THE NEXUS BETWEEN HEALTH AND SOCIO-ECONOMIC STATUS: TWO-PERIOD LIFE CYCLE MODEL AND EVIDENCE FROM TURKEY*

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Abstract

Knowing which aspects of socio-economic status (SES) affects health over life cycle are key to policy debate. In this respect, by using Turkstat Survey of Income and Living Conditions (SILC) 2010 for Turkey, the contribution of this study is as the following: i) we depict SES gradient in health over life course by using different aspects of SES. 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. Second, our 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 parameters. Lastly, estimation results present that age is the main determinant of health followed education and income.

Keywords: Socio-economic status, health status, life-cycle model, endogeneity

JEL Classification: C31, D91, I14

SAĞLIK VE SOSYO-EKONOMİK DURUM İLİŞKİSİ: İKİ ZAMANLI HAYAT DÖNGÜSÜ MODELİ VE TÜRKİYE'DEN BİR ÖRNEK

Öz

Yaşam döngüsü üzerinde, sağlık üzerinde sosyo-ekonomik statü'nün (SES) hangi boyutunun etkili olduğunu bilmek politika tartışmalarının anahtarıdır. Bu bağlamda, Türkiye için TÜİK 2010 Gelir ve Yaşam Koşulları Araştırması (SILC) kullanılarak, bu çalışmanın katkısı şu şekildedir: i) SES'in farklı yönlerini kullanarak sağlıktaki SES gradyanını yaşam döngüsü üzerinde gösteriyoruz. ii) SES'in sağlık üzerindeki etkilerini açıklayan iki aşamalı bir yaşam döngüsü modeli geliştiriyoruz. iii) teorik modelimizi, endojenlik düzeltilmiş denklemler tahmin ederek test etmeye çalışıyoruz. Sonuçlar, Türkiye'deki SES hiyerarşisinin tabanında bulunanların sağlık ortalamalarının daha kötü olduğunu ortaya koymaktadır. İkinci olarak teorik modelimiz, hem iş gücü hem de işgücü dışı gelirlerin sağlık üzerinde olumlu etkileri olduğunu gösterirken, eğitim ve iş durumunun etkisinin parametrelerin nispi büyüklüklerine bağlı olduğunu göstermektedir. Son olarak, tahmin sonuçları yaşın sağlık üzerinde en etken faktör, eğitimin ise ikinci etken faktör olduğunu göstermektedir.

Anahtar Kelimeler: Sosyo-ekonomik statü, sağlık durumu, hayat-döngüsü modeli, endojenlik

JEL Sınıflaması: C31, D91, I14

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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 status (SES) has a substantial impact on health in which socially and economically favored individuals enjoy better health. However socioeconomic disparities in health do not follow a simple explanation. Pathways by which SES affects health can be expressed by differences in access to health services, exposure to occupational and environmental hazards, low levels of social support and social capital, poor social policy and the cumulative impacts of stress and disparities in health risk behaviors (Kagamimori et al., 2009). These socio-economic inequalities in health are a major challenge for health policy, not only because most of these inequalities can be contemplated 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).

Muurinen (1982) uses a generalized version of Grossman (1972)'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. Kemma (1987) examines relationship between schooling and health. The 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.

By using intertemporal model of Grossman (1972), Case and Deaton (2005) discuss multiple causal links between health income and education, and third factors that affect both health and socioeconomic status. Ettner (1996) estimates the structural impact of income on different measures of health status. According to estimation results, both ordinary and Instrumental Variable (IV) estimates show that increases in income significantly improve physical and mental health but also rises alcohol consumption.

Ross and Wu (1996) examine whether education based gap in health rises with age and find that SES gap in health diverges with age. Beckett (2000) argues 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 that 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. 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 and 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).

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, and the decrease in health satisfaction and rise in disability with age and 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. 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. 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. In another study Van Kippersluis et al. (2010) adopt a life cycle perspective in the evolution of SES gradient in health for The Netherlands. The 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. Duzgun-Oncel (2018) depicts SES gradient in health over life course by using different aspects of SES for Turkey and observe relatively wide SES gradient in health in middle ages and narrowing of it in old ages.

Understanding fundamental relationships between education, occupation, work and health is important in order to form an efficient public policy concerning retirement, pensions, health financing, health and social care in a developing country as Turkey. 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 cohort differences in the social, health and economic conditions experienced at a given age but still provides useful information for specific time periods.

The rest of the study is organized as follows: Second section gives information about the data and SES gradient in health. In the third section we use two period-life cycle setting in order to provide a structure on the relationship between SES and health. Fourth section presents the estimation methodology and results which are aimed to test the theoretical model and provide information about the underlying mechanisms of the relationships between SES and health. Moreover, we present we present robustness checks in the forth section. Lastly fifth section concludes.

2. Data

The data used come from the wave of Turkstat Income and Living Conditions Survey (SILC) of Turkey for the year 2010. SILC contains information on demographic characteristics, income, poverty, social exclusion and living conditions with respect to the region and population. Since the analysis is focused on adults, we exclude people under 25.

After excluding individuals younger than 25 and with incomplete information, we have 12666 individual observations of whom 8850 are men and 3816 are women. We use self-reported health status as a health indicator. Self-reported health is obtained from the question "How do you rate your health" and categorized as good and bad. Good health contains very good and good health status, while bad health contains very bad, bad and fair health status. In this section we evolution of SES gradient in health be using income quartiles, education quartiles and work status as indicators of SES. Descriptive statistics reported in this section do not reveal anything about the direction of causality but presents a precursor analysis of the structure.

3. Methodology

3.1. Two-Period Life Cycle Setting

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, y_1. Furthermore in the first period of their lives 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. 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. In other words, only source of income in the second period is the savings from the first period. Additionally individuals 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:

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

where c_1 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:

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

[3] $(1 + r)s_1 = c_2 + m_2$

When we combine equations [1] and [2], we obtain intertemporal budget constraint:

[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:

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

[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 $(0 < \theta < 1)$ where as 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 [5] and [6] to substitute for medical services, m_t, as in Case and Deaton (2005).

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

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

When we use equations [7] and [8] to produce inter-temporal budget constraint that respects both financial and health identities. Thus, modified inter-temporal budget constraint is as the following:

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

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

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

Solution of the maximization problem yields the following health and consumption functions:

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

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

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

[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 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 saving decisions. Individuals respond increase in interest rate in the first period by decreasing medical expenses not the consumption level. Increase in θ, efficiency of income that creates health, has a positive impact on both arguments in both periods which is anticipated. 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.

Table 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	ambigous	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

Source: Author's calculations

On the other hand the impact of φ that is the efficiency of medical services is ambiguous. For example has a positive effect on h_1 through $w_1 n_1(\theta + \varphi)$ 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 along with the increase in $\theta + \varphi.$ 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 medical services.

Increase 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 in consumption and health in second period and a negative impact for both arguments in first period implying that individuals value second period of their life 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.

3.2. Estimation Methodology

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 designs. In this section we aim to establish the relation from SES to health empirically.

The model to be estimated is:

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

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.

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. Work hours are defined as zeros for those who are not in the labor force and who are unemployed. Thus, 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). 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 by following Xu (2013).

Another considerable weakness of self-reported health status (SRH) is the potential endogeneity between respondents' answers and the socio-economic status which may lead bias results. Not only does SES affect health, but health also may affect SES (Bender and Habermalz, 2005). For instance, it is possible that associations between SAH and employment occur because employment actually causes good health and alternatively it could be that, 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., 2005). Income and work hours (employment) are likely to be endogenous due to reverse causality and unobserved factors that affect labor market choices and health behaviors. For instance, rates of time preference will determine both investments in human capital (income) and health (Xu, 2013). In order to address this endogeneity problem we employ instrumental variable approach. Determinants of income and work hours (employment) should not affect individual's health. Thus 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:

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

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

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

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.

The efficiency of IV approach relies on the fact that whether the instruments are sufficiently correlated with income per capita and work hours (employment). Not surprisingly, considerable evidence suggest that work hours (employment) and income are highly correlated with regional economic conditions. The strong positive association between regional unemployment rates and work hours is quite mechanical since higher unemployment rates suggest more people having zero work hours; the extensive margin of work hours (Xu, 2013). Moreover, a substantial literature has documented that conditional on working, average working hours are also sensitive to regional economic activities; intensive margin of employment (Xu, 2013). In addition, higher unemployment rates lead unemployed individuals to work for lower wages and thus causes income to fall.

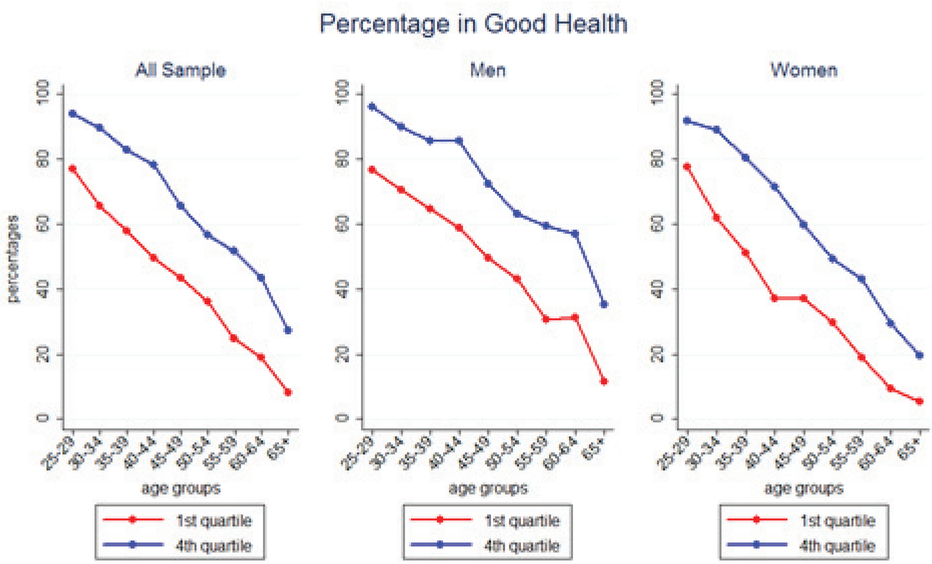
In the light of the discussion of the previous section equation [20] with equations [21], [22] and [23] constitutes the model estimated.

4. Results

4.1 Descriptive Results

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 (Duzgun-Oncel, 2018). We compare self-reported health status of individuals from different income quartiles. First income quartile represents the lowest quartile (lowest income group), whereas the fourth income quartile represents the highest quartile (highest income group).

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



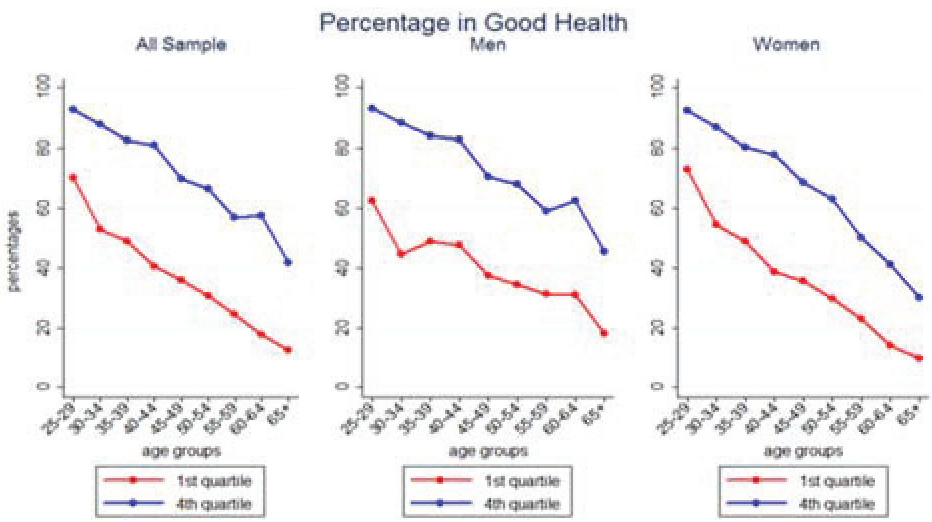
Source: Turkstat SILC 2010 and author's calculations.

Figure 1 shows self-reported good health according to income quartiles. One can regard percentages in the Figure 1 as: *Prob(good health/1st quartile & age & gender)*. Individuals in the high income quartile always report better health with respect to worse counterparts for both men and women. 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 (Duzgun-Oncel, 2018). 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 (Duzgun-Oncel, 2018). 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 for women who are in the fourth income quartile (Duzgun-Oncel, 2018). 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.

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/vocational high school and university or higher education.

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



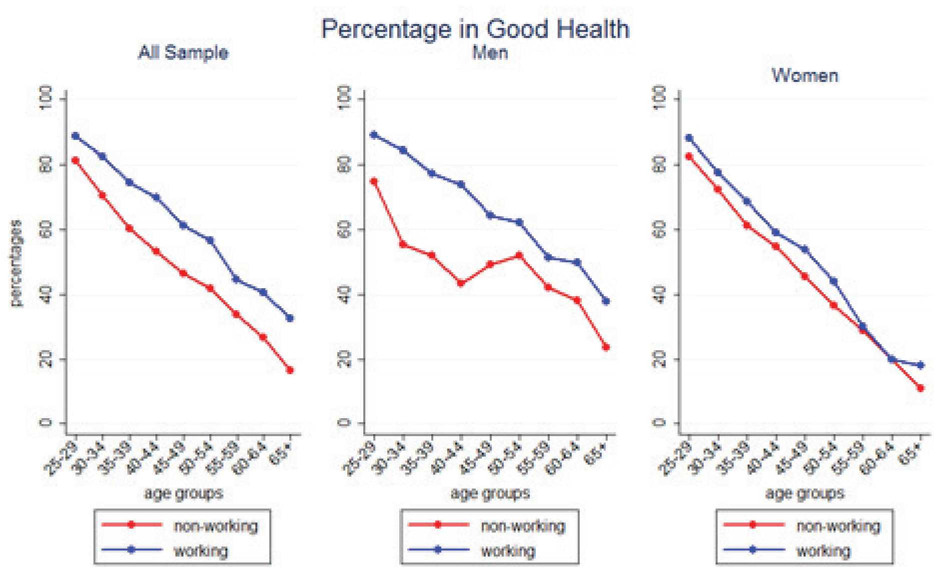
Source: Turkstat SILC 2010 and author's calculations.

As in the income gradient, men always report better health in every education and age category when we compare bottom and top education quartiles (Duzgun-Oncel, 2018). 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. In comparison with the picture for the income gradient in Figure 1, the size of the education gradient is larger both at younger and older ages. 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 that affect health (Duzgun-Oncel, 2018). 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. Thus, the income gradient may strengthen with age, as health shocks increasingly lead to labor market exit and drop in income, but there is no such mechanism to drive the dynamics of the education-health relationship (Van Doorslaer et al., 2008).

The difference in the magnitudes of income and education gradients might be due to the differential responsiveness of education and income to health (Duzgun-Oncel, 2018). The difference with the pattern for men may be attributed to differential disease patterns, with low educated women being less prone to the onfall of cardiovascular disease than low educated men are, and education-determined occupational choice being less relevant to the health of women than men (Van Doorslaer et al., 2008).

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.

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



Source: Turkstat SILC 2010 and author's calculations.

Figure 3 shows the percentages in good health according to work status. Working category includes individuals who are employed full time and part-time, non-working category refers to the individuals who are both unemployed and out of labor force. Theory predicts that working in a regular job has positive affect on health while unemployment has a negative impact since losing a job leads to a lot of psychological distress. On the other hand, some individuals choose to exit the labor force voluntarily (i.e. maternity leave) while others do so involuntarily (discouraged workers) which makes expectations about the relationship between health satisfaction and being out of the labor force ambiguous (Bender and Habermalz, 2005). We observe narrowing of the gradient after age group 45-49 for men and almost stable gradient for women implying that women's health is not responsive to work status.

4.2 Estimation Results

Table 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 3 shows the results when employment is used as a labor status indicator. 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.

According to Table 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 biological factors. For instance, being 65 or older increases the probability of poor health about 55 % under IV-LPM and about 51% 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 18% under IV- LPM and IV-Probit. Coefficients of living in a urban area and living quartiles per person in the household are insignificant in all four specifications.

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 effect of being in 4^{th} education quartile becomes insignificant. For instance, being in 2^{nd} education quartile increases the probability of good health by 6% and being in the 3^{rd} education quartiles increases the same probability by 12% according to column 4. Moreover being a blue collar worker increases the probability of bad health when we apply IV-LPM and IV-Probit. As we mentioned before, the impact of income on health would be due to reverse causality which may lead over-estimated results and unobserved factors along with error in measuring income would also cause under-estimated results. Moreover, reverse causality could also be an issue between health and work hours. The results in column 1 and 2 in Table 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 becomes insignificant according to IV-LPM and significant only at 10% according to IV-Probit while the effect of work hours turns to negative. Behavior of the income coefficient imply that reverse causality may not be an important issue and unobserved factors such as cultural-social characteristics, and probable error in measuring income would be essential for individuals.

In Table 3 we use binary employment variable as a labor status indicator instead of weekly work hours. We observe smaller coefficients in Table 3. For example being in age group 65+ decreases the probability of good health about 43% and 39% under LPM and Probit respectively. On the other hand, according to IV-LPM and IV-Probit being in 65+ age category decreases the probability of good health by 30% and 31% respectively. Being male has a positive effect on health status according to columns (1) and (2), however when we apply endogeneity correction the coefficient of being male becomes insignificant. Urban area and living quartiles coefficients are still insignificant. Education still has remarkable impact on health, for example being in the 4^{th} education quartile increases the probability of good health by 13% according to IV-Probit results. Being a blue collar worker insignificant in all specifications.

Table 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***	-0.1259***	-0.1388***
	(0.0094)	(0.0097)	(0.0115)	(0.0135)
age 45-54	-0.2327***	-0.2323***	-0.2639***	-0.2625***
	(0.0107)	(0.0102)	(0.0220)	(0.0281)
age 55-64	-0.3601***	-0.3331***	-0.4155***	-0.3893***
	(0.0151)	(0.0137)	(0.0369)	(0.0416)
age 65+	-0.4407***	-0.4012***	-0.5516***	-0.5185***
	(0.0223)	(0.0207)	(0.0651)	(0.0730)
male	0.0766***	0.0719***	0.1825***	0.1849***
	(0.0092)	(0.0090)	(0.0517)	(0.0542)
urban	-0.0027	-0.0060	-0.0056	-0.0067
	(0.0090)	(0.0089)	(0.0178)	(0.0155)
living quartiles	-0.0003	-0.0002	-0.0009	-0.0007
	(0.0003)	(0.0003)	(0.0010)	(0.0010)
2nd education quartile	0.0856***	0.0565***	0.0929***	0.0670***
	(0.0132)	(0.0121)	(0.0266)	(0.0219)
3rd education quartile	0.1372***	0.1058***	0.1495***	0.1223***
	(0.0183)	(0.0177)	(0.0368)	(0.0342)
4th education quartile	0.1536***	0.1312***	0.0849	0.0625
	(0.0165)	(0.0157)	(0.0623)	(0.0615)
blue collar	-0.0134	-0.0137	-0.0416*	-0.0446***
	(0.0095)	(0.0093)	(0.0213)	(0.0173)
income	0.0836***	0.0836***	0.0684	0.0854*
	(0.0068)	(0.0067)	(0.0422)	(0.0459)
work hours	0.0006**	0.0005**	-0.0061**	-0.0078***
	(0.0002)	(0.0002)	(0.0033)	(0.0027)
Observations	12,666	12,666	12,666	12,666
R-squared	0.1629	0.1377	0.1527	0.1281

Standard errors in parentheses

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

The first endogeneous variable income has a positive impact on health which is about 8% according to columns (1) and (2) in Table 3, however when we correct endogeneity the effect of income becomes insignificant. Without endogeneity correction we observe that being employed increases the probability of good health about 7% and 6% in columns 1 and 2 respectively. However, when we apply endogeneity correction the impact of being employed on good health jumps to 51% in column (3) and 36% in column (4). This change in the sizes of coefficients imply that reverse causality would be an issue on the impact of employment on health.

As we mentioned before work hours are defined as zeros for those who were not in the labor market, the estimated impact of hours of work represents the total effects on one hour change 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 2) and employment (labor status indicator in Table 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 2.

Table 3: Marginal Effects-All Sample (Employment as Labor Status Indicator)

	(1) LPM	(2) Probit	(3) IV-LPM	(4) IV-Probit
endogeneity correction	no	no	yes	yes
dep. var: health status				
age 35-44	-0.1162***	-0.1302***	-0.1063***	-0.1245***
	(0.0094)	(0.0097)	(0.0109)	(0.0110)
age 45-54	-0.2324***	-0.2318***	-0.2024***	-0.2135***
	(0.0107)	(0.0102)	(0.0186)	(0.0175)
age 55-64	-0.3583***	-0.3311***	-0.3034***	-0.2972***
	(0.0150)	(0.0137)	(0.0303)	(0.0269)
age 65+	-0.4315***	-0.3932***	-0.3049***	-0.3113***
	(0.0223)	(0.0206)	(0.0630)	(0.0541)
male	0.0689***	0.0644***	-0.0306	-0.0013
	(0.0091)	(0.0090)	(0.0460)	(0.0409)
urban	-0.0024	-0.0055	0.0147	0.0054
	(0.0090)	(0.0089)	(0.0148)	(0.0134)
living quartiles	-0.0003	-0.0002	0.0009	0.0006
	(0.0003)	(0.0003)	(0.0007)	(0.0008)
2^{nd} education quartile	0.0811***	0.0531***	0.0730***	0.0456**
	(0.0132)	(0.0121)	(0.0196)	(0.0208)
3^{rd} education quartile	0.1323***	0.1021***	0.1311***	0.0976***
	(0.0183)	(0.0177)	(0.0248)	(0.0316)
4^{th} education quartile	0.1446***	0.1239***	0.1700***	0.1354***
	(0.0165)	(0.0157)	(0.0345)	(0.0429)
blue collar	-0.0133	-0.0136	-0.0139	-0.0126
	(0.0094)	(0.0093)	(0.0125)	(0.0127)
income	0.0807***	0.0809***	-0.0164	0.0209
	(0.0068)	(0.0067)	(0.0525)	(0.0554)
employed	0.0760***	0.0633***	0.5188**	0.3622**
	(0.0124)	(0.0116)	(0.2111)	(0.1874)
Observations	12,666	12,666	12,666	12,666
R-squared	0.1649	0.1393	0.1529	0.1280

Standard errors in parentheses

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

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. We obtain the effect of extensive margin of labor by multiplying the employment coefficients by 0.02 in Table 3. Hence, the impact of 2 percent change at the extensive margin of labor supply can be compared to the total effect of one hour change. Consequently, we can identify which aspect of labor supply is the driving force of the total effects (Xu, 2013).

Table 4: Comparison Between Intensive and Extensive Margin of Labor

	(1) LPM	(2) Probit	(3) IV-LPM	(4) IV-Probit
endogeneity correction	no	no	yes	yes
effect of 1 hour increse in work hours (intensive Margin of labor)	0.0006*	0.0005**	-0.0061**	-0.0078***
effect of 2% increase in employment (extensive margin of labor)	0.0015***	0.0012***	0.0150**	0.0126**

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

According to Table 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. Results in the first two columns of Table 4 suggest that impact of labor force status on health is originated from changes in employment not changes in work hours since extensive margin of labor is greater than the intensive margin. However when we correct the estimation for endogeneity, we observe that intensive margin of labor has a negative impact on health while extensive margin has a positive effect.

4.3 Robustness Check

In this section we present endogeneity and weak instruments tests. Table 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 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 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. Both of the statistics propose rejection of the null hypothesis implying that there is no endogeneity in the model and instruments used are not weak. 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: 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 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

5. Conclusion

We began our discussion by mentioning the strong relationship between socio-economic status (SES) in which socially and economically advantaged individuals enjoy better health. Furthermore, determining the nature of relationship is crucial for effective public policy designs especially for a young-populated country like Turkey. In this sense we tried to bring a life-cycle perspective in analyzing health-SES nexus in order to provide some insights for policy implications. First, we demonstrate SES gradients in health which can reveal important information on the nature of SES-health nexus. Then two-period life cycle model is built to decompose 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. 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). 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 does not play a significant role when results are corrected for endogeneity. 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 remains positive.

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