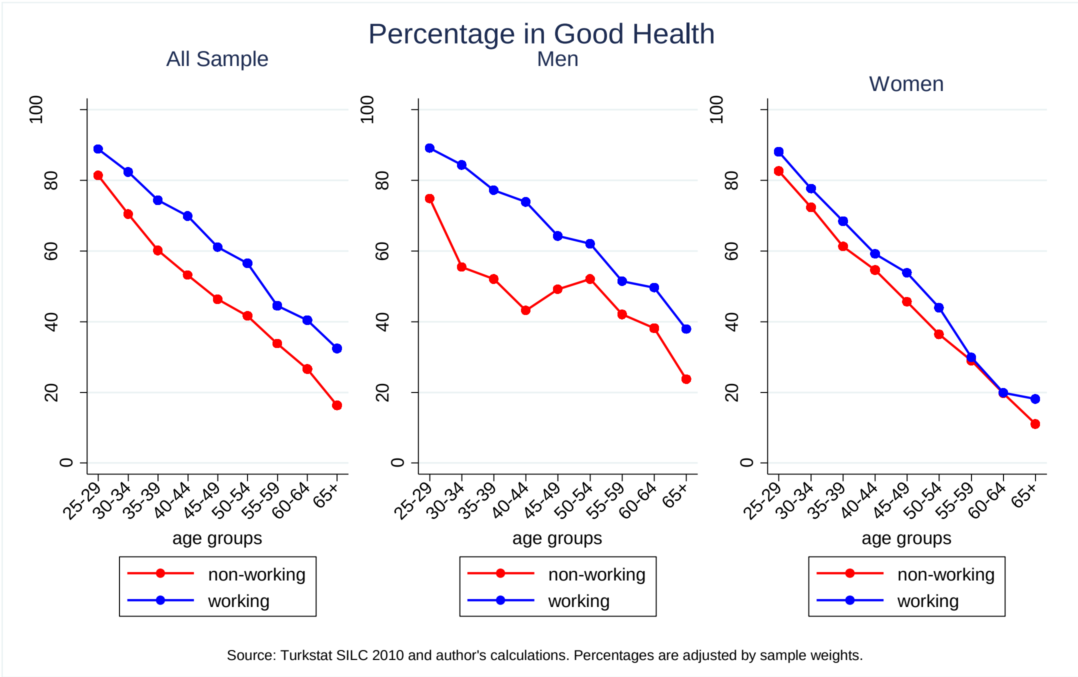
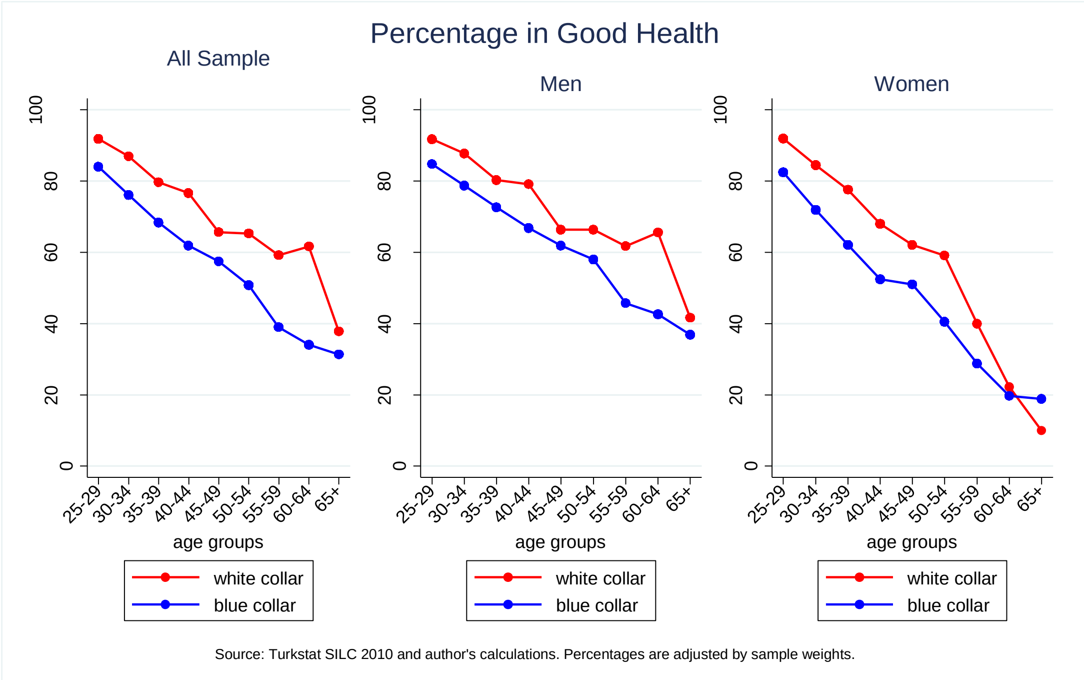


Figure 4: Self-Reported Good Health by Age According to Work Type



at younger ages and narrowing of it after age group 45-49 for men. Narrowing of the gradient would be due to selective mortality that leaves more robust survivors in the sample. Furthermore this movement of the gradient could be due to retirement behavior of the individuals. We also observe almost stable gradient for women implying that women's health is not responsive to work status. Figure 4 presents share of good health according to work type. We monitor almost stable occupational gradient in health until late middle ages and widening of the gradient in older ages for men. In other words in the young ages differences in health between blue and white collar workers are evident but not marked. However health trajectories experienced by blue collar workers are steeper. On the other hand occupation gradient is almost stable for women implying the unresponsive nature of women's work gradient in health.

3.2 How Does the Picture Change When Education and Income is Conditioned on Work Status?

In order to understand the importance of work status versus income and education in determining the life cycle profile of health, we present the share of good health according to income and education conditioned on work status. According to Case and Deaton(2005) Smith (2004,2007), Van Doorslaer et al. (2008), and Van Kippersluis et al. (2010) education increasingly affects health either directly or indirectly through choice of occupation and the depreciation of health leads to labor force withdrawal and a decline in income of economically disadvantaged groups. We have argued in the previous sections that widening of income gradient might be due to an increasing effect of health on work and thus on income. To gain further insight about the importance of this mechanism, we now compare evolution of self reported health status according to income across workers and non-workers which are given in Figure 5 and Figure 6 respectively.

Figure 5: Self Reported Good Health of Working Individuals by Age According to Income Quartiles and Gender

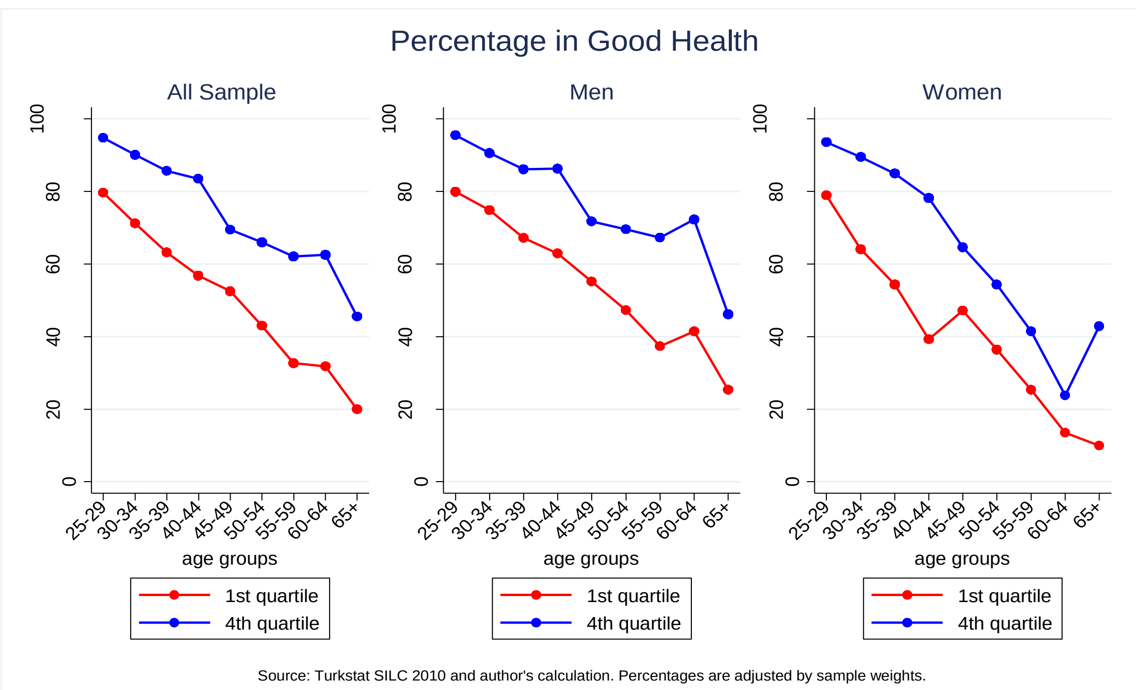
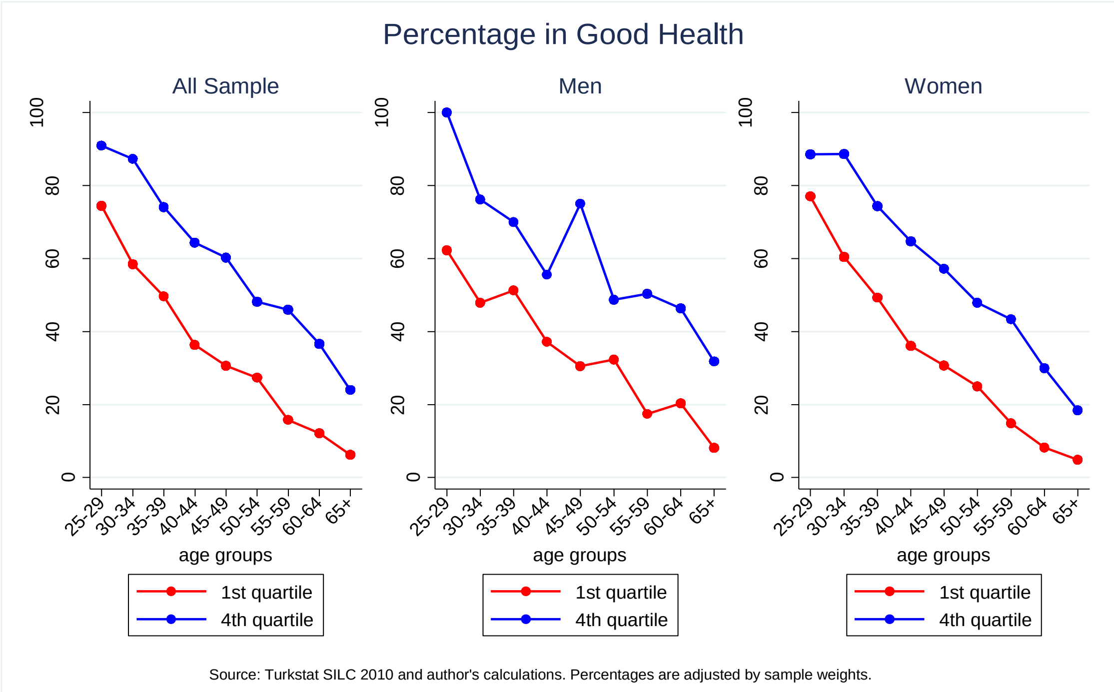


Figure 6: Self Reported Good Health of Non-Working Individuals by Age According to Income Quartiles and Gender



The first important feature is rather flat profile of self reported health according to income quartiles for those who are working even if the magnitude of the income gradient slightly changes when we compare the picture with Figure 1. For example, the percentage of good health for working men at the age group 35-39 is about 67% in the first income quartile and this rate is reached at the age group 55-59 for fourth income quartile. The same ratio at the age group 35-39 was about 62% and reached at age group 50-54 in Figure 1. Second, the sizes of gradients for both working and non-working men change remarkably. The gradient for working men is relatively narrow at young ages and starts to widen at older ages. We also observe a disparity between men and women that could be attributed to the fact that work being a strong contributor to the widening of income gradient for men. Furthermore, since labor force participation is very low for women in Turkey and work status of women do not contribute as much as it does for men.

Non-working individuals are always in poorer health, and the widening differential suggests that health progressively becomes a more important reason for not working until advanced ages. Narrowing of the gradient for both men and women could be due to the growing importance of non-health reasons for not working, principally voluntary retirement (Van Doorslaer, et al., 2008). The widening of gradient among male workers at the same age groups is consistent with this explanation.

Now lets turn attention to the change of education gradient when we condition education quartiles on work status. Figure 7 and Figure 8 show the education gradients for workers and non-workers. The first striking observation is that the education gradient gets narrower for working men at younger ages and wider for non-working men. Additionally we observe rather flat profile of self-reported good health for those working for both men and women. On the other hand, in almost every age group the magnitude of education gradient increases for both working women indicating the crucial importance of education on health for women. For example in Figure 2 the gap between highest and lowest education gradient for age group 50-54 was about 32% for women. However the gap between first and fourth quartiles for working women rises to 40% in Figure 7. Furthermore education gradient for non-wprking women in Figure 8 is very similar to the one in Figure 2.

Figure 7: Self Reported Good Health of Working Individuals by Age According to Education Quartiles and Gender

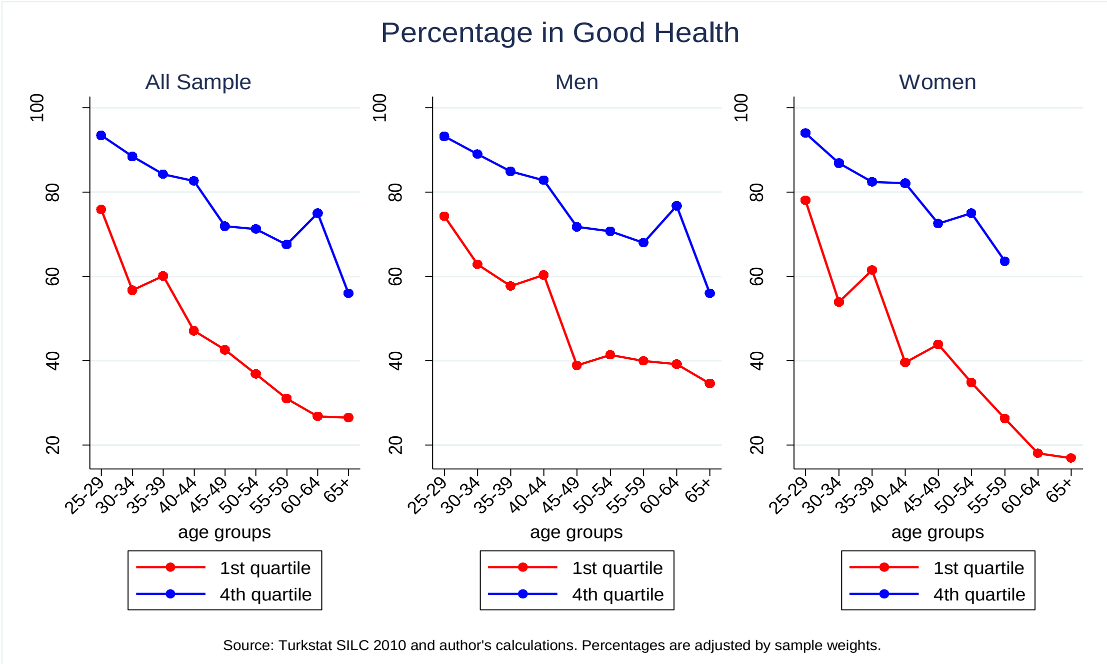
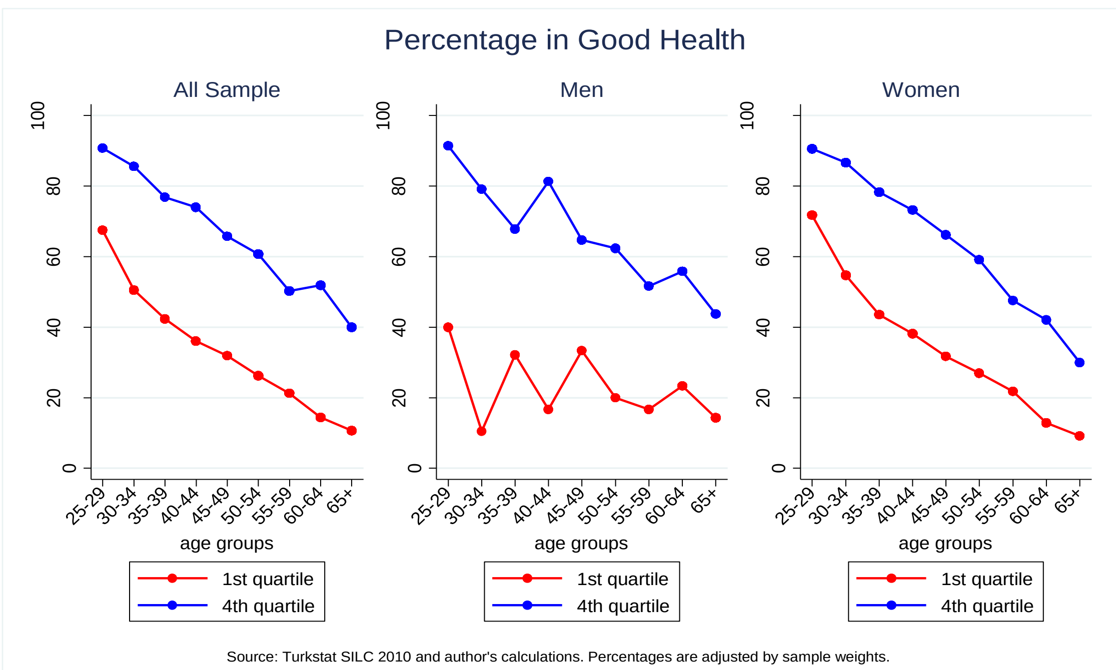


Figure 8: Self Reported Good Health of Non-Working Individuals by Age According to Education Quartiles and Gender



To sum up, relatively wide SES gradient in health in middle ages and narrowing of it in old ages is a sign of *cumulative-advantage hypothesis* operating in middle ages before *age of leveler hypothesis* begins to play the major role in old ages. Although we cannot explicitly observe justification bias, selective mortality and cohort effects, the evolution of gradients reveals many important features. Education, work and income gradients imply that both of them are important for the production of adult health. Furthermore we observe significant difference between men and women over life cycle. Women's health status is always worse than men in every SES group in any age category. However health of women shows greater response to education men. We can argue that policies directed at increasing female education would help to increase labor force participation and thus health status of women.

4. Two-Period Life Cycle Setting

In the previous section we presented SES gradient in health over life cycle to see the dynamic relationship between SES and health status. However our aim was not to dispose the causality from SES to health. Now in this section, we try to form a two-period life cycle model to capture the effect of SES on health over life course which mainly stems from the models of Grossman (1972) and Case and Deaton (2005). In the simple two-period setting, 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 c, and health status h, and utility function, $u(c, h)$ is concave in all arguments, that is; $u_c > 0, u_h > 0, u_{cc} < 0$, and $u_{hh} < 0$. For simplicity we assume time-separable logarithmic utility function.

In the first period individuals work and receive a labor income $(w_1 n_1)$, where w_1 is the hourly wage and n_1 is the weekly working hours. Individuals also receive non-labor income through non-labor activities such as rent, interest or benefits, which is y_1. Furthermore in the first period individuals spend for consumption c_1, medical services m_1 and education e_1 and save for retirement s_1. We do not make a distinction between the periods of education and working, we assume that both of them take place in the first period. Lastly, in the first period individuals invest in their health through a health investment function similar to Grossman (1972) and Case and Deaton (2005).

In the second period, individuals retire and consume their savings from the first period. Additionally they continue to invest in their health by making medical expenses, m_2 and die when health status falls below a certain level. We assume a difference between the structure of the medical services in the first and second periods depending on aging. We also normalize prices of consumption, education and medical services to 1 for simplicity.

The utility function is the following:

[4.1] $$U = \log(c_1) + \log(h_1) + \beta \log(c_2) + \beta \log(h_2)$$

where c_t is consumption, h_t is health status, and β is time discount which is $0 < \beta < 1$.

Budget constraints in the first and second periods are:

[4.2] $$c_1 + m_1 + e_1 + s_1 = w_1 n_1 + y_1$$

[4.3] $$(1 + r)s_1 = c_2 + m_2$$

When we combine equations [4.2] and [4.3], we obtain intertemporal budget constraint:

[4.4] $$c_1 + \frac{c_2}{(1+r)} = w_1 n_1 + y_1 - e_1 - m_1 - \frac{m_2}{(1+r)}$$

Health is updated according to health investment function which is slightly modified version of Grossman(1972)'s health investment function. Health status in the first and second periods are as the following:

[4.5] $h_1 = \bar{h} - \delta\bar{h} + \varphi m_1 + \theta w_1 n_1 - \tau n_1 + \sigma y_1 + \varepsilon e_1$

[4.6] $h_2 = h_1 - \delta h_1 + \varphi m_1$

where $\bar{h}$ is health endowment (initial stock of health), δ is the depreciation rate of health that is $0 < \delta < 1$. φ is the efficiency of medical services that creates health; $0 < \varphi < 1$, θ is the efficiency of labor income that creates health; $0 < \theta < 1$, σ is the efficiency of non-labor income, $0 < \sigma < 1$, and ε is the efficiency of education that creates health, $0 < \varepsilon < 1$. Health in first period increases with quantity of medical services, labor income, non-labor income and level of education. On the other hand, health decreases with the depreciation as individuals age and with working hours since working causes loss in leisure and health producing activities.

We use health investment functions provided in equations [4.5] and [4.6] to substitute for medical services, m_t, as in Case and Deaton (2005).

[4.7] $m_1 = \frac{h_1 - \bar{h} + \delta\bar{h} - \theta w_1 n_1 + \tau n_1 - \sigma y_1 - \varepsilon e_1}{\varphi}$

[4.8] $m_2 = \frac{h_2 - h_1 + \delta h_1}{\varphi}$

When we use equations [4.7] and [4.8] to produce inter-temporal budget constraint that respects both financial and health identities, new inter-temporal budget constraint is as the following:

[4.9] $c_1 + \frac{c_2}{(1+r)} = w_1 n_1 + y_1 - e_1 - (\frac{h_1 - \bar{h} + \delta\bar{h} - \theta w_1 n_1 + \tau n_1 - \sigma y_1 - \varepsilon e_1}{\varphi}) - \frac{h_2 - h_1 + \delta h_1}{\varphi}$

The issue of a risk averter individual becomes a standard life-time utility maximization problem:

$\max U = \log(c_1) + \log(h_1) + \beta \log(c_2) + \beta \log(h_2)$

subject to

$c_1 + \frac{c_2}{(1+r)} = w_1 n_1 + y_1 - e_1 - (\frac{h_1 - \bar{h} + \delta\bar{h} - \theta w_1 n_1 + \tau n_1 - \sigma y_1 - \varepsilon e_1}{\varphi}) - \frac{h_2 - h_1 + \delta h_1}{\varphi}$

In order to solve the model and find health and consumption functions we use Lagrangian multipliers. The Lagrangian is as the following:

[4.10] $L = \log(c_1) + \log(h_1) + \beta \log(c_2) + \beta \log(h_2) + \gamma[w_1 n_1 + y_1 - e_1$
$-(\frac{h_1 - \bar{h} + \delta\bar{h} - \theta w_1 n_1 + \tau n_1 - \sigma y_1 - \varepsilon e_1}{\varphi}) - \frac{h_2 - h_1 + \delta h_1}{\varphi} - c_1 - \frac{c_2}{(1+r)}$

First order conditions:

[4.11] $\frac{1}{c_1} = \gamma$

[4.12] $\frac{\beta}{c_2} = \frac{\gamma}{(1+r)}$

[4.13] $\frac{1}{h_1} = \frac{\gamma(r+\delta)}{\varphi(1+r)}$

[4.14] $\frac{\beta}{h_2} = \frac{\gamma}{\varphi(1+r)}$

[4.15] $w_1 n_1 + y_1 - e_1 - (\frac{h_1 - \bar{h} + \delta\bar{h} - \theta w_1 n_1 + \tau n_1 - \sigma y_1 - \varepsilon e_1}{\varphi}) - \frac{h_2 - h_1 + \delta h_1}{\varphi} - c_1 - \frac{c_2}{(1+r)} = 0$

Simultaneous solutions of equations [4.11]-[4.15] yield the following health and consumption functions:

[4.16] $h_1 = \frac{(1+r)[w_1 n_1(\theta+\varphi) + y_1(\sigma+\varphi) + e_1(\varepsilon-\varphi) - \tau n_1 + \bar{h}(1-\delta)]}{2(r+\delta)(1+\beta)}$

[4.17] $h_2 = \frac{\beta(1+r)[w_1 n_1(\theta+\varphi) + y_1(\sigma+\varphi) + e_1(\varepsilon-\varphi) - \tau n_1 + \bar{h}(1-\delta)]}{2(1+\beta)}$

[4.18] $c_1 = \frac{[w_1 n_1(\theta+\varphi) + y_1(\sigma+\varphi) + e_1(\varepsilon-\varphi) - \tau n_1 + \bar{h}(1-\delta)]}{2(1+\beta)\varphi}$

[4.19] $c_2 = \frac{\beta(1+r)[w_1 n_1(\theta+\varphi) + y_1(\sigma+\varphi) + e_1(\varepsilon-\varphi) - \tau n_1 + \bar{h}(1-\delta)]}{2(1+\beta)\varphi}$

Table 4.1 shows the responses of health and consumption to parameter changes. High interest rate will lead people to save more and devote less resources to medical services in the first period leading deterioration in health. However in the second period greater financial resources will lead higher level of investment in health and thus improvement in health. Interest rate not having an impact on consumption in the first period is due to its operation mainly through health investment and savings decisions. Individuals respond increase in interest rate in the first period by decreasing medical expenses not the consumption level.

Table 4.1: Responses of Consumption and Health to Parameter Changes

increase in parameter	h_1	h_2	c_1	c_2
r	falls	rises	no effect	rises
θ	rises	rises	rises	rises
φ	ambiguous	ambiguous	ambiguous	ambiguous
δ	falls	falls	falls	falls
β	falls	rises	falls	rises
τ	falls	falls	falls	falls
ε	rises	rises	rises	rises
σ	rises	rises	rises	rises

Increase in θ, efficiency of income that creates health, has a positive impact on both arguments in both periods. Rise in the efficiency of income will lead individuals invest in health and consume more effectively which will in turn increase the health status and consumption level in both periods. On the other hand the impact of φ that is the efficiency of medical services is ambiguous. For example φ has a positive effect on h_1 through $w_1 n_1(\theta + \varphi)$ and $y_1(\sigma + \varphi)$ and has a negative effect on h_1 through $-e_1\varphi$. The first condition comes from the fact that the increase in efficiency of medical services causes the efficiency created by income. Now individuals will have greater resources to devote to medical services and thus health investment. The second condition on the other hand implies that individuals will devote some of their resources to education which will lead a reduction in consumption of medical services.

Rise in depreciation rate of health δ causes health and consumption to fall in both periods. The negative effect on health is expectable since high depreciation rate will cause health to deteriorate more rapidly. However the negative impact of higher depreciation rate on consumption comes from the deterioration of initial stock of health more rapidly which in turn would lead less health resources attributable to consumption. Furthermore, rise in parameter of time discount (preference), β has a positive impact on consumption and health in second period and a negative impact for both arguments in first period implying that individuals value second period more than the first period.

Rise in τ has a negative impact on health and consumption whereas increase in σ has a positive impact. The positive impact of non-labor income is obvious through more financial resources available that can increase health investment and consumption. Rise in τ causes a decline in health in both periods through the inefficiency that working hours creates. Finally we observe that efficiency that education creates, ε, has a positive impact on both health and consumption functions in two periods.

Now let's look at the comparative statics of the model. Equations [4.20]-[4.29] present how health functions in the first and second period react to the changes in exogenous variables in the model.

[4.20] $\frac{\partial h_1}{\partial w_1} = \frac{(1+r)(\theta+\varphi)n_1}{2(r+\delta)(1+\beta)} > 0$ increases with working hours, n_1

[4.21] $\frac{\partial h_2}{\partial w_1} = \frac{\beta(1+r)(\theta+\varphi)n_1}{2(1+\beta)} > 0$ increases with working hours, n_1

[4.22] $\frac{\partial h_1}{\partial n_1} = \frac{(1+r)[(\theta+\varphi)w_1-\tau]}{2(r+\delta)(1+\beta)}$ ambiguous, increases with the wage but decreases with inefficiency that working creates.

[4.23] $\frac{\partial h_2}{\partial n_1} = \frac{\beta(1+r)[(\theta+\varphi)w_1-\tau]}{2(1+\beta)}$ ambiguous, increases with the wage but decreases with inefficiency that working creates.

[4.24] $\frac{\partial h_1}{\partial \bar{h}} = \frac{(1+r)(1-\delta)}{2(r+\delta)(1+\beta)} > 0$

[4.25] $\frac{\partial h_2}{\partial \bar{h}} = \frac{\beta(1+r)(1-\delta)}{2(1+\beta)} > 0$

[4.26] $\frac{\partial h_1}{\partial e_1} = \frac{(1+r)(\varepsilon-\varphi)}{2(r+\delta)(1+\beta)}$ ambiguous, depends on the relative sizes of ε and φ

[4.27] $\frac{\partial h_2}{\partial e_1} = \frac{\beta(1+r)(\varepsilon-\varphi)}{2(1+\beta)}$ ambiguous, depends on the relative sizes of ε and φ

[4.28] $\frac{\partial h_1}{\partial y_1} = \frac{(1+r)(\sigma+\varphi)}{2(r+\delta)(1+\beta)} > 0$

[4.29] $\frac{\partial h_2}{\partial y_2} = \frac{\beta(1+r)(\sigma+\varphi)}{2(1+\beta)} > 0$

Health in both periods rises with wages, non-labor income, education and initial stock of health. The positive effect of wage rises with working hours showing the positive effect of work. However the impact of working hours on health is ambiguous in both periods. Working hours has a positive effect through the increase in wage income which creates more resources attributable to health investment. On the other hand working creates inefficiency through the loss in leisure, health producing activities and depreciation it creates especially for individuals who work in physically demanding jobs. The effect of education depends on the relative sizes of ε and φ. Education has two opposing impacts on health; positive effect through the efficiency it creates and negative effect through the loss in medical services that individuals would receive.

Equation [4.20] shows the positive effect of wage income on health in the first period. However it is also important to assess whether this positive effect increases or decreases according to parameter changes. The positive effect of income on health in the first period rises with the efficiency that wage and medical expenses create $(\sigma+\varphi)$. Both the rise in the efficiency that wage and medical expenses create causes the positive impact of wage to increase by creating more efficient resources that can be devoted to health investment. On the other hand, the positive effect of wage on health in the first period decreases with the rise in interest rate r, time preference β and depreciation rate of health δ. Rise in interest rate will cause individuals to save more and invest less in health in the first period that diminishes the positive effect of wage. The increase in the depreciation rate will cause health to decline and increase in time preference will cause individuals to value future more and thus their health in the second period.

Equation [4.21] shows the positive effect of wage income on health in the second period. Rise in the parameters (r; θ; φ ; β) causes the positive impact of income on health in the second period to rise. The rise in the interest rate will increase the savings of individuals in the first period and thus the resources from income for the health investment in the second period. The rise in the efficiency of income and medical expenses will also increase the positive effect of income on health in the second period by implying more efficient resources from income that can be devoted to health investment in the second period. Finally the rise in time preference also causes the positive impact of income to rise on second period health since individuals will value future more.

Equation [4.22] shows the positive effect of initial health endowment on health in the first period. Both the rise in interest rate r, depreciation rate of health δ and time preference β will cause a fall in the positive effect of initial health status on health in the first period. Higher interest rate will lead individuals assign more resources to savings in the first period and diminishes the positive effect of initial health stock. Additionally higher depreciation rate and time preference reduce the positive effect of initial health. Equation [4.23] displays the positive effect of initial health endowment on health in the second period. This positive effect rises with the increase in interest rate r and time preference β and decreases with depreciation rate δ. Rise in interest rate augments the positive effect of initial health by greater financial resources coming from the first period. Furthermore as individuals value future more, the positive impact of initial health on the second period's health status is also stimulated.

According to equations [4.24] and [4.25] we observe that the effect of education on health in both periods is ambiguous depending on the relative sizes of ε and φ. First assume that ε is greater than φ and the effect of education on health is positive in both periods. The rise in interest rate would decrease the positive effect of education on health both in the first period and increase the positive effect in the second period. Higher interest rate would shift individuals from making education expenses to save more in the first period implying a decrease in the positive effect of education. On the other hand rise in interest rate will cause higher amount of resources that can be spent to produce health in the second period and thus augments the effect of education on health. Increase in depreciation rate of health decreases the positive impact of education in the first period and rise in time preference causes the positive effect of education on health to fall in the first period and increase in the second period.

If the efficiency of medical expenses create is greater than the efficiency that education create, that is $\varphi > \varepsilon$, then the effect of education on health in both periods will be negative. Then increase in interest rate will cause a fall in the negative effect of education on health in the first period and an increase in the negative impact in the second period. Rise in depreciation rate will increase the negative effect of education on health in the first period. Finally higher rate of time preference amplifies the negative effect of education on health in the first period and reduces the impact in the second period.

When we look at the effect of working hours on health in both periods, we see that the sign of the impact is ambiguous depending on the relative sizes of $(\theta + \varphi)w_1$ and τ. If the inefficiency of working creates is greater than the efficiency that wages and medical expenses creates then the effect of working hours on health will be negative in both periods. This could be the case when working hours are too long and if individuals are working in physically demanding jobs. If the effect of working hours on health in first period is negative, which is given by equation [4.22], then rise in interest rate will cause a decrease in this negative effect and rise in β will augment the negative impact. On the other hand according to equation [4.23] rise in the interest rate will augment the negative impact of working hours on health and rise in β will cause a decrease in the negative effect if τ is greater than $(\theta + \varphi)w_1$ in the second period.

According to equations [4.28] and [4.29] the impact of non-labor income on health is positive in both periods. The positive effect rises with $(\sigma + \varphi)$ in both periods, falls with interest rate in the first period and rises with interest rate in the second period. Furthermore, when β is higher, the positive impact of non-labor income on health will decrease in the first period and rise in the second period.

Equations [4.30]-[4.39] show the comparative statics of consumption functions with respect to exogenous variables. The conclusions are similar to the health functions; consumption in both periods rises with wages, non-labor and labor income, education and initial stock of health, whereas the effect of working hours and education is ambiguous.

[4.30] $\frac{\partial c_1}{\partial w_1} = \frac{(\theta+\varphi)n_1}{2\varphi(1+\beta)} > 0$ increases with working hours, n_1

[4.31] $\frac{\partial c_2}{\partial w_1} = \frac{\beta(1+r)(\theta+\varphi)n_1}{2\varphi(1+\beta)} > 0$ increases with working hours, n_1

[4.32] $\frac{\partial c_1}{\partial n_1} = \frac{(\theta+\varphi)w_{1-}\tau}{2\varphi\,(1+\beta)}$ ambiguous, increases with the wage but decreases with inefficiency that working creates.

[4.33] $\frac{\partial c_2}{\partial n_1} = \frac{\beta(1+r)[(\theta+\varphi)w_{1-}\tau]}{2\varphi\,(1+\beta)}$ ambiguous, increases with the wage but decreases with inefficiency that working creates.

[4.34] $\frac{\partial c_1}{\partial \bar{h}} = \frac{(1-\delta)}{2\varphi(1+\beta)} > 0$

[4.35] $\frac{\partial c_2}{\partial \bar{h}} = \frac{\beta(1+r)(1-\delta)}{2\varphi(1+\beta)} > 0$

[4.36] $\frac{\partial c_1}{\partial e_1} = \frac{(\varepsilon-\varphi)}{2\varphi(1+\beta)}$ ambiguous, depends on the relative sizes of ε and φ

[4.37] $\frac{\partial c_2}{\partial e_1} = \frac{\beta(1+r)(\varepsilon-\varphi)}{2\varphi(1+\beta)}$ ambiguous, depends on the relative sizes of ε and φ

[4.38] $\frac{\partial c_1}{\partial y_1} = \frac{(\sigma+\varphi)}{2\varphi(1+\beta)} > 0$

[4.39] $\frac{\partial c_2}{\partial y_2} = \frac{\beta(1+r)(\sigma+\varphi)}{2\varphi(1+\beta)} > 0$

The health and consumption functions and the comparative statics of the model show us that parameters not only affect the health and consumption functions directly but also affects the magnitudes of the comparative statics. Moreover the results present that the behavior of the parameters are also important along with the change in exogenous variables in order to fully understand the reasoning behind the operation of the model and to build effective health and social security policies.

5. Estimation Methodology and Results

5.1 Results

One of the primary goals of this study is to show that socio-economic status (SES) is not a one dimensional concept and knowing which aspect of SES affects health is important for the policy design surrounding the SES-health gradient. For instance, if the only pathway that operates SES to health is education, policies directed at income distribution could not be justified in terms of a beneficial impact on health or vice versa (Smith, 2007). In this section we aim to establish the relation from SES to health empirically by employing Turkstat Survey of Income and Living Conditions (SILC) 2010. The model to be estimated is:

[5.1] $H_i = f(\boldsymbol{X'}_i\beta_1 + \boldsymbol{SES'}_i\beta_2) + \varepsilon_i$

where H_i is the self-reported health status and is a function of $\boldsymbol{X_i}$ and $\boldsymbol{SES_i}$. $\boldsymbol{X_i}$ represents the vector of demographic and household characteristics such as age, gender, region and living quartiles per person in the household. $\boldsymbol{SES_i}$ shows socio-economic status of individuals including education level, income per capita in the household, occupation, work hours and whether the individual is employed. ε_i is the random error term.

Turkstat Income and Living Conditions Survey 2010 presents age as a category variable, thus age categories are used as dummy variables in order to cover the depreciation of health over life cycle. The reference category is individuals aged between 25 and 34. Since the main goal of the study is to analyze health-SES nexus of adults, individuals younger than 25 are ignored. Male dummy is used in order to cover the effect of gender. Urban dummy shows whether the individual lives in a urban area. Living quartiles is a continuous variable showing per capita living area for each person in the household. Education quartile dummies are used to measure the impact of education on health and the reference category is first (lowest) education quartile. Blue collar dummy is used to assess whether people work in physically demanding jobs has worse health. Household income per capita is a continuous variable in logarithmic form calculated from yearly income of the household and adjusted by Oxford Equivalence Scale. Work hours is a continuous variable that measures the weekly working hours of individuals and employment is a dummy variable that is equal to one for people who are full time or part time employed. Table 5.1 shows the definitions of variables used in the estimation.

An important issue needed to be mentioned is that we use work hours and employment dummy separately in different equations to cover labor force status. Since work hours are defined as zeros for those who are not in the labor force and who are unemployed the estimated impact of work hours both includes the effects of changes at the extensive margin of labor (changes in employment) and the effects of changes at the intensive margin of labor (changes in work hours conditional on employment) (Xin Xu, 2013). In order to assess the impact of changes at the extensive margin, we replaced the variable work hours with binary variable employment and duplicated the estimations.

Table 5.1: Definitions of Variables Used in Estimation

dependent variable	
health status (1=if good, 0=if bad)	assessment of own health
demographic&household characteristics	
age 35-44	=1 if age of individual is between 35 and 44
age 45-54	=1 if age of individual is between 45 and 54
age 55-64	=1 if age of individual is between 55 and 64
age 65+	=1 if age of individual is greater than or equal to 65
male	=1 if individual is male
urban	=1 if individual lives in urban area
living quartiles in the household	size of living area per person
socio-economic status	
second education quartile	=1 if individual is in first education quartile
third education quartile	=1 if individual is in third education quartile
fourth education quartile	=1 if individual is in fourth education quartile
blue collar	=1 if individual is a blue collar worker
household income	logarithm of total yearly income per capita adjusted by Oxford scale
work hours	total weekly work hours
employment	=1 if individual is full-time employed

Another considerable issue of self-reported health status (SRH) is the potential endogeneity between respondents' answers and the socio-economic status which may lead biased results. In the model used there are two variables that may create endogeneity bias; income and work hours (employment). Standard theory predicts that individuals in good health will have higher labor force participation rates and also have higher wage rates, both of which lead to greater income (Ettner, 1996). Hence, impact of income on health would be due to reverse causality which may lead over-estimated results. On the other hand, error in measuring income and unobservable factors may imply that income effect on health could also be underestimated (Ettner, 1996).Furthermore, it is possible that associations between SRH and employment occur because employment actually causes good health and alternatively, for a given level of true health, individuals who are not working report poorer health in order to justify their employment status (Au et al., 2004).

We instrument for income and work hours (employment) by regional unemployment rates, work experience and spousal education. Specifically the following first stage reduced form equations are estimated in order to obtain instrumented variables:

[5.2] $income_i = \alpha_1 + \alpha_2 X_i + \alpha_3 S_i + \alpha_4 unemp_i + \alpha_5 exp_i + \alpha_6 seduc_i + u_i$

[5.3] $hours_i = \theta_1 + \theta_2 X_i + \theta_3 S_i + \theta_4 unemp_i + \theta_5 exp_i + \theta_6 seduc_i + u_i$

[5.4] $employment_i = \gamma_1 + \gamma_2 X_i + \gamma_3 S_i + \gamma_4 unemp_i + \gamma_5 exp_i + \gamma_6 seduc_i + u_i$

where X_i is the vector of demographic and household characteristics, S_i is the vector of exogenous socio-economic status indicators, $unemp_i$ is the regional unemployment rate according to SR-BBS 12, exp_i shows the work experience in years,and $seduc_i$ is a binary variable showing the education level of the spouse.

In the light of the discussion of the previous section, the empirical specification to measure the effect of socio-economic status on health becomes as in the equation [5.5] where $\boldsymbol{SES'}_i$ represents matrix of exogenous socio-economic factors and $\boldsymbol{SES'}_e$ shows matrix of endogenous socio-economic indicators. Equation [5.5] with equations [5.2], [5.3] and [5.4] constitutes the model estimated.

[5.5] $H_i = f(\boldsymbol{X'}_i\beta_1 + \boldsymbol{SES'}_i\beta_2 + \boldsymbol{SES'}_e\beta_3) + e_i$

Table 5.2 shows the marginal effects of estimation results from LPM, Probit, IV-LPM and IV-Probit respectively for all sample when work hours is used as a labor status indicator. Table 5.3 shows the results when employment is used as a labor status indicator. According to Table 5.2, we observe that age has the biggest impact on health whether the estimated equation is corrected for endogeneity or not. Getting older increases the probability of being in poor health which implies the importance of depreciation of health. For instance, being 65 or older increases the probability of poor health about 49 % under IV-LPM and about 46% under IV-Probit. Being male has a positive effect on health and increases the probability of being in good health about 0.07 % when the model is not corrected for endogeneity. On the other hand, when we correct the estimation results the effect of being male increases to about 14% under IV- LPM and IV-Probit. Coefficients of living in a urban area and living quartiles per person in the household are insignificant in columns 1 and 2 and both of them increases the probability of good health in columns 3 and 4.

Another important observation is the positive impact of education on health. Being in fourth education quartile has the biggest impact on the probability of good health when results are not corrected for endogeneity. On the other hand when we correct endogeneity the biggest impact on health stems from third education quartile. For instance, being in 3rd education quartile increases the probability of good health by 21% and 18% under IV-LPM and IV-Probit respectively. Moreover being a blue collar worker increases the probability of poor health about 6% when we apply IV-LPM and IV-Probit.

Now let's focus on the effects of endogenous covariates; household income per capita and work hours. The results in column 1 and 2 in Table 5.2 suggest that increase in household income and work hours rises the probability of being in good health. However when the estimates are corrected for endogeneity the impact of income does not change while the effect of work hours turns to negative. Behavior of the income coefficient imply that reverse causality may not be an important issue in Turkish experience.

In Table 5.3 we use binary employment variable as a labor status indicator instead of weekly work hours. The first feature of the results in Table 3 is the slight drop in the coefficients of age dummies. For example according to IV-LPM and IV-Probit being in 65+ age category decreases the probability of good health by 41% and 37% respectively. Being male has a positive effect on health status in all four specifications. Living in a urban area is insignificant whereas living quartiles rises the probability of good health when we correct results for endogeneity. Education still has remarkable impact on health, for example being in the 4th education quartile increases the probability of good health by 20% according to IV-Probit results. Further, being a blue collar worker decreases the probability of good health about 3% under endogeneity corrected specifications.

Income has a positive impact on health which is about 8% according to all specifications in Table 5.3 implying that reverse causality is not a major issue. Furthermore, we observe positive effect of employment in health about 7%. Unresponsiveness of income and employment coefficients to endogeneity correction yet imply that causality runs from income and employment to health status.

Table 5.2 Marginal Effects-All Sample (Work Hours as Labor Status Indicator)

	(1)	(2)	(3)	(4)
	LPM	Probit	IV-LPM	IV-Probit
endogeneity correction	no	no	yes	yes
dep. var: health status				
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	-0.0027	-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	0.1372***	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	12,666	12,666	12,666	12,666
R-squared	0.1629	0.1377	0.1626	0.1376

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.3 Marginal Effects-All Sample (Employment as Labor Status Indicator)

	(1)	(2)	(3)	(4)
	LPM	Probit	IV-LPM	IV-Probit
endogeneity correction	no	no	yes	yes
dep. var: health status				
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	-0.0024	-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	12,666	12,666	12,666	12,666
R-squared	0.1649	0.1393	0.1646	0.1391

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As we mentioned before the estimated impact of hours of work represents the total effects on one hour change (intensive margin) in labor supply, including the effects of changes at the extensive margin. In this respect, the coefficients of work hours (labor status indicator in Table 5.2) and employment (labor status indicator in Table 5.3) are not directly comparable. In order to compare these coefficients we report both the effects of extensive and intensive margin of labor. The effect of intensive margin of labor is measured by the effect of 1 hour change in work hours conditional on employment. These numbers are directly from the estimates in Table 5.2. On the other hand the effect of extensive margin of labor is measured by the effect of 2 percent change in employment. Since the average work hours per week are about 50 hours in the sample, one-hour change in average work hours can be brought by a 2 percent change in employment. Thus we obtain the effect of extensive margin of labor by multiplying the employment coefficients by 0.02 in Table 5.3. Consequently, the impact of 2 percent change at the extensive margin of labor supply can be compared to the total effect of one hour change and we can identify which aspect of labor supply is the driving force.

According to Table 5.4, when results are not corrected for endogeneity both intensive and extensive margins of labor increases the probability of good health. Extensive margin of labor being greater than intensive margin implies that it is the change in employment (not work hours) that causes the change in probability of good health. However when endogeneity correction is applied the effect of intensive margin of labor turns negative suggesting that 1 hour increase in work hours decreases the probability of good health. On the contrary, the impact of extensive margin of labor is still positive presenting that the effect of extensive margin of labor increases on the probability of good health.

Table 5.4 Comparison Between Intensive and Extensive Margin of Labor

	(1)	(2)	(3)	(4)
	LPM	Probit	IV-LPM	IV-Probit
endogeneity correction	no	no	yes	yes
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 (intensive margin of labor)	0.0015***	0.0012***	0.0015***	0.0012***

*** p<0.01, ** p<0.05, * p<0.1

5.2 Robustness Check

A valid instrument needs to satisfy the following three conditions: i)it is not correlated with exogenous explanatory variables, ii) it is (partially) correlated with the endogenous explanatory variable, iii) it is not correlated with the dependent variable, other than through its correlation with the endogenous regressor (exclusion restrictions) (Terza et al., 2007). First two conditions can be tested but exclusion restrictions cannot be tested directly. However if the model has multiple instruments overidentification tests are possible. In this sub-section first we present endogeneity tests, whether our instruments are weak or not, and overidentification tests respectively.

Table 5.5 gives the first stage regression results for all sample. The most common diagnostic test of the first stage is the F-statistics offered by by Staiger and Stock (1994). The rule-of thumb of F-stat being above 10 indicates the consistency of the instruments. The first stage regressions are run by using OLS. Baum et al. (2007) argue that only OLS estimation is guaranteed to produce first stage residuals that are uncorrelated with covariates and fitted values even if the endogenous regressor is binary. By contrast logit or probit residuals will be uncorrelated with covariates and fitted values only if the underlying first stage functional form is truly logit or probit. Baum et al. (2007) also suggests that one need not to worry about whether the first stage is really linear since it is only an approximation to the underlying relationship and consistency does not depend on correct specification of the first stage functional form. According to Table 5.5 the identifying instruments are jointly significant in the first stage regressions implying that IV parameter estimates are consistent (Bound et al., 1993).

However F-stat being above 10 is not sufficient for the validity of results. Table 5.6 exhibits endogeneity and weak IV identification tests. We use Hausman -Wu Test to check if there is endogeneity in the model and Cragg-Donald Wald test to check whether the instruments we use are weak or not. Hausman-Wu Test suggest that there is endogeneity problem in the model at 10% significance level. Additionally according to Cragg-Donald test, instruments are not weak at 5% and 10% significance level when we use work hours and employment as labor status indicators respectively.

Table 5.5: First Stage Regression Results(All Sample)

	(1) income	(2) work hours	(3) employed
age 35-44	0.0530***	-1.9350***	-0.0071
	(0.0133)	(0.3857)	(0.0073)
age 45-54	0.1409***	-4.8583***	-0.0316***
	(0.0175)	(0.5084)	(0.0096)
age 55-64	0.2065***	-8.2121***	-0.0744***
	(0.0253)	(0.7351)	(0.0139)
age 65+	0.2184***	-16.3268***	-0.2378***
	(0.0372)	(1.0789)	(0.0205)
male	-0.1457***	9.6508***	0.1573***
	(0.0162)	(0.4711)	(0.0089)
urban	0.2227***	1.1086***	0.0127*
	(0.0119)	(0.3456)	(0.0066)
2nd education quartile	0.0144***	0.0031	0.0004**
	(0.0003)	(0.0091)	(0.0002)
3rd education quartile	0.3381***	2.6059***	0.0877***
	(0.0170)	(0.4919)	(0.0093)
4th education quartile	0.5270***	3.8741***	0.1060***
	(0.0242)	(0.7017)	(0.0133)
blue collar	0.8260***	-2.9851***	0.1087***
	(0.0212)	(0.6144)	(0.0117)
living quartiles	-0.1920***	-4.3468***	-0.0395***
	(0.0123)	(0.3554)	(0.0067)
regional unemp.	0.4407**	-15.3788**	-0.2004*
	(0.2060)	(5.9764)	(0.1134)
work experience	0.0047***	0.1205***	0.0009**
	(0.0007)	(0.0191)	(0.0004)
sp. low educ.	0.0573***	-1.7971***	-0.0587***
	(0.0195)	(0.5663)	(0.0107)
sp. medium educ.	-0.0020	1.2185	-0.0246
	(0.0300)	(0.8703)	(0.0165)
sp. high educ.	0.4345***	-3.1641***	0.0754***
	(0.0315)	(0.9142)	(0.0173)
Observations	12,666	12,666	12,666
R-squared	0.4782	0.1584	0.1492
F-stat	724.44	148.79	138.61

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.6 Endogeneity and Weak IV Identification Tests

	Hausman-Wu Endogeneity Test	Cragg-Donald Wald F-stat
when hh income and work hours are endogeneous	2.32*	14.23**
when hh income and employed are endogeneous	2.58*	9.20*

*** p<0.01, ** p<0.05, * p<0.1

Table 5.7 and Table 5.8 give sensitivity of estimation results to choice of instruments. We estimated three versions of just identified models to check if there is any considerable change in the coefficients. Table 5.7 shows the IV-Probit estimations results when work hours is used as an indicator of labor force status and Table 5.8 presents when employment is used as an indicator of labor force status. The estimates in Table 5.7 and Table 5.8 are reasonably stable and quite close to original coefficients with only few of exceptions. Hence use of just identified model with few instruments does not lead to suspiciously large estimated effects of income and work hours(employment) on the probability of good health. Lastly the coefficients in Table 5.7 and 5.8 are still significant, despite the reduction in efficiency from relying on fewer instruments.

Table 5.7 Sensitivity of Estimation Results to Choice of Instruments (Work Hours as Labor Status Indicator)

dep. var: healt status	(1) unemp. and work exp. as instruments	(2) work exp. and spousal education as instruments	(3) unemp. and spousal education as instruments
age 35-44	-0.1230***	-0.1559***	-0.1229***
	(0.0102)	(0.0109)	(0.0090)
age 45-54	-0.2156***	-0.2987***	-0.2155***
	(0.0103)	(0.0207)	(0.0107)
age 55-64	-0.3088***	-0.4458***	-0.3087***
	(0.0120)	(0.0338)	(0.0142)
age 65+	-0.3749***	-0.6295***	-0.3747***
	(0.0218)	(0.0617)	(0.0204)
male	0.0610***	0.2703***	0.0609***
	(0.0084)	(0.0484)	(0.0088)
urban	0.0126	-0.0098	0.0128
	(0.0090)	(0.0163)	(0.0091)
living quartiles	0.0010***	-0.0011	0.0010***
	(0.0002)	(0.0009)	(0.0002)
2nd education quartile	0.0864***	0.0761***	0.0864***
	(0.0122)	(0.0234)	(0.0134)
3rd education quartile	0.1512***	0.1379***	0.1512***
	(0.0181)	(0.0351)	(0.0170)
4th education quartile	0.1999***	0.0191	0.1998***
	(0.0149)	(0.0520)	(0.0163)
blue collar	-0.0327***	-0.0685***	-0.0328***
	(0.0087)	(0.0199)	(0.0108)
income	0.0853***	0.1566***	0.0836***
	(0.0065)	(0.0545)	(0.0067)
work hours	0.0005***	-0.0162***	-0.0005**
	(0.0002)	(0.0041)	(0.0002)
Observations	12,666	12,666	12,666
R-squared	0.1381	0.1290	0.1377

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.8 Sensitivity of Estimation Results to Choice of Instruments (Work Hours as Labor Status Indicator)

dep. var: health status	(1) unemp. and work exp. as instruments	(2) work exp. and spousal education as instruments	(3) unemp. And spousal education as instruments
age 35-44	-0.1228***	-0.1331***	-0.1227***
	(0.0101)	(0.0122)	(0.0094)
age 45-54	-0.2155***	-0.2390***	-0.2154***
	(0.0095)	(0.0165)	(0.0110)
age 55-64	-0.3083***	-0.3432***	-0.3083***
	(0.0116)	(0.0245)	(0.0130)
age 65+	-0.3746***	-0.4166***	-0.3746***
	(0.0192)	(0.0308)	(0.0206)
male	0.0599***	0.0808***	0.0601***
	(0.0080)	(0.0123)	(0.0084)
urban	0.0128	-0.0094	0.0130
	(0.0091)	(0.0157)	(0.0098)
living quartiles	0.0010***	-0.0005	0.0010***
	(0.0002)	(0.0008)	(0.0002)
2nd education quartile	0.0867***	0.0508**	0.0866***
	(0.0119)	(0.0216)	(0.0111)
3rd education quartile	0.1513***	0.0964***	0.1513***
	(0.0158)	(0.0325)	(0.0169)
4th education quartile	0.1999***	0.1108**	0.1998***
	(0.0147)	(0.0504)	(0.0129)
blue collar	-0.0326***	-0.0110	-0.0327***
	(0.0100)	(0.0149)	(0.0079)
income	0.0826***	0.1046*	0.0809***
	(0.0065)	(0.0557)	(0.0071)
employed	0.0641***	0.0729***	0.0621***
	(0.0113)	(0.0121)	(0.0114)
Observations	12,666	12,666	12,666
R-squared	0.1397	0.1303	0.1392

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6. Conclusion

We began our discussion by mentioning the strong relationship between socio-economic status (SES) and health in which socially and economically advantaged individuals enjoy better health. Further, determining the nature of relationship is crucial for effective public policy designs (rise in retirement age and alterations in social security systems) especially for a young-populated country like Turkey. In this respect we tried to bring a life-cycle perspective in analyzing health-SES relationship in order to provide some insights for policy implications. The study is founded on three sections which are in substantial relation to each other. First SES gradients in health are demonstrated which can reveal important information on the nature of SES-health relation. Then two-period life cycle model is built to see the effect of SES on health and to help to interpret empirical findings. Finally we tested our theoretical model with Turkish data.

Behavior of gradients for men and women were quite different than each other. Women always report worse health than men in every age, income, education, and work category. Moreover the pace of deterioration of health for women is always higher. Our main conclusion was that cumulative advantage hypothesis operates until middle ages then age-as leverer hypothesis plays a major role. However due to data limitations we cannot observe selective mortality or cohort effects which can affect the nature of the gradients.

Furthermore we try to build a basic two-period life cycle model inspired from Grossman (1972) and Case and Deaton (2005) in order to form a theoretical mechanism that incorporates causal effects from SES to health. We assume that income, education, medical expenses have positive impact on health while working hours has both positive and negative effects coming from the income it creates and loss in leisure it causes. Nonetheless, relative magnitudes of the parameters also plays a crucial role in determining health outcomes. For instance the impact of education becomes ambiguous depending on the relative sizes of ε and φ. The efficiency created by better education, ε and efficiency of medical services that creates health, φ , may be larger in certain ages or differ by gender which can in turn explain the differences among genders and across ages.

Lastly estimation results show that age is the main determinant of health satisfaction followed by education and income. Results imply that reverse causality is not a major issue and the direction of the relatiponship is from income to health. Moreover, we find that it is the extensive margin of labor, not the intensive margin of labor that alters probability of good health when results are not corrected for endogeneity. On the other hand when we apply endogeneity correction the sign of intensive margin of labor becomes negative whereas the sign of extensive margin of labor stays positive.

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