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HOW GOOD IS YOUR HEALTH? THEORETICAL EXPLANATIONS AND MICRO EVIDENCE FROM TURKEY ON SOCIO-ECONOMIC STATUS & HEALTH NEXUS

Doktora Tezi

BURCU DÜZGÜN ÖNCEL

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Advisor: PROF. DR. ALİ SUUT DOĞRUEL

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SOSYAL BİLİMLER ENSTİTÜSÜ MÜDÜRLÜĞÜ

TEZ ONAY BELGESİ

İKTİSAT (İNGİLİZCE) Anabilim Dalı İKTİSAT (İNGİLİZCE) Bilim Dalı DOKTORA öğrencisi BURCU DÜZGÜN ÖNCEL'nın HOW GOOD IS YOUR HEALTH? THEORETICAL EXPLANATIONS AND MICRO EVIDENCE FROM TURKEY ON SOCIO-ECONOMIC STATUS & HEALTH NEXUS adlı tez çalışması, Enstitümüz Yönetim Kurulunun 17.09.2014 tarih ve 2014-33/28 sayılı kararıyla oluşturulan jüri tarafından oy birliği / ~~oy çokluğu~~ ile Doktora Tezi olarak kabul edilmiştir.

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ABSTRACT

HOW GOOD IS YOUR HEALTH? THEORETICAL EXPLANATIONS AND MICRO EVIDENCE FROM TURKEY ON SOCIO-ECONOMIC STATUS & HEALTH NEXUS

Numerous studies have shown a strong relationship between health and socio-economic status (SES). People at low socio-economic status suffer a heavier burden of morbidity rates 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 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 or work status is used as indicators of SES. We observe relatively wide SES gradient in health in middle ages and narrowing of it in old ages impling some mixture of *cumulative advantage hypothesis* and *age-as-leverer 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 by income and education. Increase in work hours or being employed is insignificant for men while it increases the probability of poor health for women. 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. Further underestimated income coefficients without endogeneity correction implies reverse causality is not a major issue for Turkish data and unobservable factors or error in measuring income plays an essential role in determining income-related health outcomes. We also observe that education has greater impact of health of women. Although we lack to monitor cohort effects and selective mortality due to data limitations, results of the study imply that policies directed at increasing equal income distribution, rising female education and thus labor force participation would improve health of the society as a whole.

GENEL BİLGİLER

İsim ve Soyadı: Burcu Düzgün Öncel

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Danışman: Prof. A. Suut Doğruel

Anahtar Kelimeler: Sosyo-ekonomik statü, sağlık gradyantı, hayat döngüsü modeli, içsellik

ÖZET

SAĞLIĞINIZ NE KADAR İYİ? TEORİK AÇIKLAMALAR VE SAĞLIK SOSYO-EKONOMİK DURUM İLİŞKİSİ ÜZERİNE TÜRKİYE'DEN MİKRO KANITLAR

Sayısız çalışma sağlık ve sosyo-ekonomik statü (SES) arasında güçlü bir bağ olduğunu ortaya koymuştur. Düşük sosyo-ekonomik statüdeki kişiler, kendilerinden daha iyi durumdakilere göre sağlık bozukluğundan daha çok etkilenmektedirler. Ancak SES tek boyutlu değildir. SES'in hangi yönlerinin sağlığa etkisi olduğunu ve bazı bireylerin sağlığının diğerlerine göre hayat döngüsü süresince neden daha hızlı bozulduğunu bilmek, politika tartışmaları, emeklilik ve sosyal güvenlik sistemlerinin belirlenmesi için önem taşımaktadır. Bu bağlamda Türkiye için 2010 yılına ait kesit veri kullanarak yapılan bu çalışmanın literatüre katkısı üç aşamalıdır: i)Sağlıktaki SES gradyantını, hayat döngüsü süresince çizebilmek için gelir, eğitim ve iş durumu gibi SES'in farklı yönlerinden faydalanıyoruz. ii)SES'in sağlık üzerindeki etkilerinin belirlemek için iki dönemli temel bir hayat döngüsü modeli oluşturuyoruz. iii)bu iki dönemli modelimizi test etmek için içsellikten arındırılmış tahminler yapıyoruz.

Sonuçlar Türkiye'de SES hiyerarşisinde alt kısımda bulunanların üst kısımda kalanlara göre sağlık durumlarının daha kötü ve ortalama olarak erkeklerin sağlıklarının kadınlara göre daha iyi durumda olduğunu göstermektedir. Sağlık gradyantı gelir, eğitim ve iş durumu gibi bütün SES göstergelerinde bulunmaktadır. Orta yaşlarda gözlemlediğimiz daha geniş gradyant ve ileri yaşlarda gözlemledigimiz daha dar gradyant, yaşam döngüsünde *cumulative-advantage* ve *age-as-leverer* hipotezlerinin bir karışımının etkin olduğunu göstermektedir. İkinci olarak, kurduğumuz temel iki dönemli hayat döngüsü modeli göstermektedir ki işgücü ve işgücü dışı gelirlerin sağlık üzerine pozitif etkileri vardır. Öte yandan eğitim ve çalişma durumunun etkilerinin model parametrelerine bağlıdır. Parametre büyüklüklerinin etkin olması yaş ve cinsiyet arasındaki farklılıkları açıklamada

yardımcı olabilir. Son olarak, tahmin sonuçları sağlık durumunun en onemli belirleyicisinin yaş olduğunu ve gelir ile eğitimin yaşı takip ettiğini ortaya koymaktadır. Çalışma saatlerindeki artış ya da istihdamda olmak, erkekler için anlamsiz olsa da kadınların iyi sağlık durumunda olma olasılığını düşürmektedir. İstihdamın içsel ve dışsal marjları arasında yaptığımız karşılaştırma, asıl etkin olan iş durumu faktörünün çalışma saati degil istihdam durumu olduğunu ortaya koymuştur. Ek olarak, içsellikten arındırılmamış ve eksik değerlendirilmiş gelir katsayıları, ters nedenselligin Türkiye için önemli bir sorun olmadığını, gelir ölcümleme hatalarının veya gözlemlenemeyen faktörlerin gelirden kaynaklanan sağlık sonuçları üzerinde daha etkin olduğunu göstermektedir. Ayrıca eğitimin kadınların sağlığı üzerinde erkeklere göre daha çok etkisi olduğunu gözlemlemekteyiz. Çalışmamız topluluk etkilerini ve seçici ölümlülüğü veri kısıtı nedeniyle göz ardı etse de, bulunan sonuçlar eşit gelir dağılımına ve kadınların eğitim seviyelerini, dolayısıyla da iş gücüne katılımlarını arttırmaya yönelik politikaların genel toplum sağlığı açısından faydalı olacağını belirtmektedir.

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LIST OF ABRREVIATIONS

AHEAD	Asset and Health Dynamics of the Oldest Old
BRFSS	Behavioral Risk Factor Surveillance System
CHNS	China Health and Nutrition Survey
CI	Concentration Index
CPS	Current Population Survey
EU	European Union
GCM	Growth Curve Model
GSOEP	German Socioeconomic Panel
HIS	Dutch Health Interview Survey
HRS	Health and Retirement Survey
ILCS	Income and Living Conditions Survey
IV	Instrumental Variable
LPM	Linear Probability Model
NHANES	National Health and Nutrition Examination Survey
NHIS	National Health Interview Survey
OLS	Ordinary Least Squares
PSID	Panel Study of Income Dynamics
RII	Relative Index of Inequality
SAH	Self Assesed Health
SES	Socio-Economic Status
SHARE	Survey of Health, Aging, and Retirement
SRHS	Self Reported Health Status
TSIV	Two-Sample Instrumental Variables
UK	United Kingdom

US	United States
2SLS	Two-Stage Least Squares
2SPS	Two-Stage Predictor Substitution
2SRI	Two-Stage Residual Inclusion

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. Does the distribution of health change across generations? Do socio-economic disparities narrow or widen as people age? Does differences in health reflect causation from SES to health or instead the cumulative consequences of poor health outcomes through one's life? What dimensions of SES matter- financial aspects like income or wealth or non-financial aspects such as education? All of these questions address the strong relationship between healh and socio-economic conditions in which individuals live and work both in rich and poor countries.[1]

Socio-economic status (SES) has a substantial impact on health in which socially and economically favored individuals enjoy better health. Huge literature on socioeconomic inequalities reveals a persistent phenomenon of social inequalities in health in many countries and people at low socio-economic status suffer a heavier burden of morbidity and have higher mortality rates than their better-off counterparts. 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., 2009:2152). 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 enormous potential for improving the average health status of

[1] See Van Kippersluis et al., 2009; Willson et al., 2007; Smith, 2004; Smith, 2007; Van Doorsleer et al., 2008; Kunst and Mackenbach, 1997

the population as a whole (Kunst and Mackenbach, 1997:758).

However looking at the socioeconomic differences only at certain ages would lead to incomplete impression of the extent of health differences over the life course. Life cycle component to the SES gradient in health should be taken into account in order to reflect the health of which groups decline more rapidly than the others. In other words, outcomes at prime ages do not arrive independently from earlier ages and are of relevance for outcomes in later life. Knowledge of how the distribution of health changes over the life cycle is key to understanding individual behavior with respect to retirement, saving, health insurance and the utilization of health care and consequently, to the formation of public policy (Van Kippersluis et al., 2009:820).

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 and evolution of socio-economic status(SES) gradient in health and dimensions of SES that effect health in a developing country as Turkey becomes crucial in policy designs and improving socio-economic and health status of people.

Literature is divided between two approaches on the evolution of socioeconomic gradient in health over life cycle; *cumulative advantage hypothesis* and *age-as-leverer hypothesis*. 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. 2007:1890). On the other hand, age-as-leveler hypothesis suggests that deterioration in health is an inevitable part of the process of aging and irrespective of economic means or social position, with the result that SES-health gradient narrows at advanced ages (Beckett, 2000:109). A compromise sce-

nario, for which there is growing evidence, 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 of health strengthen relative to the socioeconomic determinants (Van Doorsler et. al 2008:14).

Furthermore literature also divided on which aspect of SES is more crucial on health; financial aspect or non-financial aspect. In other words, there exists a controversy whether the financial aspects such as labor income, non-labor income and wealth or non-financial aspects such as education play a significant role in effecting the health outcomes.

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 theoretical model that incorporates socio-economic status as a determinant of health. The empirical analysis is based on data from Turkish Statistical Institute (Turkstat) Income and Living Conditions Survey 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 on the evolution of health gradient and effect of socioeconomic status(SES) on health over life cycle.

The rest of the study is organized as follows: Second section gives review on literature. We provide information of Grossman's model and alterations and criticism by his followers. Despite not being directly related to our study, we also present brief literature on life cycle models that incorporate retirement in order to give insight on the aspect of retirement behavior. Then we present literature on SES gradient in health and impact of SES on health over life course. Third section gives information about the data, descriptive statistics and SES-health gradient over life cycle. We provide information on income, education, work status and occupation gradients in self assessed health as well as different indicators of health of such disability and chronic illness. However health gradients depicted in section 3 do not reveal anything about the direction of causality. Comparison of the SES gradients in health over life cycle can nonetheless be revealing about the nature of the gradient and may be helpful in suggesting the possible underlying mechanisms and

serve as a precursor to the analysis on the effect of socio-economic status on health. In forth section we give detailed information on the models of Grossman(1972) and Case and Deaton(2005). Additionally we present three versions of a basic two period-life cycle setting in order to provide a structure for interpreting the empirical findings. We define the behavior of the arguments of the utility function and the parameters of the model are of interest. Fifth 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. We also mention the measurement issues such as reporting heterogeneity and endogeneity between underlying aspects of SES and health and possible remedies. Lastly sixth section concludes.

2. LITERATURE SURVEY

Health is extensively regarded as an important part of human capital. Since the seminal work of Grossman (1972), Grossman model has become the standard model to study health demand and health determinants (Zhao, 2005:2). Economists conducted many theoretical and empirical studies by applying Grossman model. In this section we present the literature review on SES-health relationship by grounding on the studies on Grossman(1972). We proceed as the following: first we present health demand model of Grossman and alterations and criticism made by his followers. Then we present life cycle studies that account for health behaviors. Thirdly studies that incorporate SES-health relationship are put forward. Finally brief literature on measurement issues of health are disclosed. Although the main focus of this study is on the relationship between SES and health and the direction of causality from SES to health in adult life for Turkey, research on retirement-health nexus is also presented briefly in the literature survey section in order to fully cover the literature in all periods of life.

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. Individual's stock of knowledge affects his market and non-market productivity, whereas his stock of health determines the total amount of time he can spend producing money earnings and commodities (Grossman, 1972:224). Furthermore, it is assumed that health of individuals depreciate over time and can be increased by investment in health. Investment in health capital are produced by household production functions whose direct inputs include the own time of the consumer and market goods such as medical care, diet, exercise, recreation and housing (Grossman, 1972:225). This production function also depends on education since it is assumed that more educated people are more adequate producers of health.

Individuals demand health for two reasons; first reason is that health directly enters

their utility functions and secondly poor health creates dis-utility due to the loss of efficient work or leisure time. Stock of health capital is determined by equating the marginal efficiency of this capital to its user cost in terms of the price of gross investment (Grossman, 1972:246). Downward sloping demand curve relates marginal efficiency of capital to the stock and infinitely elastic supply curve.

Grossman (1972) argues that his model clarifies variations in both health and medical care among persons in terms of variations in supply and demand curves for health capital. Upward shifts of supply curve is due to the increase in the depreciation on the stock of health with age and upward shifts of demand curve is due to the rise in wage rate and education. Moreover, quantity of health capital demanded declines due to the increase in depreciation rate while expenditures for medical care increases with age. Consumer's demand for health and medical care are positively related with his wage rate (Grossman, 1972:247). Furthermore more educated people demand more stock of health.

Grossman (2000) makes theoretical extensions to his seminal model in 1972 and tests the predictions made by the model and causality between years of formal schooling completed and good health. Grossman (2000) include a new interpretation of the condition for death by reformulating the selection of the optimal stock of health and length of life as a discrete time optimal control problem. Grossman (2000) assumes that the rate of depreciation on the stock of health rises with age and optimal gross investment in health is positive except in the very last year of life. As a result length of life is determined as the outcome of an iterative process in which lifetime utility functions with alternative horizons are maximized (Grossman, 2000:361). Rise in the rate of depreciation not only reduces the amount of health capital demanded by consumers but also reduces the amount of capital supplied to them by a given amount of gross investment Grossman, 2000:369).

Grossman (2000) also offers tests to distinguish the investment model from the consumption model by using 1963 United States survey conducted by the National Opinion Research Center and the Center for Health Administration Studies of the University of Chicago. Education and the wage rate have positive and significant effects on health and an increase in age reduces health and increases medical expenses (Grossman, 2000:382).

The signs of the age, wage, and schooling coefficients in the health demand function and the sign of the age coefficient in the medical care demand function are consistent with the predictions contained in the pure investment model (Grossman, 2000:382).

In 2003, Grossman also studies the impact of education on non-market outcomes such as general consumption patterns, savings and rate of growth of consumption over time, adult health and inputs to the production of adult health, fertility and child quality (Grossman, 2003:578). Two most important components of human capital; knowledge capital and health capital, interact with and affect the cost and usefulness of each other. Grossman (2003) conducts his analysis by using health levels that are measured by mortality rates, morbidity rates, self-evaluation of health status, or physiological indicators of health and finds a significant positive impact of education on health.

Muurinen (1982) uses a generalized version of Grossman's original model in which it does not rely on the acceptance of household production theory and time prices and mainly depends on two criticisms of Grossman(1972). First Muurinen (1982) 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. In the present model the productive aspect of health is seen as increased capacity to perform ones tasks in the role of a producer (either inside the home or in the labor force), and the value of this as dependent on the characteristics of this participation, the individual in question, and his or her circumstances more generally (Muurinen, 1982:7).

Second, Muurinen (1982) suggest that the justification of the positive education-health correlation is somewhat unsatisfactory. The individual has three different stocks available for service creation in each period of life. First one is his or her stock of health, second is his or her stock of skills and knowledge and the third one is stock of wealth and the first two together constitute the human capital of the individual (Muurinen, 1982:8). The service flows of these stocks are inputs into two different classes of activities: those linked directly with utility production such as consumption and those productive activities that only indirectly increase utility such as working and investing in the three stocks (Muuri-

nen, 1982:8). The human capital stocks do not produce separate tangible service flows, but rather change the individual in question by making him or her more fit in the case of health and more skilful and knowledgeable in the case of education. Thus, the extent to which the stock of health is used up in producing the desired services is likely to depend on the availability of education capital for the individual under examination (Muurinen, 1982:9).

Rooting the grounds of their study on Grossman(1972), 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 low of services over several periods of time, depreciates and can be increased with investment. Epidemiological measures of health such as life expectancy and the average length of life suggest that it might be useful to see health as a stock of capital and health-promoting activities as investment in this stock (Muurinen and Le Grand, 1985:1029). 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.

Kemma (1987) examines the occupational linkage in the empiracally observed positive 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. The empirical results suggest that the existence of a small occupation affect in schooling-health relationship, but this impact is conservatively estimated and biased downward given the presence of unobserved differences in health status of individuals (Kemma, 1987:206).

Leibowitz (2004) begins his discussion by referring Grossman (1972)'s clear distinction between health and medical care services Grossman(1972)'s insight that consumers combine their own time with medical services to create the commodity health. However 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. Not only do non-medical commodities compete

with health investments for an individual's time and money resources, but other types of consumption also may directly affect health (Leibowitz,2004:664).

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 consume medical goods and services for some period of time (Galama and Kapteyn, 2011:1045). In other words healthy individuals initially do not demand medical care until their health has deteriorated to a certain threshold level given by Grossman's optimal health.

The generalized solution repeats the predictions of the traditional Grossman model with the exception of the problematic prediction that health and medical care should be positively correlated (Galama and Kapteyn, 2011:1052). Their final conclusions are as the following: Health decreases with the cost of medical goods/services and with environmental factors that are destructive to health. The effect of income is unclear as different sub models predict a different relation with health(Galama and Kapteyn, 2011:1052). Healthy individuals do not go to the doctor or stay in hospital while the unhealthy do. Effective health deterioration slows as individuals reach the health threshold and begin to consume medical care. Consumption of medical care increases discontinuously as healthy individuals begin to consume medical care once their health reaches the health threshold (Galama and Kapteyn, 2011:1052). Blue collar workers tend to have faster depreciation rates than the white collar counterparts.

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, 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. The differences in health and health decline in different parts of the income distribution are due to whether or not people are in the labor force (Case and Deaton, 2005:6). Both income and education have independent protective effects on health for those who are in work, and these effects

are reduced but not eliminated by controlling for occupation (Case and Deaton, 2005:6).

All of the above studies are inspired from Grossman (1972) to form a health capital model and how health changes in response to changes in certain conditions such as time uses, prices, education, occupation and income. Since our main purpose of the study is to develop a precursor for policy design on the SES-health connection, it is also worthwhile to mention studies that relate health, labor and retirement decisions.

Bleichrodt and Quiggin (1999) also examines life-cycle preferences over consumption and health status. They argue that cost-benefit analysis is always consistent with life cycle preferences over consumption and health since it puts no assumptions on the lifetime utility function over consumption and health status. On the other hand Bleichrodt and Quiggin (1999) show that cost-effectiveness analysis is consistent with cost-benefit analysis if the lifetime utility function is additive over time by using quality-adjusted-years (QALYs) which is an outcome measure in cost-effectiveness analysis. Willingness to pay for a QALY gained is determined by four factors: wealth, life expectancy, health status and the possibilities for intertemporal substitution of consumption (Bleichrodt and Quiggin, 1999:702). The willingness to pay for a QALY gained increases with wealth and with life-expectancy and decreases with health status and the possibilities for intertemporal substitution of consumption (Bleichrodt and Quiggin, 1999:702).

French and Jones (2011) estimated a dynamic programming model of retirement that accounts for both saving and uncertain medical expenses by using data from Health and Retirement Study. First, they estimated or calibrated parameters that can be cleanly identified without explicitly using the model. For example, they estimate mortality rates and health transitions straight from demographic data (French and Jones, 2011:697). Secondly they estimated the preference parameters of the model, along with the consumption floor, using the method of simulated moments (French and Jones, 2011:706).

Key point of French and Jones (2011)'s estimation is is to compare the behavior of individuals with different forms of employer-provided health insurance. According to their results value of employer provided health insurance is remarkably affected by health

care uncertainty. Their calculations suggest that about half of the value workers place on employer provided health insurance comes from its ability to reduce medical expense risk (French and Jones, 2011:728). Additionally, the evidence presents that individuals with higher tastes for leisure mostly choose employers that provide health insurance to early retirees. French and Jones (2011) presents the insight to form a life-cycle model. Their model differs from this papers aim in the way that they included the savings decision in addition to health insurance and medical care expense uncertainty.

Another life-cycle model of optimal retirement is conducted by Bloom et al. (2004). In this paper they develop a theoretical model of retirement and consumption based on individual optimization over the life cycle with complete and perfect capital markets (Bloom et al., 2004:1). Individuals decide their lifetime labor supply and consumption and take the real wage rate and interest rate to be exogenous. Furthermore interest rate is fixed overtime whereas real wages grow at a constant rate which reflects long run economic growth (Bloom et al., 2004:7). According to the analysis optimal retirement age increases with the rise in health and life expectancy. However this increase is less than the rise in longevity. As a result the fraction of the life span in retirement years rises. At the same time, consumption at each age rises and saving rates fall (Bloom et al., 2004:5). In other words, the model predicts longer working lives, and lower savings rates among workers.

Dwyer and Mitchell (1998) examine the alternative measures health in order to determine how decision to retire is affected by mental and physical health. They follow the literature in which a worker chooses a retirement age that maximizes utility over the remainder of his life. The present value of labor earnings, non labor income and leisure determine the life time budget constraint. In this formulation, the retirement period is the expected lifetime remaining minus the retirement age (Dwyer and Mitchell, 1998:5). The present discounted value of income over the remainder of lifetime incorporates the discounted sum of lifetime earnings net of taxes until retirement, plus pension contributions, and the net income from pensions and social security from retirement to death (Dwyer and Mitchell, 1998:5). They further argue that health status may has an impact on retirement decision in many ways; such as poor health decreases productivity, working hours

and earnings, poor health also can affect preferences through the change in consumption and leisure.

Dwyer ad Mitchell (1998) found health problems always have a remarkable influence encouraging earlier retirement. Especially, individuals self reporting poor health, or indicating they suffer functional limits, plans retirement between one and two years earlier than average (Dwyer and Mitchell, 1998:16). They argue that there is little evidence of measurement error in the more objective health measures. Presence of functional limitations is a good objective proxy of underlying health in retirement models, but self-reported work limitations perform similarly (Dwyer and Mitchell, 1998:16). Furthermore, they checked whether justification bias holds for their sample and they found no evidence supporting justification hypothesis.

Kalemli-Ozcan and Weil (2002) investigate the role of changing mortality in explaining the rise of retirement over the last century. They construct a model in which individuals make labor-leisure choices over life cycle subject to uncertainty about their date of death (Kalemli-Ozcan and Weil, 2002:3). So their health indicator is mortality. In an environment in which mortality is high, an individual who saved up for retirement would face a high risk of dying before he could enjoy his planned leisure and optimal plan would be to work until die (Kalemli-Ozcan and Weil,2002:1). However as rate of mortality decreases save for retirement becomes the optimal plan. Thus the main driving force behind the change in the life cycle pattern of labor supply is a change in the pattern of mortality. By using both a realistic mathematical formulation of the survival function and actual life table data for US Kalemli-Ozcan and Weil (2002) show that a fall in mortality can lead to a shift in the life cycle pattern of labor supply implying intuitive effect of higher life expectancy in rising retirement age (Kalemli-Ozcan and Weil,2002:1).

Now let's focus on the studies that examine the relationship between health and different dimensions of SES such as income, wealth, education, labor supply, occupation and retirement and studies that include health measurement issues.

Bound et al. (1998) analyzes the relationship between health and labor market behav-

ior in the later part of the working life. When examining the dynamic health status and labor force behavior among older working age adults, they included of contemporaneous health and lagged values of health status. This permits to distinguish the labor market effects of persistently poor health from those of health declines. Bound et al. (1998) pays attention to addressing problems of measurement since the inclusion of both contemporaneous and lagged health in the model tends to exacerbate problems associated with measuring health status.

Bound et al. (1998) start their discussion by mentioning that although variation in health status exists at all ages and influences early educational and occupational attainment, the decline in health starting in late middle age that is likely to create a mismatch between an individual capabilities and the requirements of his job (Bound et al., 1998:1).

In order to overcome the problems associated with subjective health measures, Bound et al. (1998) use a latent variable model to construct an index of health. They assume that health at time t is a linear function of some exogenous variables, such as age, education, a vector of health measures (functional limitations in their paper), and other unobserved factors. (Bound et al., 1998:10). Findings of the study reveals that among people in poor health, more than half of those who exit the labor force apply for social security disability insurance and those who keep working, many change jobs within several years of the onset of their poor health. This finding presents the fact that older workers adapt to enable to continue labor force participation by changing jobs (Bound et al., 1998:26). Their results present a dynamic relationship between health and labor supply outcomes. Individuals whose health declined relatively recently are more likely to apply for social security disability insurance, and less likely to change jobs, than are individuals whose health declined earlier (Bound et al., 1998:26).

McGarry (2002) on the other hand, mentions the the relative importance of health in comparison to financial variables in determining retirement plans and the difficulty in adequate measure of health. However McGarry (2002) claims that the usage of unique measure of labor force attachment, the subjective probability of continued work, enables to overcome the problem that subjective measures created. For instance while a zero-one

indicator of retirement does not vary over individuals, this kind of labor force attachment measures show the differences among individuals. By focusing exclusively on workers the concern about justification bias among retired individuals is eliminated and it is found that subjective reports of health have an important impact on retirement that are stronger than financial variables (McGarry, 2002:2).

The results of McGarry(2002)'s study suggests that there is a strong relationship between health and the decision the remain employed and this strong relation is not due to the justification bias. The paper also argues changes in retirement plans are strongly correlated with change in health and weakly related to other financial variables (McGarry, 2002:21).

Dor et al. (2003) also analyzes the effect of health insurance on health status and retirement decisions. They argue that endogeneity bias that arises if the decision to purchase insurance is correlated with unobservable traits that may also impact future health. Endogeneity of health insurance is adjusted in the context of a treatment effects model in the estimation process which leads increase in the insurance effect. In other words, having insurance leads to better health status. Since the focus is on private insurance markets, worker's decision is conditional on the employer's offer. Thus the identification problem becomes one of finding instrumental variables that predict the likelihood that an employer offers insurance without being correlated with health status (Dor et al., 2003:7).

Dor et al. (2003) estimates Grossman's health production function in which lag structure of each variables are used in order to allow for the fact that adjustment to behavioral covariates does not occur instantaneously. Hence the study puts forward that adjusting for endogeneity of insurance in health equations in a treatment effects or instrumental variable model leads to remarkably larger insurance effects compared with a more naive model (Dor et al., 2003:28).

Coe and Zamarro (2011) analyzes the retirement effects on health in a multi-country setting for Europe. Their results obtained by using Survey of Health, Aging, and Retirement in Europe (SHARE) show that planned retirement induced by government social

security systems leads to a 35 percent decrease in the probability of reporting fair, bad or very bad health, and almost one standard deviation improvement in the health index (Coe and Zamarro,2011:85).

Dave et al. (2006) looks at the effects of retirement on health status which is measured by indicators of physical and functional limitations, illness conditions, and depression by using Health and Retirement Survey (HRS) for United States (US). Health outcomes differ across several observable socio-economic and demographic dimensions (Dave et al.,2006:14). Complete retirement leads to a 5- 16 percent increase in difficulties associated with mobility and daily activities, a 5-6 percent increase in illness conditions, and a 6-9 percent decline in mental health (Dave et al.,2006:28).

Ettner (1996) estimates the structural impact of income on different measures of health status by using National Survey of Families and Households, the Survey of Income and Program Participation, and the National Health Survey for US. The measures of health status are; self-assessed health status, work and functional limitations, bed days, average daily consumption of alcohol, and scales of depressive symptoms and alcoholic behavior. The purpose of the study is to derive consistent estimates of income on a variety of health proxies, using two-stage instrumental variables estimation applied to cross-sectional data and state unemployment rate, work experience, parental education, spouse characteristics as instruments for household income (Ettner, 1996:68). According to estimation results Ettner (1996) finds that both ordinary and Instrumental Variable (IV) estimates show that increases in income significantly improve physical and mental health but also rises alcohol consumption.

Mackenbach et al. (2002) compare inequalities in morbidity and mortality among Western Europe countries. They calculated odds ratios to compare a broad lower socio-economic group with a broad upper counterpart and they also calculated an absolute measure for inequalities in mortality, a risk difference which takes into account differences among countries in average rates of ill health (Mackenbach et al.,2002:3). According to their result inequalities in health exist all over Europe. Odds ratios for morbidity lie between 15 and 25 whereas the odds ratios for mortality ranges between 13 and 17.

Frijters et al. (2005) also mentions the direction of causality between income and health and on the importance of gradient linking socio-economic status to health outcomes. They investigate whether there was a causal impact of income changes on the health satisfaction of East and West Germans in the years following reunification by using reunification as a natural experiment that leads exogenous rise in East Germans's income and not for West Germans. In order to control for unobserved individual heterogeneity that might determine both income and health satisfaction fixed effects ordered logit model is used in the estimation (Frijters et al.,2005:999). They found that income causes a rise in health satisfaction but the size of the effect is small and a clear deterioration of health is observed over the analyzed period.

Van Ourti et al. (2009) begin their discussion by remarking EU countries declaration to couple income growth with reductions in income and health inequalities and how these goals can be achieved by presenting theoretical and empirical grounds. Their theoretical model indicates that the relationship between income and health is concave that proportional income growth rises mean health increasing pro-rich income inequality with constant mean income reduces mean health (Ourti et al.,2008:537). Furthermore they develop a decomposition technique that points to the important role of the income elasticity of health and if this elasticity increases with income, then proportional income growth may under certain conditions yield to greater income-health related inequalities (Ourti et al.,2008:526). The empirical results suggest that the marginal effect of income on health is positive and decreases with income justifying the concave relationship between income and health. However Ourti et al. (2008) also mentions that their analysis does not necessarily solve the endogeneity problem between health and income.

Van Kippersluis et al. (2009a) 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 estimation 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 (Van Kippersluis et al.,2009:827). In almost all countries, health is more dispersed among older generations implying that Europe has experienced a fall in overall health inequality over time (Van Kippersluis et al.,2009:818). Although there is no consistent evidence that health inequality increases as a given cohort ages, this is true in the three largest countries; United Kingdom (UK), France and Germany (Van Kippersluis et al.,2009:818).

In another study Van Kippersluis et al. (2009b) adopt a life cycle perspective in the evolution of socio-economic status health gradient for The Netherlands. Socio-economic indicators used in the study are education, income, work status and occupation. They show that socio-economic differences in health widen until middle age before narrowing in later years of life. The widening gradient is due to health related withdrawal from the labor force, resulting in lower incomes, and cumulative effect of education on health outcomes (Van Kippersluis, et al.,2009b:1). Furthermore the narrowing of the gradient in old age can be attributed to the fact that only robust individuals survive into old age (Van Kippersluis, et al.,2009b:1).

In a similar study Van Doorslaer et al. (2008) also investigate SES-health gradient in The Netherlands and compare the results to those of US. The conclusions are similar to Van Kippersluis et al. (2009b). Additionally they determine very similar pattern in the gradient both in The Netherlands and US despite striking disparities in health system finance and organization, income inequality, social protection and disability insurance. According to Van Doorslaer et al. (2008) fundamental mechanisms linking age, health, education and income are relatively unresponsive to policy parameters at least for western high-income economies.

Monden (2005) investigates the extent to which current and lifetime exposure to working conditions differ between educational groups in the Netherlands. The research question of the study is twofold; i)to what extent can differences in current or lifetime exposure to working conditions explain educational inequalities in health, ii)does taking into account lifetime exposure to negative working conditions rather than exposure at one moment improve the reasoning of educational inequalities in health (Monden, 2005:2466).

Monden (2005) uses Ordinary Least Squares (OLS) to estimate the impacts of current and lifetime exposure of working conditions and education on health separately for men and women. The results suggest that exposure to adverse working conditions only explains a small part of educational differences in health for women if relative lifetime exposure is taken into account. However the results for men are in the directions of expectations. Lifetime exposure to adverse working conditions decreases educational health differences by a third, while current exposure explains only 14 percent of the health difference between tertiary and primary educated men (Monden,2005:2474).

Kim and Durden (2007) uses latent growth-curve modeling to examine age trejectories of both physical and mental health by SES using panel data based on a national probability sample of 3167 US adults. One of the main aims of their study is to determine whether evidence supports cumulative advantage or age as leverer hypothesis. They find that education and income based gaps in physical deterioration and educational based gap in depression diverge over time supporting cumulative advantage hypothesis and income based gap in old ages converges supporting age as leverer hypothesis (Kim and Durden, 2007:2499).

Kagamimori et al. (2009) discuss the effect of education, occupation, income and unemployment on health in Japan. They argue that all factors with a prominent influence on SES, like environmental exposure, social environment, health care and behavior/lifestyle, demonstrate a smaller influence on SES because they show better values (Kagamimori et al.,2009:2159). Furthermore results show that different socioeconomic contexts and inequality contribute to the mortality, morbidity, biological and behavioral risk factors in Japan, although the pattern of the relationships may not necessarily be the same as in Western countries (Kagamimori et al.,2009:2159).

Kunst and Mackenbach (1997) examine different quantitative measures of the magnitude of socio-economic inequalities in health. The framework identifies the different perspectives, remarks the complementarity of simple and more sophisticated approaches, and suggests a whole series of summary measures (Mackenbach and Kunst, 1997:767). Their measures differ in many important aspects. For example measures differ in rela-

tive or absolute terms, the effect of lower socio-economic status, or of the total impact of socio-economic inequalities on the health status, and simple versus sophisticated techniques.

Kakwani et al. (1997) examines the relationship between relative index of inequality (RII) and the concentration index (CI) both of which are indices of health inequality. They use Dutch Health Interview Surveys (HIS) for the years 1980 and 1981 and concentrate on two measures of health status; chronic illness and self assessed health. Their results show that inequality is more pronounced if health is measured by self-assessed health than if it is measured by chronic illness (Kakwani et al.,1997:88).

Bago d'Uva et. al (2006) proposes the use of vignettes to overcome reporting heterogeneity. Their concern is not with the cross-country comparability of health measures but with the comparability of self-reported health across demographic and socio-economic groups within a country and the consequences of any systematic differences in reporting behaviour for measures of health disparities between these groups. They apply the vignettes methodology to data from the three largest Asian countries (Indonesia, India and China) in order to test for systematic differences in reporting of health. The hypothesis of homogeneous reporting across all socio-demographics is rejected for all countries and health domains (Bago d'Uva et. al, 2006:372). However they found that reporting heterogeneity does not appear to have a large quantitative impact on measured socio-economic disparities in health may be contingent upon the measurement of health (Bago d'Uva et. al, 2006:373).

Willson et al. (2007) investigate how multiple dimensions of socio-economic status are related to health differences as people age by examining if cumulative advantage hypothesis operates over life cycle. Using data from the Panel Stduy of Income Dynamics (PSID) drawn from 1984-2001, the study analyzes whether greater economic resources across the life course provide individuals with a cumulative advantage in health as they age (Willson et al., 2007:1887). Their health indicator is self assessed health and SES indicators are education and household income. Their conclusions are consistent with a path-dependent process of cumulative advantage whereby the over time compounding of

early advantages and disadvantages produces trajectories of health that diverge with age (Willson et al., 2007:1912).

Ross and Wu (1996) examines whether education based gap in health rises with age by using three indicators of health; self reported health, physical functioning and physical well being. They mention the importance of education of which shapes the likelihood of being employed, the kind of occupation and the amount of income. Their sample is from Work, Family, and Well-Being which is a 1990 telephone survey of a national probability sample of US households. According to results the SES gap in health diverges with age and no evidence of convergence in health among educational or income groups with age for any health measure (Ross and Wu, 1996:115).

In a detailed study Smith (2005) examines the different dimensions of SES-health relationship by looking at the both directions from SES to health and from health to SES. The study is divided into different sections. The first section investigates the issue of reverse causation from health to out of medical expenses, labor supply, household income and household wealth. In the second section the perspective is switched by asking whether the so-called direct causation from SES to health really matters that much (Smith, 2005:110). Smith (2005) find out that new serious health events have a quantitatively large impact on work, income, and wealth. SES also affects future health outcomes, although the primary factor here is education and not an individual's financial resources (Smith,2005:129). Furthermore the principal financial measures of SES such as household income and household wealth do not seem to be related to individual health outcomes (Smith,2005:129).

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). Current realizations of both economic status and health reflect a dynamic history in which both health and SES are mutually affected by each other (Smith, 2007:760). Education plays the most important role in the causation of SES to health. On the other hand financial resources do not have a considerable impact whether they are in form of income or wealth. Additionally results are robust across new

health outcomes that take place across the short and intermediate time frames (Smith, 2007:762).

Sacker et al. (2005) use growth curve models (GCM) to examine change in health inequality between the years 1991-2001 by using pooled cross sectional data from British Household Survey. They argue that GCM allows to separate the effects of aging, period and cohort and test two hypothesis: whether social inequalities rise with age and whether social mobility acts as a constraint in the magnitude of social inequalities in self assessed health. They argue that a quadratic growth curve for self assessed health better represents health changes with age than a linear curve implying that health deteriorating more with each additional year at older ages than younger ages. Dynamic analysis of health inequalities conducted present narrower inequalities than those observed for cross sectional analyzes at a single time point (Sacker et al.,2005:499). Moreover social mobility acts to dilute or constrain social inequality and low autonomy, rewards, and security at work are associated with greater declines in health. (Sacker et al.,2005:499). Sacker et al. (2005) also proposes policy implications such as increasing autonomy and security at work, improving employment relations and encouraging social mobility.

Deaton (2007) investigates the relationship between life and health satisfaction and national income, age and life expectancy by using 2006 Gallup World Poll for over one houndred countries. 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. In the rich countries people in their 50s, not in their 60s or 70s, who report the least satisfaction with their health and the highest level of disability (Deaton, 2007:32).

Xu (2013) examines the effects of wages and working hours on health behaviors of low educated individuals by using data from Behavioral Risk Factor Surveillance System (BRFSS), National Health Interview Survey (NHIS) and Current Population Survey (CPS) for US between the years 1984-2005. Estimates of the impact of wage and working hours on health behavior are obtained from two-sample instrumental variables approach

(TSIV) since it is an appealing approach to overcome the data limitation on wages, work hours and health (Xu,2013:127). Health status is proxied by smoking habits, alcohol use, physical activity and doctor visits. Results suggest that changes at the extensive margin of labor supply associated with economic activity, rather than changes in income has the most important effects on health (Xu, 2013:134).

Bender and Habermalz (2005) investigate the relationship between SES and health status across ages by using 2002 German Socioeconomic Panel (GSOEP) and by correcting for endogeneity between SES and health. Their health indicator is self assessed health. The results imply important differences in the SES-health relationship exist across age groups. Income has an increasingly important effect on the health satisfaction of women over the life cycle while the effect of unemployment on health satisfaction if strongest for young males (Bender and Habermalz, 2005:11).

Zhao(2005) identifies health determinants in urban China by employing Grossman's health demand model. The data set is the China Health and Nutrition Survey (CHNS) for the year 2000 (Zhao, 2005:6). The health measure is self reported health status. The results show that education has an important increasing effect on health whereas the cost of health care services has a negative effect. However, effects of wage rate and household income are insignificant (Zhao, 2005:11).

Deaton and Paxson (1997) examine whether inequality in health status increases with age and how the distribution of health and income evolve over life course. They use interview Survey (NHIS) and Panel Study of Income Dynamics (PSID) for US between the years 1983-1994 and 1984-1992 respectively. The approach is to track the moments and co-moments of self reported health status and household income over time for individuals from the same birth cohort (Deaton and Paxson, 1997:250). Their results show that health status decline with age and decrease in household income but the pace of decline is grater for women. One implication of the results would be labor supply and earnings ability are adversely and cumulatively affected by health shocks, so that poor health and low income are increasingly correlated with age (Deaton and Paxon, 1997:252). Furthermore the gradient between health and income becomes stronger over time.

Adams et al. (2003) analyzes the association of socioeconomic status and health by applying Asset and Health Dynamics of the Oldest Old (AHEAD) Panel for US. They test for the absence of causal links from socioeconomic status (SES) to health innovations and mortality, and from health conditions to innovations in wealth (Adam et al.,2003:5). They also provide statistical methods for measurement errors and test for causality. The evidence supports the hypothesis of no direct causal link from SES to mortality and to incidence of most sudden onset health conditions (accidents and some acute conditions), once initial health conditions are controlled, but there is some association of SES with incidence of gradual onset health conditions (mental conditions, and some degenerative and chronic conditions), due either to causal links or to persistent unobserved behavioral or genetic factors that have a common influence on both SES and innovations in health (Adam et al.,2003:51).

Charles and Decicca (2008) investigates the relationship between local market conditions and different measures of health for working men living in the largest 58 metropolitan areas in US. They find systematic evidence of pro-cyclical relationships for weight-related health and, mental health and these relationships are most pronounced for individuals in the lowest predicted employment deciles and for African-Americans (Charles and Decicca,2008:1547).

Lindeboom and Kerkhofs (2002) examine the relationship between health and work decisions of elderly workers by using Dutch longitudinal survey. Their study consists of three stochastically related parts. First part is a model for work, where together with socio-economic and demographic variables, financial incentives and health are allowed to affect retirement behavior (Lindeboom and Kerkhofs,2002:23). Second one is a model for health that relates past labor market outcomes to current health levels (Kerkhofs and Lindeboom,2002:23). Third part is a model for reporting behaviour that translates the observed subjective health measure into a health index that is free of reporting errors (Lindeboom and Kerkhofs,2002:23).

Coe and Lindeboom (2008) investigate the direct impact of retirement on later-life health by using early retirement windows, which are special incentives to retire at a spe-

cific time offered by employers to employees and are exogenous to an individual? health, as an instrument for retirement. They use data from the Health and Retirement Survey (HRS) for US. The IV estimates suggest that there are no negative health effects of retirement and these findings hold for different types of workers and are robust with respect to use of different instruments (Coe and Lindeboom, 2008:18). Coe and Lindeboom (2008) also find some evidence of improvements in health of highly educated individuals.

Beckett (2000) examines whether the educational differences in self reported chronic and serious conditions converge in old ages and whether sample selection due to mortality explain any convergence in education differentials in chronic or serious conditions at older ages. The data for this study is from NHANES I Epidomologic Followup Study (NHEFS) 1982-1984 through 1991 which contains information on basic social and demographic characteristics, extensive self reported health, and risk factor information as well as physical examination(Beckett, 1991:108). The results of the ordinal logistic regression 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. Additionally cross sectional data results are consistent with convergence of health inequalities in later life.

Cutler et al. (2008) focus on four dimensions of socioeconomic status; education, financial resources, rank, and race and ethnicity, paying particular attention to how the mechanisms linking health to each of these dimensions diverge and coincide. They use data from the National Health Interview Surveys of 1986 through 1995 for US, and consider two commonly used measures of health: mortality, an objective but blunt measure of health, and self-reported health status (SRHS), which captures quality of life and has been shown to be highly correlated with objective measures of health, including mortality (Cutler et al.,2008:5). 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.(Cutler et al.,2008:5). In other words their results show that in most of adulthood, income and wealth no longer appear to have a large affect on health but education

continues to be a powerful determinant.

Herd (2006) examines whether functional inequalities grow, stagnate, diminish, or disappear in old age and mortality selection and cohort effects are responsible for declining health inequalities in later years of life by using 1992-2002 Health and Retirement Study for US. The study uses a random coefficient growth curve model (Herd, 2006:384). The results of the study provide support for the age-as-leveler hypothesis with regard to how education and functional health interact across the life course. Educational functional health disparities consistently widen until age 63, after which they start to diminish (Herd, 2006:389).

Lynch (2003) investigates how cohort structures the influence of education on life-course health trajectories by applying basic regression analysis and random-effects models to National Health Interview Survey (NHIS) and the National Health and Nutrition Examination Survey (NHANES) and its follow-ups (NHEFS) for US. The results show that the effect of education is increasing in magnitude across birth cohort, and that the life-course effect is quadratic in cross-sectional data but can be modeled as linear and is increasing in panel data (Lynch, 2003:325). Furthermore, in terms of the cohort effect, the effect of education is increasing across successive birth cohorts (Lynch, 2003:326). Results also provides evidence supporting cumulative advantage hypothesis.

Sacker et. al (2007) put forward a review on associations between health and socio-economic circumstances during 11 year period in the United States and the United Kingdom by using US Panel Study of Income Dynamics and The British Household Panel Survey for the years 1990-2002. They used latent transition analysis to investigate change in self reported health from one discrete state to another (Sacker et al.,2007,812). One of their conclusions is that health states and change in health states over time are quite similar in two countries. The health of the US population is no more likely to depreciate than the health of the UK population, but the latter had a higher likelihood for improvement (Sacker et al.,2007:816). They also find evidence on worse socio-economic status causing poor health.

Table 2.1 shows literature related to our study in three categories; i) health demand and life cycle models, ii)empirical studies on SES-health relationships, iii)measurement issues such as reporting heterogeneity, justification bias and endogeneity. Some studies can enter in more than one category. We mentioned measurement issues are involved in the examination of SES-health. Although we do not provide literature on measurement issues in detail in this section one can refer to Section 5 for further information.

Table 2.1 Literature Survey on SES-Health Nexus

Health Demand and Life Cycle Models
Grossman(1972), Grossman(2000), Grossman(2003), Muurinen(1982),
Muurinen and Le Grand(1985), Kemma(1987), Leibowitz(2004),
Galama and Kapteyn(2011), Case and Deaton(2005), Bleichordt and Quiggin(1999)
French and Jones(2011), Bloom et al.(2004), Dwyer and Mitchell(1998)
Kalemli-Ozcan and Weil(2002)
Empirical Studies on SES-Health Relationship
Kemma(1997), Case and Deaton(2005), Bleichordt and Quiggin(1999)
Bound et al.(1998), McGarry(2002), Dor et al.(2003), Ettner(1996)
Coe and Zamarro(2011), Dave et al.(2006), Mackenbach et al.(2002)
Frijters et al.(2005), Van Ourti et al.(2009), Van Kippersluis et al.(2009a)
Van Kippersluis et al.(2009b), Van Doorslaer et al.(2008). Monden(2005)
Kim and Durden(2007), Kagamimori et al.(2009), Kunst and Mackenbach(1997)
Kakwani et al.(1997), Willson et al.(2007), Ross and Wu(1996), Smith(2005)
Smith(2007), Sacker et al.(2005), Sacker et al.(2007), Deaton(2007), Xu(2013)
Bender and Habermalz(2005), Zhao(2005), Deaton and Paxson(1997), Adam et al.(2003)
Charles and Decica(2008), Lindeboom and Kerkhofs(2002), Coe and Lindeboom(2008)
Beckett(2000), Cutler et al.(2008), Herd(2006), Lynch(2003)
Studies on Measurement Issues
Bound et al.(1998), Dor et al.(2003), Ettner(1996), Kunst and Mackanbach(1997)
Bago d'Uva et al.(2006), Xu(2013), Bender and Habermalz(2005)
Adam et al.(2003) Linndeboom and Kerkhofs(2002), Coe and Lindeboom(2008)
Kerkhofs and Lindeboom(1995) Bound(1991), O'Donnel(1998), Kreider(1999)
Murray et al.(2003), Murray et al.(2004) Tendon et al.(2004), Terza et al.(2007)
Dwyer and Mitchell(1998), Horrace and Oaxaca(2006)

3. DATA and DESCRIPTIVE TURKISH EVIDENCE ON SES GRADIENT IN HEALTH

Individuals with lower socio-economic status suffer from poor health irrespective of whether it is measured by self-reported health, disability or mortality and socio-economic gradient in health is strongly established in many countries (Smith 1999, Smith 2007, Marmot 1999, Kunst and Mackenbach 1997, Van Kipperluis 2009b, Van Doorslaer 2008). However static relationship between health and SES does not give sufficient information on how much more rapidly health declines for some individuals than others over life cycle. Forming a single theory that captures the SES gradient in health is inadequate and right theory of socioeconomic gradients in health must emphasize the life cycle (Cutler et al. 2008, Van Dorslaer et al. 2008, Smith 2007).

Furthermore, SES is not a one-dimensional concept and knowing which aspect of SES affects health is key to the policy debate surrounding the SES-health gradient. For instance aging of the populations puts pressure on social security systems so that it becomes crucial to determine which occupational groups suffer from poor health over life cycle. Turkey which is a young populated country has launched a series of changes in health and retirement policies recently which necessitates to determine the link and causal mechanisms between SES and health.

In this respect, we try to demonstrate the life cycle behavior of SES-health gradient in Turkey in this section by using cross section data from 2010. The aim here is not to determine the causality from SES to health but to form a context that put forwards the magnitude and nature of SES gradient in health and to form a substructure for the following two sections of which analyze the impact of SES on health.

Literature is divided between two approaches on the evolution of socioeconomic gradient in health over life cycle; *cumulative advantage hypothesis* and *age-as-leverer hypothesis*. 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. 2007:1890). On the other hand, age-as-leveler hypothesis suggests that deterioration in health is an inevitable part of the process of aging and irrespective of economic means or social position, with the result that SES-health gradient narrows at advanced ages (Beckett, 2000:109). A compromise scenario, for which there is growing evidence, 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 of health strengthen relative to the socioeconomic determinants (Van Doorslaer et. al 2008:14).

We measure health status by self assessed health (SAH) based on a survey question about how the individuals perceive their health.[2] Although SAH is subject to measurement error which may bias measurement of socio-economic gradient in health, it is known to be a very good predictor of health outcomes (Bago d'Uva et al. 2008:353).

As we mentioned according to cumulative advantage hypothesis socio-economic advantages that influence health accumulate over the life course. On the other hand, according to age-as-leverer hypothesis dependence of health on age increases at older ages and so the contribution of socioeconomic determinants falls (Van Doorslaer, 2008:24). Generally, the evidence is consistent with cumulative advantage operating until middle age and age as leverer kicks in after middle age with age acting as a leverer over the years of retirement (Van Doorslaer et al. 2008, Van Kipperlusi et al. 2009, Case and Deaton, 2005, Smith 2005, Herd 2006). 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, 2008:25). 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). Since the data used

[2]Further information about the SAH variable can be found in the following sub-section. We used only SAH, disability and chronic illness as indicators of health status.

here is cross section, we lack to observe cohort effects due to data limitations. Turkstat Income and Living Conditions Surveys between 2006 and 2010 were available during the conduct of this study. However we believe that time duration smaller than 10 years would be insufficient to cover the cohort effects. In addition we also believe that analysis applied in this study still gives the general structure of the SES-health gradient that may be important for policy designs.

Another limitation would be due to selective mortality. At older ages the most robust of the lower socioeconomic groups survive given that mortality is firmly 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. 2009b, 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. One approach is used to deal with selective mortality is to keep the dropouts in the sample and to impute their health scores by assigning a health score that is lower than the worst category or by imputing health scores for non-respondents from survivors with the same background characteristics (Van Doorslaer et al. 2008:27). Another approach is to use panel data to estimate individual-specific health trajectories from within-individual variation and then average these variations across individuals (Van Doorslaer et al. 2008:27). Once again due to data limitations we cannot observe selective mortality explicitly.

"Justification bias" would also be another 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. 2006:354). For example people who are early retired would exaggerate their poor health status in order to justify early exit from the labor force.

In the light of above discussion, we present SES gradients in health in the following sections to see the dynamic relationship between SES and health and to form a precursor of evidence on causal impact of SES on health which would have crucial policy implica-

tions. Next sub-section gives information about the data used in the study.

3.1 Description of The Data and Variables

The data used come from the wave of Income and Living Conditions Survey (ILCS) of Turkey for the year 2010. The survey has been conducted by Turkish Statistical Institute (Turkstat) within the scope of the studies compliance with European Union (EU). Turkstat describes the data as the following: Questionnaire on Income and Living Conditions Survey was formed in order to provide target variables requested by EUROSTAT for obtaining detailed information about income, poverty, social exclusion and living conditions with respect to the region and population. The entire members of the households that live within the borders of the Republic of Turkey were included within the scope. However, the population in the aged home, elderly house, prisons, military barracks, private hospitals, hotels and child care centers together with the immigrant population were excluded out of scope. Settlements with a population of 20001 and over are defined as urban, 20000 less are defined as rural. The reference period for income is the previous calendar year, reference period for labor is the previous week from the survey and current date, and the reference period concerning the indicators on the living conditions is current situation.

Income and Living Conditions Survey consists of three sub-surveys; for households, for all household members and for household members 15 years of age and over. Household survey contains information on housing, economic situation of the household and ownership of assets. Survey for all household members includes information on demographic characteristics and status of continuing education and time spent for the social-cultural activities of school age children. Survey for household members older than 15 contains information on education status, marital status, general health status, employment status, income obtained from various activities, social transfers and work history. There are 12106 households, 45389 household members. After excluding individuals younger than 25 we have 25503 individual observations of whom 12310 are men and 13193 are women. Since the analysis is focused on adults, we exclude people under 25. Further information about the whole data set can be found in Appendix A.

3.1.1 Health Variables

Self Assessed Health Status: Self assessed health is obtained from the question "How do you rate your health". The variable originally has five categories; i.very good, ii.good, iii.fair, iv.bad, v.very bad. However the subjective health variable used in the study is reduced to two categories; good and bad. Good health contains very good and good health status, while bad health contains, very bad, bad and fair health status. One potential problem with self-assessed health is that it is object to measurement error which may lead biased estimation results. People may implicitly compare their health with that of those around them and people who live in communities with poor health may rate their health higher than people with the same general health status in a different community with better average health (Kington and Smith, 1997:806). Despite imposing measurement error in its nature, self assessed health is known to be a very good predictor of other health outcomes such as mortality (Idler and Benyamini, 1997:23).

Chronic Illness: Chronic illness is a binary variable indicates whether the individual has a chronic illness such as hypertension, diabetes, asthma, renal failure, cardiovascular diseases and etc.

Limitation in Daily Activity: The variable indicates whether the daily activities are limited due to a health problem and has three categories originally; i.limited very much, ii.limited, iii.not limited. Original variable is reduced to two categories; as limited and not limited. Limitation in daily activity may serve as an indicator of disability.

3.1.2 Income Variables

*Income Quartiles:*Income quartiles are obtained from the incomes from certain activities, such as wage, salary, entrepreneurial income, unemployment benefit, disability benefit, pension and scholarship. Per capita household income is calculated by using OECD equivalence scale which assigns 1 for the head of household, 0.5 for each other person if he is older than 14 and 0.3 if he is younger than 14. The first quartile is the value in the data set that holds 25% of the values below it and third quartile is the value in the data set that holds 25% of the values above it.

3.1.3 Education Variables

Education Quartiles: Education quartiles are obtained from the education level variable in the survey. The first quartile is the value in the data set that holds 25% of the values below it and third quartile is the value in the data set that holds 25% of the values above it. First two quartiles have illiterate individuals and primary education respectively. Third quartile contains secondary education and forth quartile has high&vocational high school and higher education.

Education Level: Education level shows the degree completed and has six categories, i)illiterate (contains illiterate individuals and literate individuals who has not completed a degree) ii)primary school, iii)secondary school, iv)high school, v) vocational high school and vi)university or higher. First two categories can be regarded as low education, secondary school, high school and vocational high school as medium education and university or higher as high education.

3.1.4 Labor Variables

Work Status: Work status is classified according individual's own definition of the current work situation and has eight categories. i)employed-full time. ii)employed part-time, iii)unemployed, iv)student, v)retired, vi)seasonally employed, vii)disabled and viii)home production. We reduced work status variable into two categories; working and non-working.

Occupation: Occupation gives the individual's occupation code according to ISCO88. Managers, professionals, associate professionals, office clerks, service workers and artisans are regarded as white collar-workers and agriculture workers, skilled&unskilled workers as blue-collar workers.

Labor Force Participation: Labor force participation shows whether the individual is in or out of labor force.

Employment: Employment shows whether an individual in the labor force is employed or not.

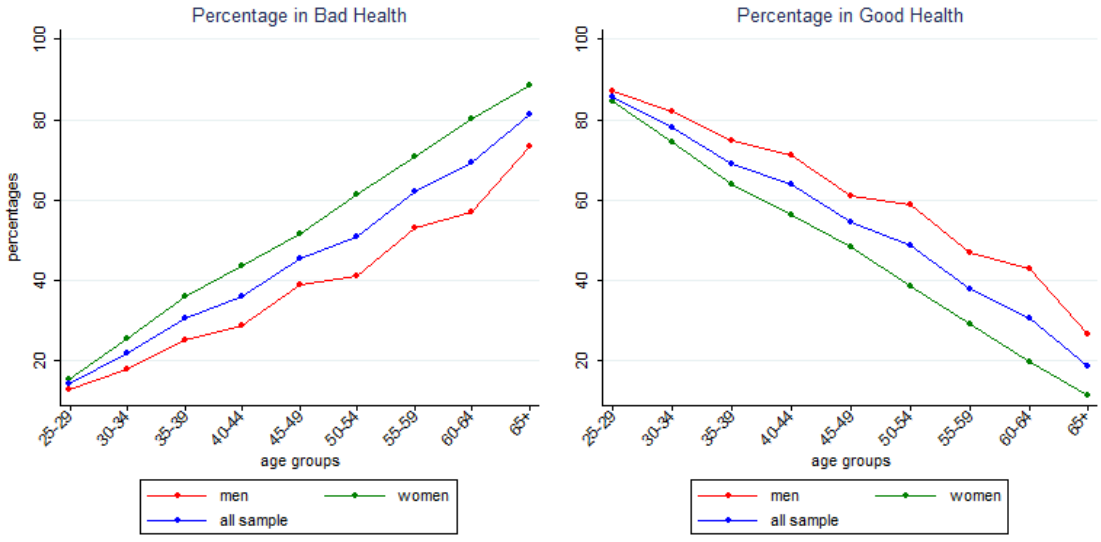
3.2 SES-Health Gradient and Descriptive Analysis

In this section evolution of SES gradient in health is depicted by using Turkstat Income and Living Conditions Survey. First, differences in self-assessed health by household per capita income over the adult life course is illustrated. Next disparities in self-assessed health by education and labor are presented. Given US evidence the theory provides stronger support for causal impacts of education and labor on health trajectories rather than income (Van Doorslaer et al., 2008:39). Our aim is to demonstrate whether Turkish evidence supports the same conclusion. Although we do not try to assess the causal impact of SES on health in this section we try to put forward a pioneer to such analysis. The sample used in the study is restricted to the adults older than 25.

3.2.1 Self Assessed Health by Age

Before analyzing the SES gradient in health through life course we present the average picture according to gender.

Figure 3.1: Self Assessed Health by Age According to Gender



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Left panel of Figure 3.1 shows the percentage of individuals in bad health by age according to gender and right panel shows percentage in good health. Bad health refers

to less than good health and includes categories fair, bad and very bad health. Good health refers to good and very good health. Percentages in bad and good health could be treated as the probability of being in bad(good) health given the age and gender, such as: $Prob(badhealth/gender\&age)$ and $Prob(goodhealth/gender\&age)$.

First, not surprisingly, bad health increases with age and men report better health than women in every age category. Second, percentages of individuals in bad and good health are very close for men and women in the first age group and then gap starts to widen after the age 29 and reaches the biggest size after age 49 until 60 indicating the biggest difference in the range of middle age. Another observed pattern revealed by the slopes of the curves is that deterioration rate of health is larger for women. For instance, about 57 percent of women report bad health in age group 45-49, while this ratio is only attained in the age group 55-59 for men. After age group 60-64 the difference between men and women begins to narrow but we can not observe the trend after the age 65 due to data limitations.[3] The convergence of health status for men and women in old ages would be due to selective mortality in old ages which leaves the healthiest individuals in the sample.

Health-reporting differences between men and women could be related to the social welfare incentives, social roles that the society imposes on different genders, justification bias or selective mortality. Labor force participation for women is very low in Turkey (about 35 %). One reason for low level of health status for women might be to justify the fact that they do not work. Selective mortality might obscure the deterioration in health with age observed in survey data, which is obviously restricted to the more robust survivors (Van Doorslaer et al., 2008:27).[4] Social roles would also be the reason behind the different perception of health for men and women since women spend more time in household work, child care and less time in employment and leisure. However correcting

[3]One important disadvantage of the data is that age is given only as a category variable and do not have further categories after age 65 which makes impossible to observe the evolution of health in old ages.

[4]As discussed before selective mortality can be adjusted by keeping the deceased and the dropouts in the sample and by using panel data to estimate individual-specific health trajectories from within-individual variation, and then average across individuals.

for justification bias, selective mortality and social roles are out of scope of this study due to data limitations.

3.2.2 Self Assessed Health by Income

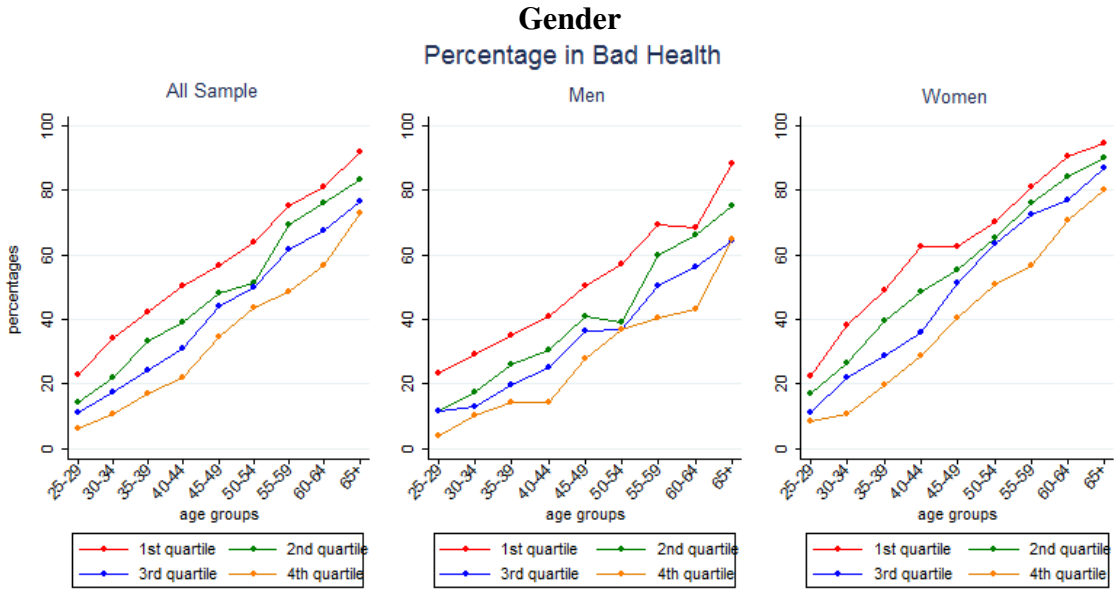
Income is attributed as the first indicator of socio-economic (SES) status. Income is the household income per capita adjusted by OECD equivalence scale in which 1 is assigned for the head of household, 0.5 for each other person if he/she is older than 14 and 0.3 if he/she is younger than 14. Self assessed health status of individuals from different income quartiles are compared. First income quartile represents the lowest quartile (lowest income group), whereas the forth income quartile represents the highest quartile (highest income group).

Figure 3.2.A and Figure 3.2.B show self assessed bad and good health according to income quartiles respectively. Income gradient in health is clear from both of the figures. Individuals in higher income quartiles always report better health with respect to worse counterparts for both men and women. Again one can think of percentages in the figures as:

$$Prob(goodhealth/1^{st}quartile\&age\&gender).$$

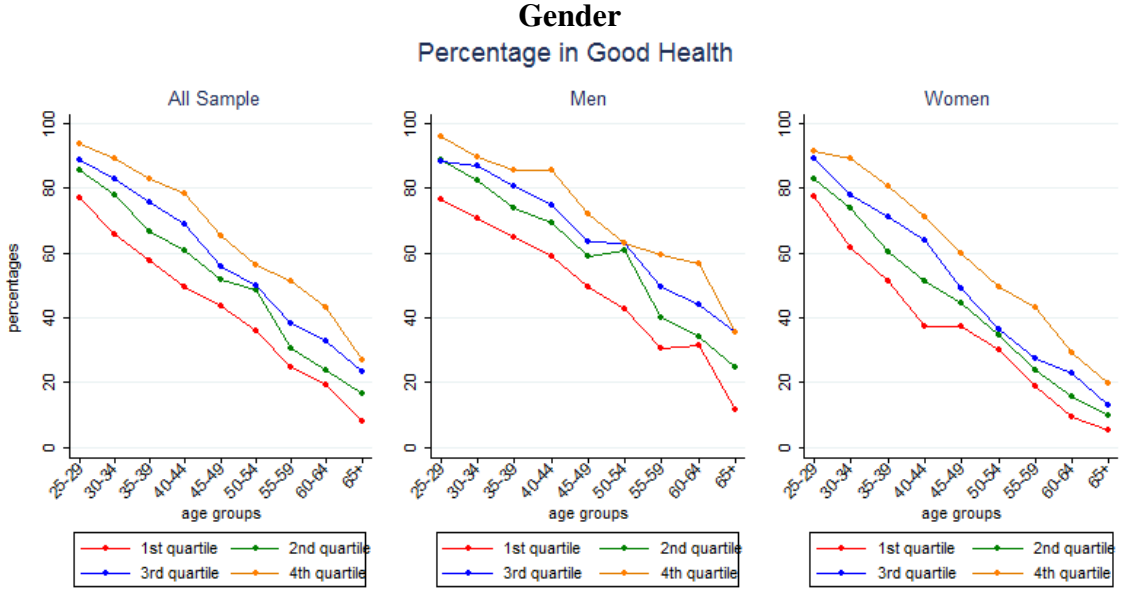
Although the income gradient is obvious, we observe different patterns for men and women. Let's compare the bottom and the top income quartiles that are depicted with red and orange lines respectively. Although the starting points of top and bottom income quartiles are very close to each other, the rate of deterioration, which is given by the slope of the curves, is greater for women. For men income gradient between the bottom and top income quartiles stays the same in young ages and income differences in health diverges in 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 age 45 for women. The immediate divergence for women would be due to justification bias and/or social roles.

Figure 3.2.A: Self Assessed Bad Health by Age According to Income Quartiles and Gender



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.2.B: Self Assessed Good Health by Age According to Income Quartiles and Gender



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

About 40% of men aged 40-44 in bottom income quartile report bad health (prevalence of morbidity), whereas the same rate is only reached at 50-59 age group for top income quartile. About 62% of women aged 40-44 in bottom income quartile report poor health

and this ratio is attained somewhere between 55-59 and 60-64 for women who are in the top income quartile. Additionally one striking feature of the figure for men is the modest drop of prevalence of morbidity in bottom income quartile between the age groups 55-59 and 60-64. The fall in morbidity rate in the bottom quartile could 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 older ages.

3.2.3 Self Assessed Health by Education

Educational attainment is an essential determinant of health in both consumption and investment models of the demand for health. Education increases the efficiency with which gross investments in health are produced then the more educated people would demand a larger optimal stock of health and they are more efficient producers of health (Grossman, 1972:247). Additionally, educational attainment hardly varies over adulthood and so it will not affected by adult health (Van Doorslaer et al., 2008:55). This structure of education does not hold for income which is contingent on labor market behavior.

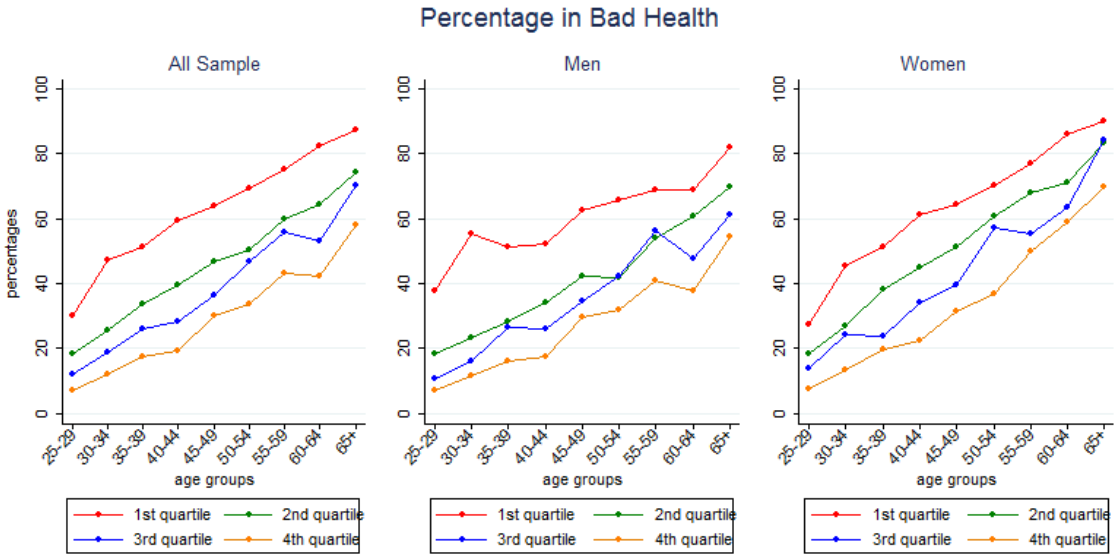
In this section two different measures of educational attainment are used as a determinant of socio-economic status. First one is the education quartiles. First quartile includes illiterate individuals, second quartile includes primary education, third quartile refers to secondary education and forth quartile involves individuals who have completed high/vocational high and university or higher education. Second measurement is due to education levels, low, medium and high. The low education group includes individuals are illiterate and only finished primary school (about 68 percent of whole sample), the medium education group involves people who have finished secondary education, high and vocational high school (about 22 percent of whole sample) and finally high education

group refers to individuals who has university or higher degree (about 10 percent of whole population). Figure 3.3.A and Figure 3.3.B shows percentages of individuals who report good and bad health by age according to education quartiles and gender and Figure 3.4.A and Figure 3.4.B depicts the percentages in good and bad health according to education levels.

As in the income gradient, men always report better health in every education and age category when we compare bottom and top education quartiles. 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 3.2.A and Figure 3.2.B, 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 that affect health 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. 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., 2008:56).

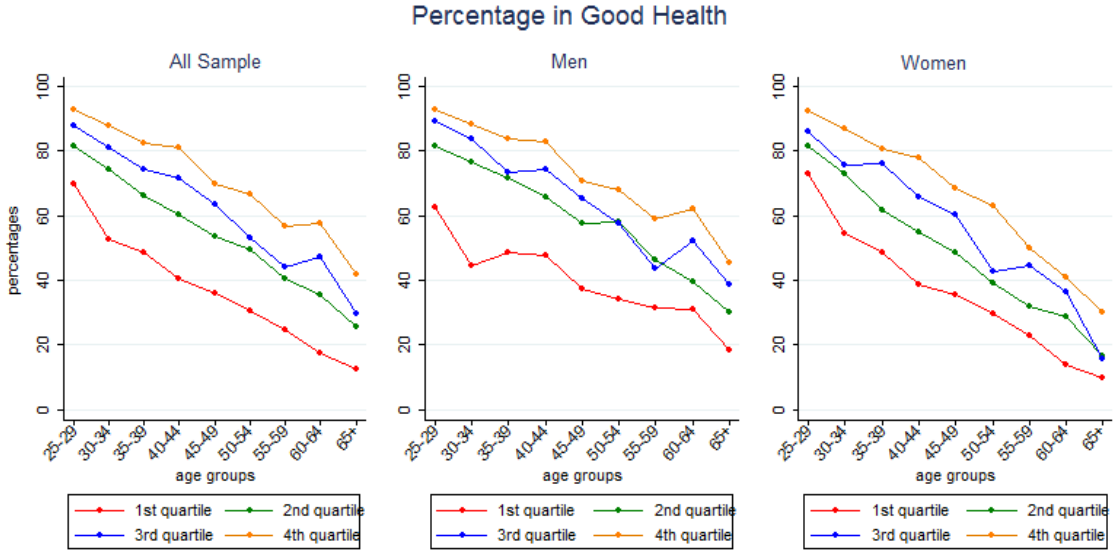
About 50% of men aged 40-44 report poor health in the bottom education quartile whereas this ratio is only reached at the age 65+ for men in top education quartile. Similar structure is also valid for women; about 60% of women aged 40-44 in the bottom education quartile report bad health while this proportion is attained after age 60-64 for the top education quartile. Furthermore the magnitude of education gradient for women in almost every age group is smaller than men in contrast to income gradient.

Figure 3.3.A: Self Assessed Bad Health by Age According to Education Quartiles and Gender



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.3.B: Self Assessed Good Health by Age According to Education Quartiles and Gender



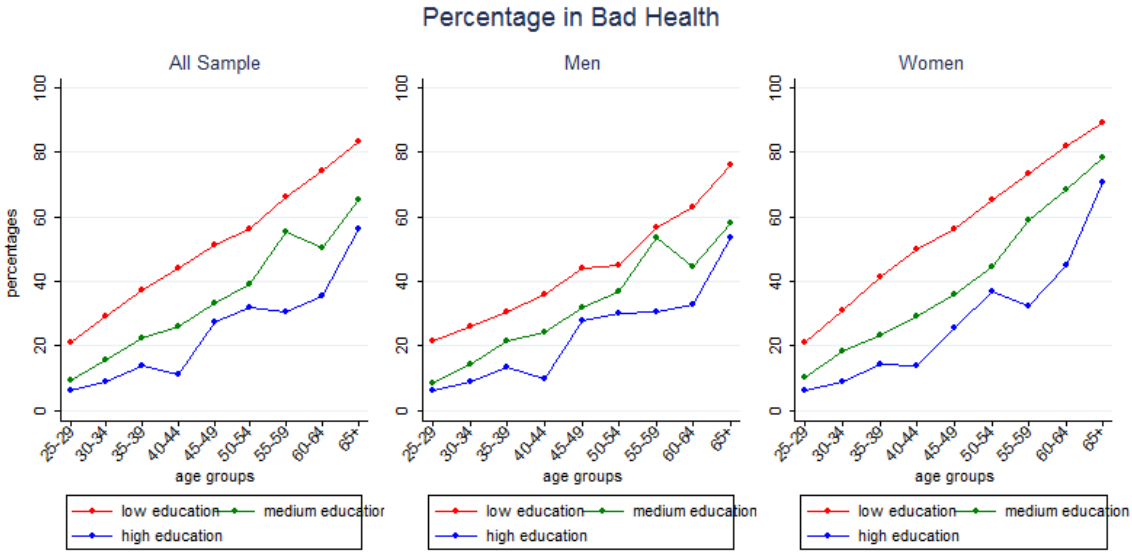
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Strong education gradient is observed which remains slightly stable through younger and early middle ages and then starts to narrow in late middle ages. Slight decrease in poor health between the age groups 55-59 for men and 60-64 for women for both bottom and top education quartiles would be due to selective mortality as in the picture in income gradient.

The difference in the magnitudes of income and education gradients might be due to the differential responsiveness of education and income to health. The difference with the pattern for men may be attributed to differential disease patterns, with low educated women being less prone to the onset 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., 2008:57).

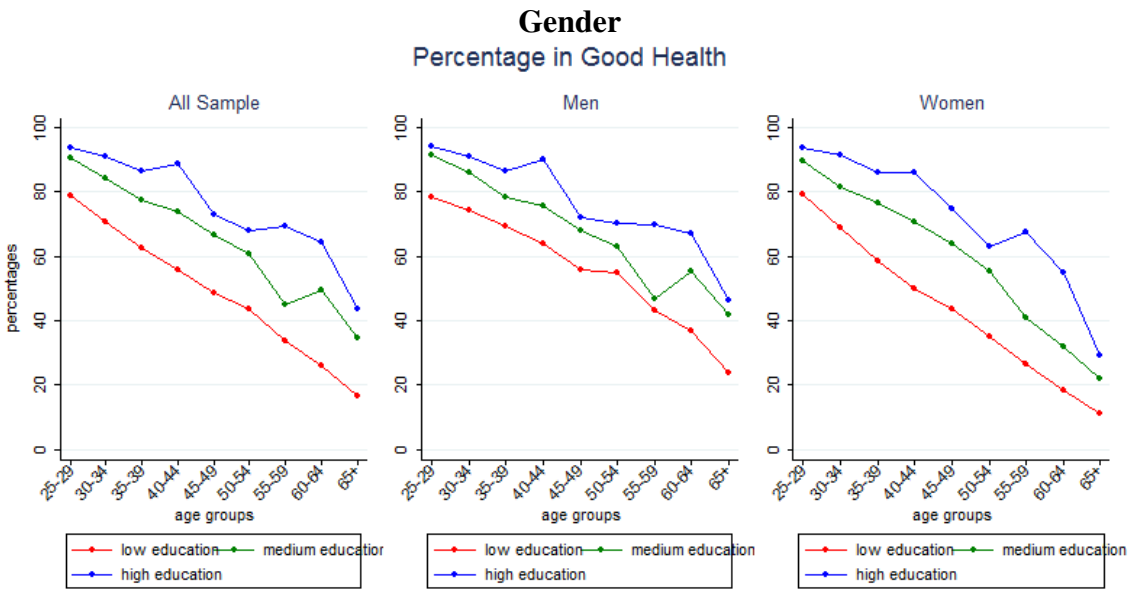
Figure 3.4.A and Figure 3.4.B give the percentages in self assessed bad and good health by age according to education levels and gender. The strong education gradient for both men and women is also obvious from the pictures. However the magnitude of the education gradients for men and women changes essentially with respect to education quartiles. Now the size of education gradient is more pronounced for women and less pronounced for men. For instance according to Figure 3.4.A about 37 % of low educated men in the age group 40-44 report bad health whereas this ratio for low-educated women in the same age group is about 50 %. When we look at the individuals who have high education in the same age groups the difference between men and women is less pronounced. About 10% of high educated men in the age group 40-44 report bad health and about 17% of high educated women in the same age group report poor health. The ratio of high educated individuals who report poor health being close to each other for men and women and the ratio of low educated people in bad health being much more greater for women implies the widening of education gradient in health almost in every age category. In the age group 55-59 the difference between low and high educated individuals who report good health is about 30% for men and 45% for women. This difference can be attributed to altered definition of education levels and higher education (university of higher) might be the major force that makes the difference for women.

Figure 3.4.A: Self Assessed Bad Health by Age According to Education Levels and Gender



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.4.B: Self Assessed Good Health by Age According to Education Level and Gender



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

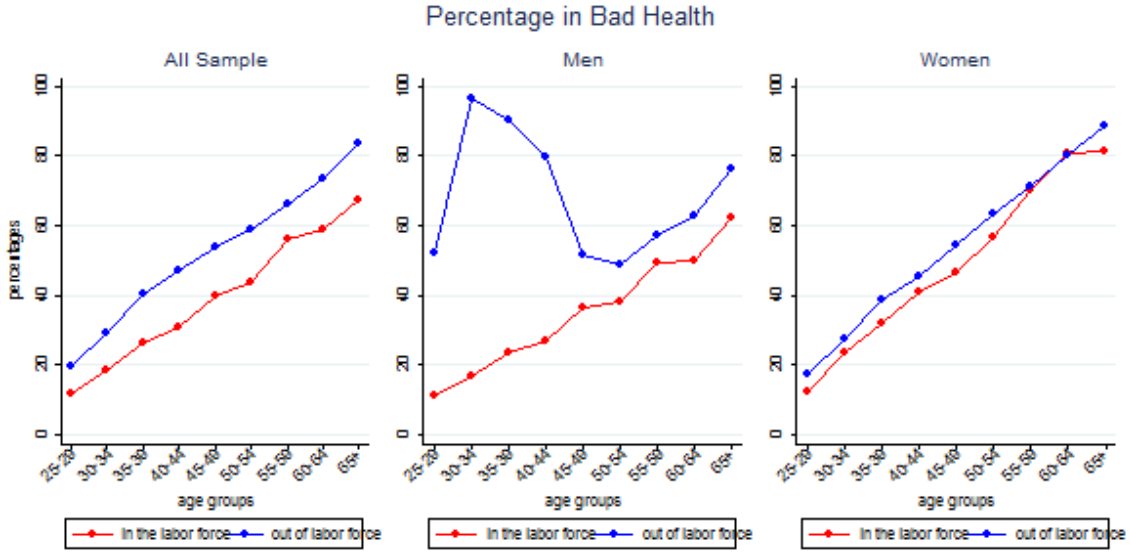
3.2.4 Self Assessed Health by Labor Indicators

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, 1972:247). 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, 2008:59). In this respect this section presents the evolution of self assessed health through life cycle according to basic labor indicators such as labor force status, work status, employment status and work type.

Figure 3.5.A and Figure 3.5.B show the percentages in bad and good health according to labor force status respectively. Individuals in the labor force are whether working or unemployed. 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 are ambiguous (Bender and Habermalz, 2005:6).

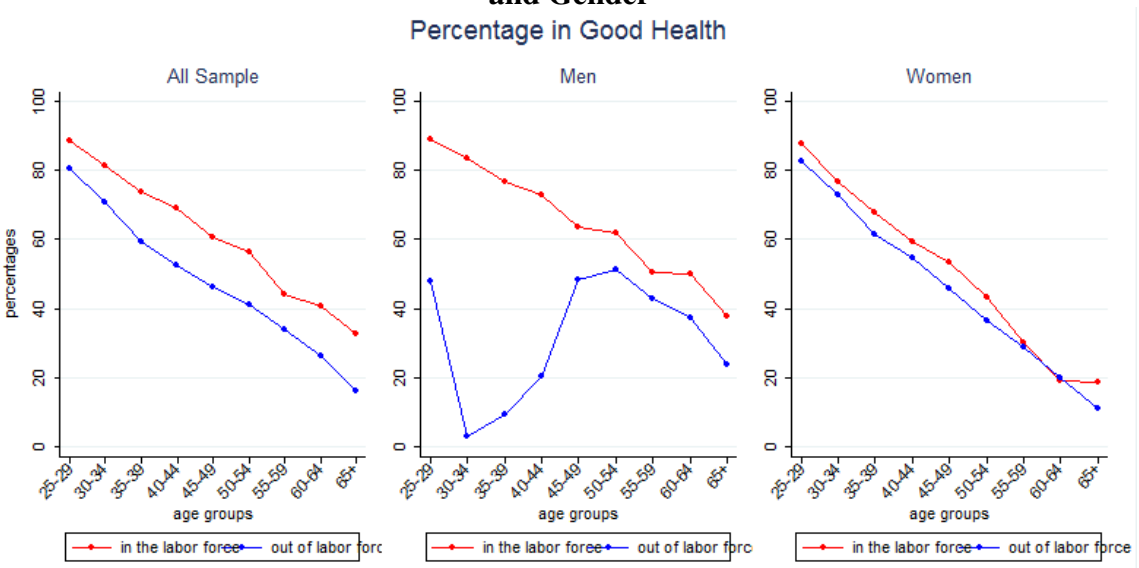
Figure 3.5.A and Figure 3.5.B reveal many interesting patterns. First, individuals in the labor force report better health than individuals out of labor force for both men and women. Next, labor force gradient in health is more pronounced for men than the gradient for women. For men labor force gradient widens at the younger ages and reaches the maximum at the age group 30-34, then begins to narrow after age 45. Huge labor force gradient at young ages could be due to the fact of justification bias or serious health problems that make individuals to stay out of labor force. On the contrary, labor force gradient is not prominent for women implying low level of labor force participation for women. Furthermore, women's health is not responsive to labor force status as health of men.

Figure 3.5.A: Self Assessed Bad Health by Age According to Labor Force Status and Gender



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.5.B: Self Assessed Good Health by Age According to Labor Force Status and Gender



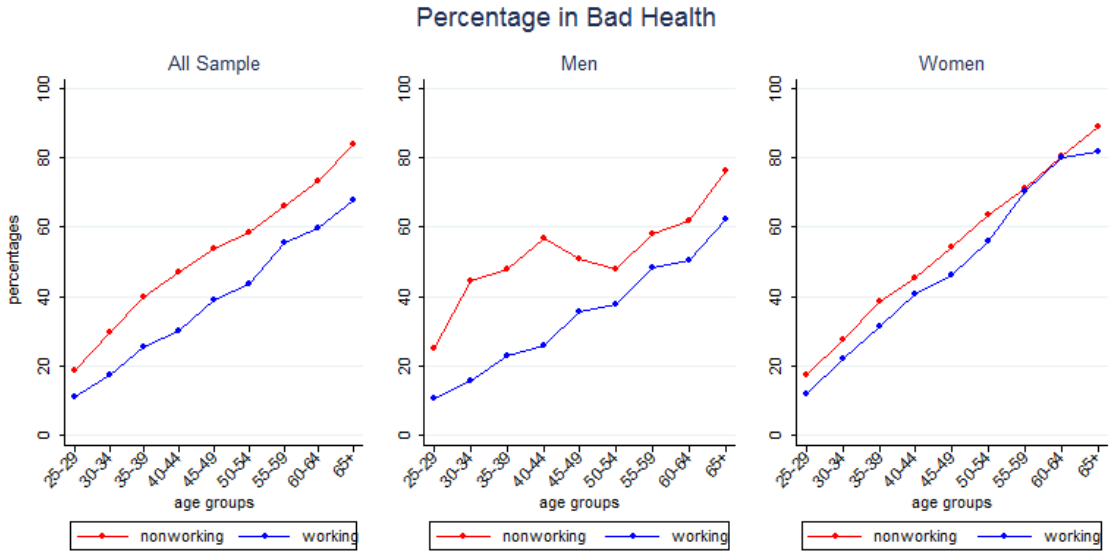
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.6.A and Figure 3.6.B draw the same picture as the Figures 4.A and 4.B, but this time 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. The picture is similar with the previous one, however work status gradient for men is less pronounced than the labor force status gradient. Narrowing of the gradient could be due to the drop in poor health for non-working individuals which covers people out of labor force and are unemployed. A plausible explanation would be that health status is not responsive to unemployment as we expected. The gradient for women stays almost the same, again implying that women's health is not responsive to work and labor status.

Figure 3.7.A and Figure 3.7.B show the percentages in bad and good health according to employment status respectively. Employed category refers to full-time employed individuals. Employment gradient in health do not follow a regular pattern like the previous SES gradients in health. The gradient widens from the young ages until middle ages and then starts to fluctuate implying the positive affect of employment on health until late-middle ages. After late-middle ages health status of unemployed individuals is better than the employed counterparts. Slight decrease in bad health of unemployed individuals observed between the age group 45-54 and 55-64 for men, and between the age group 35-44 and 50-59 for women could be due to justification bias and withdrawal of unhealthy individuals from labor force. Furthermore the jumps seen in the figures 3.7.A and 3.7.B could be due to small sample size observed in certain groups. For instance number of employed women older than 55 would be small that causes the jumps in the graph.

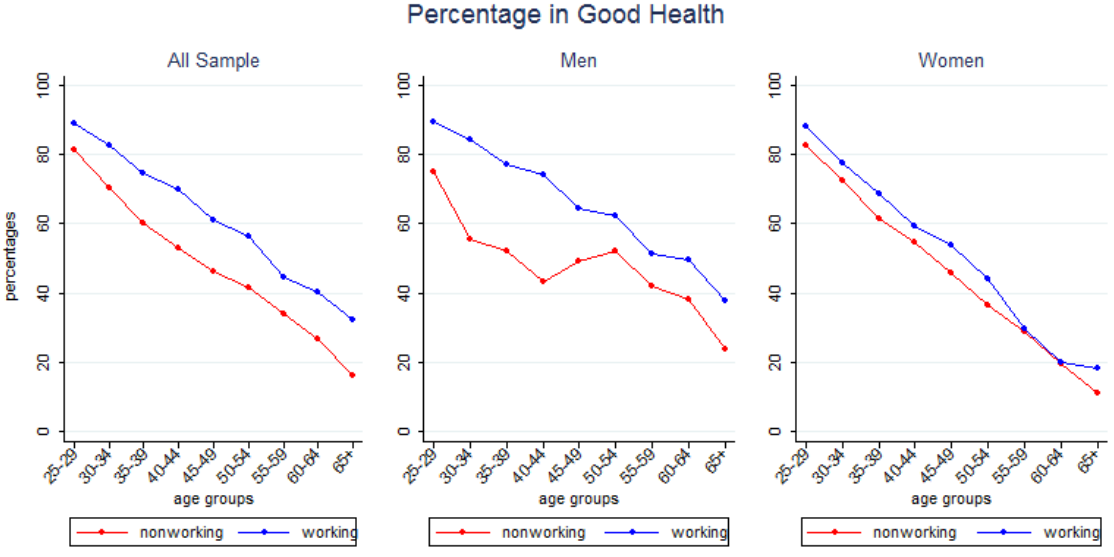
As mentioned before theory suggests that individuals with physically demanding jobs have higher depreciation rates and have a higher relative health decline over the life course. In this respect we distinguish between blue and white collar workers. Agriculture workers, skilled&unskilled workers refer to blue collar workers. White collar workers include managers, professionals, associate professionals, office clerks and service workers. We expect poorer health and higher depreciation rate for blue collar workers.

Figure 3.6.A: Self Assessed Bad Health by Age According to Work Status and Gender



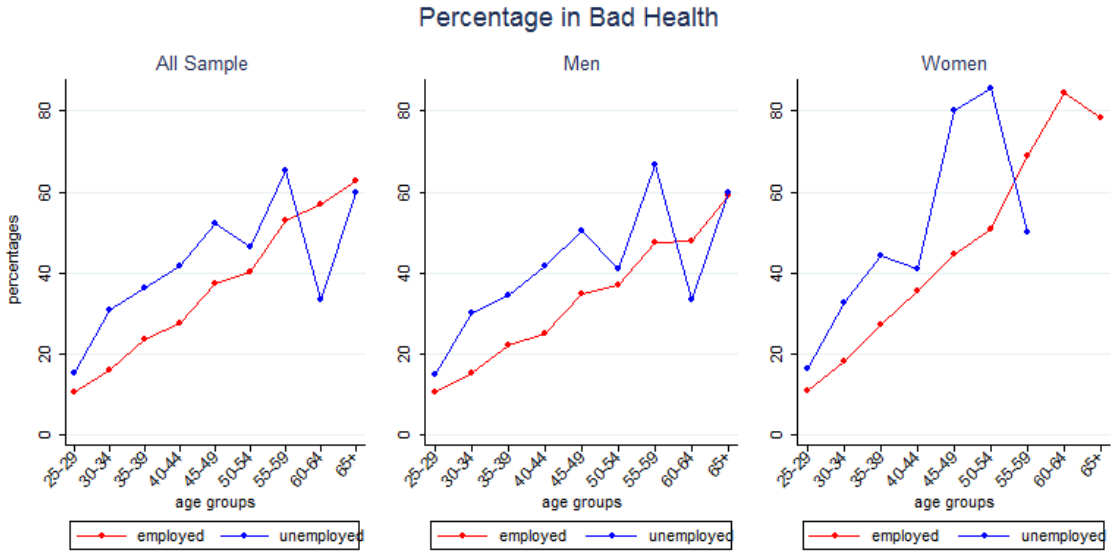
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.6.B: Self Assessed Good Health by Age According to Work and Gender



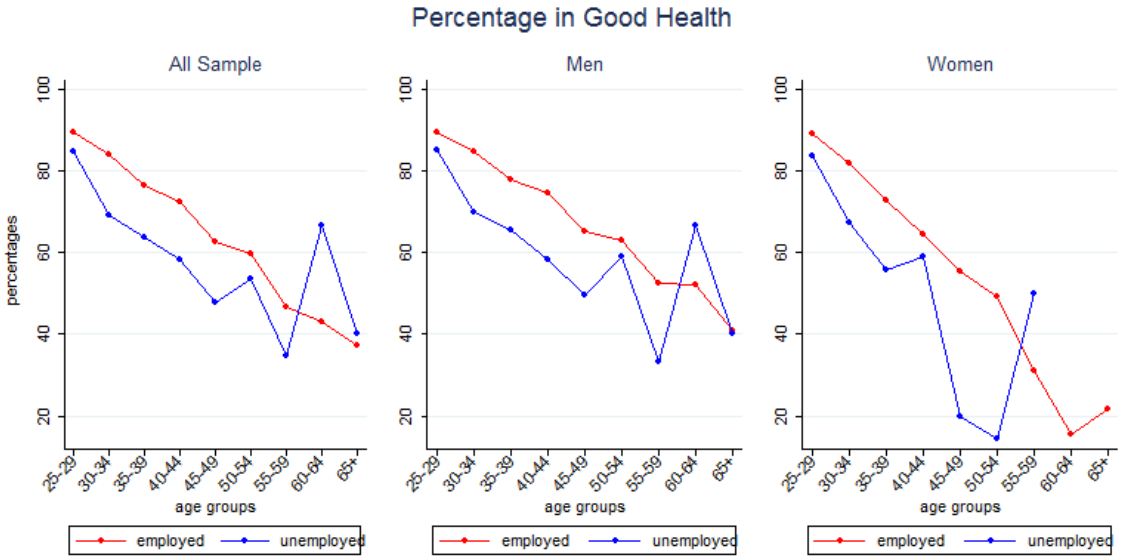
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.7.A: Self Assessed Bad Health by Age According to Employment Status and Gender



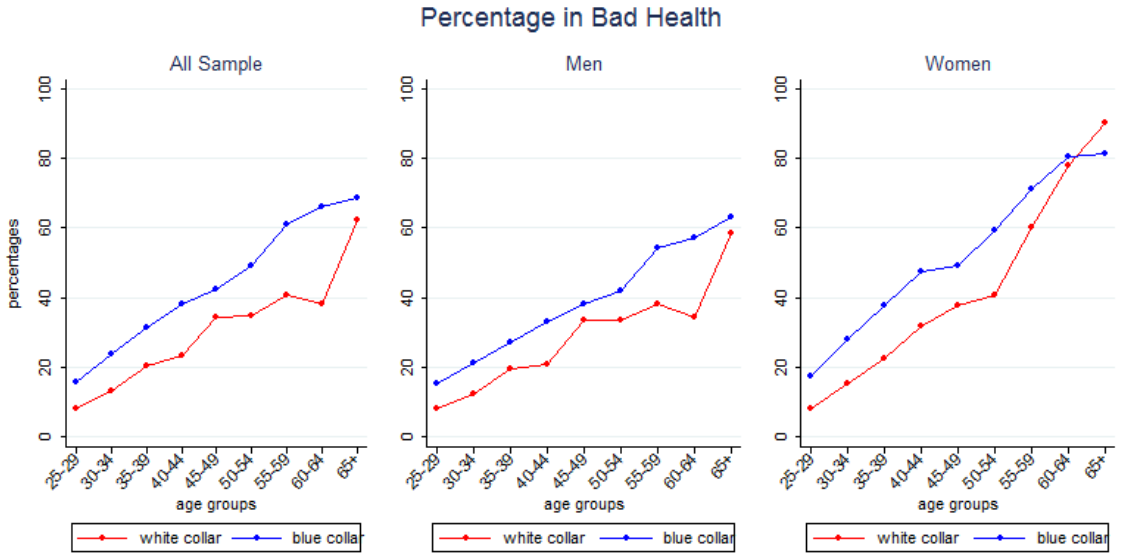
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.7.B: Self Assessed Good Health by Age According to Employment Status and Gender



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.8.A: Self Assessed Bad Health by Age According to Work Type and Gender



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.8.B: Self Assessed Good Health by Age According to Work Type and Gender

Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.8.A and Figure 3.8.B present slightly widening of occupational gradient in health until late middle ages and narrowing of the gradient in old ages. In the young ages differences in health between blue and white collar workers are evident but not marked. Given that little time has passed at this stage of the life cycle for occupation to exert an influence on health, the observed differences presumably derive from earlier childhood experiences that impact both occupational choice and health (Van Doorslaer et al., 2008:59). However health trajectories experienced by blue collar workers are steeper. For example, about 35 % of blue collar workers report bad health at the age group 40-44, whereas this ratio is reached by white collar workers at the age group 50-54 for men.

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

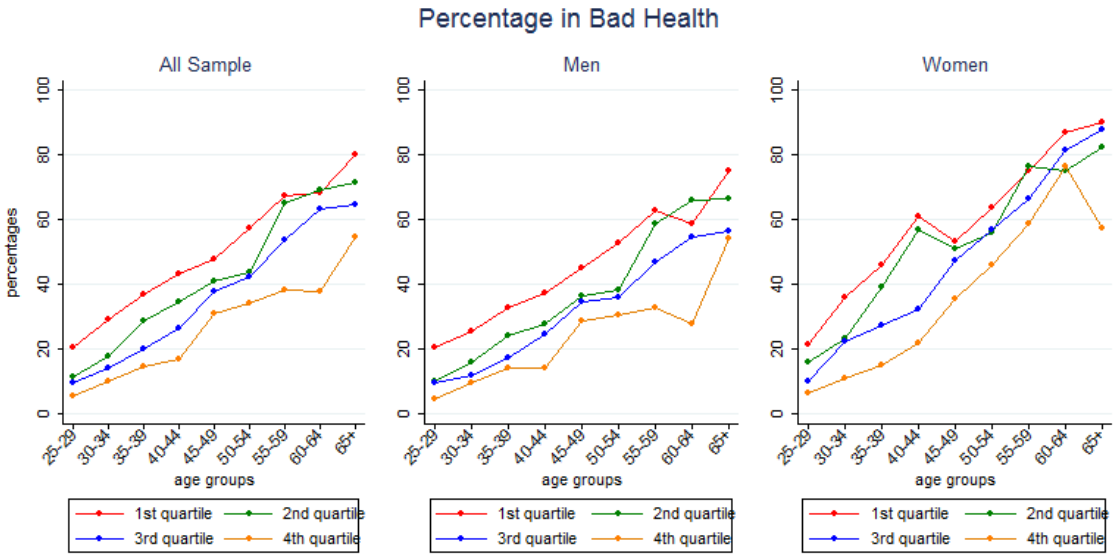
In order to understand the importance of work status versus income and education in determining the life cycle profile of health, we present the prevalence of bad and good health according to income and education conditioned on work status. According to Case and Deaton(2005) Smith (2005,2007), Van Doorslaer et al. (2008), Van Kippersluis et al. (2009) 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 assessed health status according to income across workers and non-workers. The age profiles of the percentages of reported good and bad health are depicted in Figure 3.9.A and Figure 3.9.B for workers, and in Figure 3.10.A and 3.10.B for non-workers.

The first important feature is rather flat profile of self assessed health according to income quartiles for those who are working even if the magnitude of the income gradient slightly changes if we compare the picture with Figure 3.2.A and Figure 3.2.B. For exam-

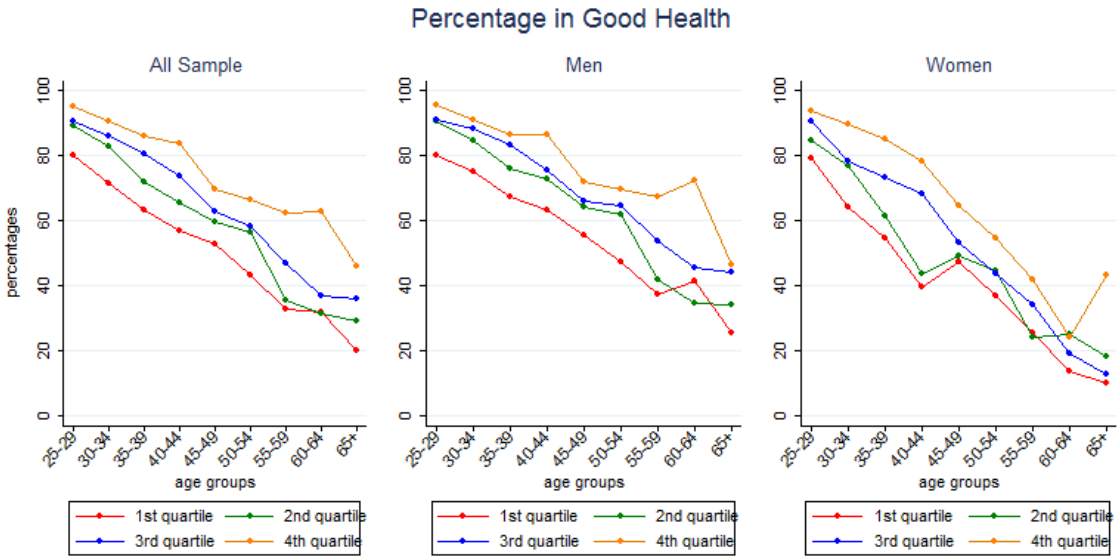
ple the prevalence of bad health for working men at the age group 35-39 is about 30% in the bottom income quartile and this rate is reached at the age group 55-59 for top income quartile. The same ratio was 37% and reached at age group 50-54 in Figure 3.2.A.

Figure 3.9.A: Self Assessed Bad Health of Working Individuals by Age According to Income Quartiles



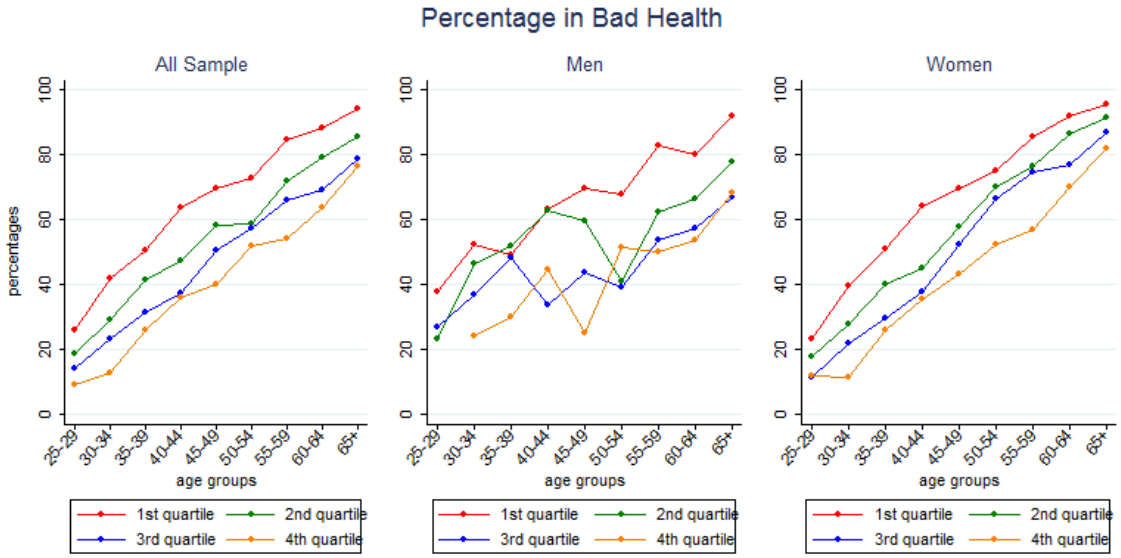
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.9.B: Self Assessed Good Health of Working Individuals by Age According to Income Quartiles



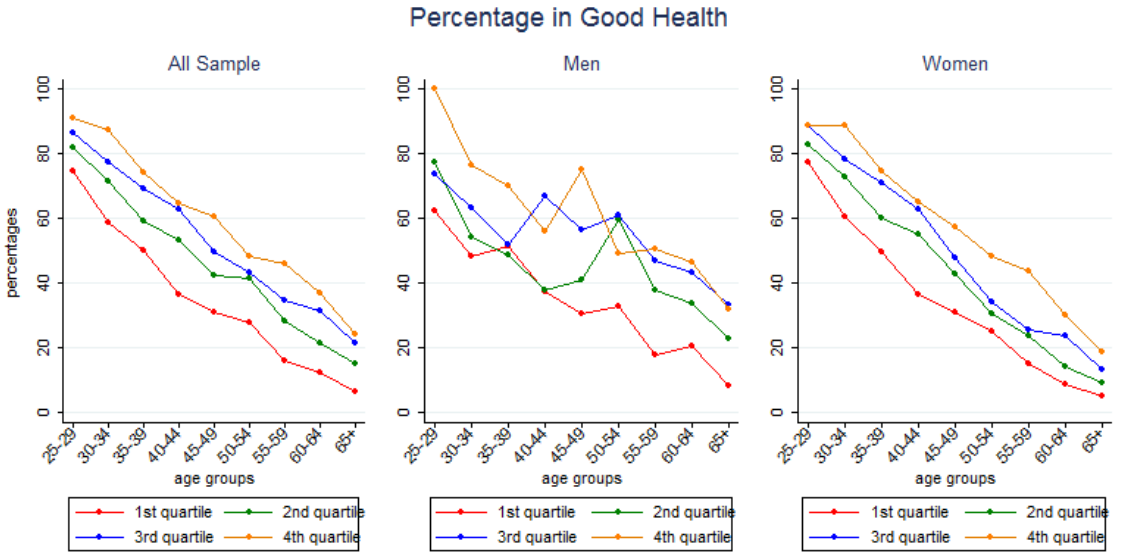
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.10.A: Self Assessed Bad Health of Non-Working Individuals by Age According to Income Quartiles



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.10.B: Self Assessed Good Health of Non-Working Individuals by Age According to Income Quartiles



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Second, the sizes of gradients for both working and non-working men and women change dramatically. The gradient for working men is relatively narrow at young ages and starts to widen at older ages where as the opposite is valid for working women. This disparity between men and women could be attributed to the fact that work being a strong contributor to the widening of income gradient for men and 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.

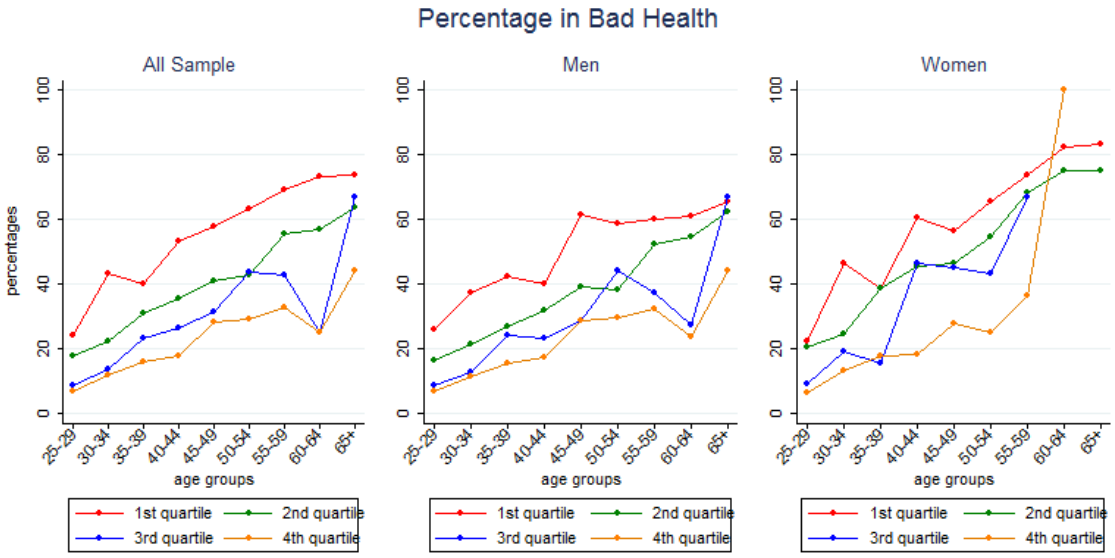
Non-working individuals are always in poorer health, and the widening differential suggests that health progressively becomes a more important reason for not working until the age group 50-54. Narrowing of the gradient after the age group 50-54 for both men and women could be due to the growing importance of non-health reasons for not working, principally voluntary retirement (Van Doorslaer, et al., 2008:61). The widening of gradient among 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 and education levels on work status. Figure 3.11.A, Figure 3.11.B, Figure 3.12.A and Figure 3.12.B show the education gradients for workers and non-workers . The first striking observation is that the education gradient gets narrower for working men wider for non-working men. Additionally we observe rather flat profile of reported good and bad health for those working at each age category for both men and women. On the other hand, in almost every age group the magnitude of education gradient increases for both working and non-working women indicating the crucial importance of education on health for women. For example in Figure 3.3.A the gap between highest and lowest education gradient for age group 50-54 was about 32% for women. However the gap between first and forth quartiles for working women rises to to 40% and to 20% for non-working women as depicted in Figure 3.11.A and Figure 3.12.A respectively.

We repeted the same analysis on education gradient in health by using education levels; low, medium and high education. The first important feature to be mentioned is that the new gradient for working individuals depicted in Figure 3.13.A and Figure 3.13.B gets bigger in size with respect to Figure 3.4.A and Figure 3.4.B. Furthermore new education

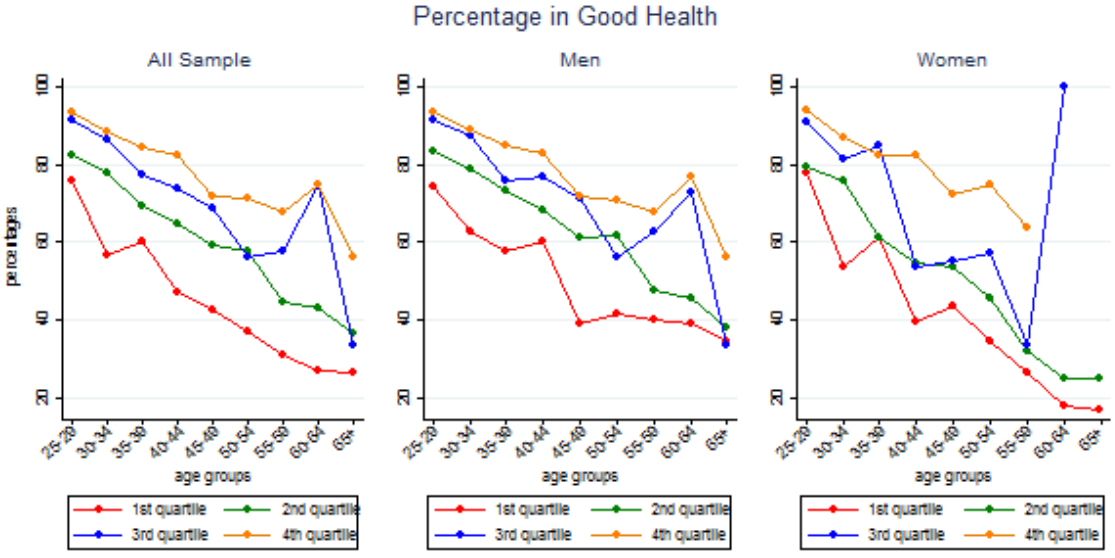
gradient is relatively narrow for working men with respect to working women implying greater effect of education on work status and thus health of women.

Figure 3.11.A: Self Assessed Bad Health of Working Individuals by Age According to Education Quartiles



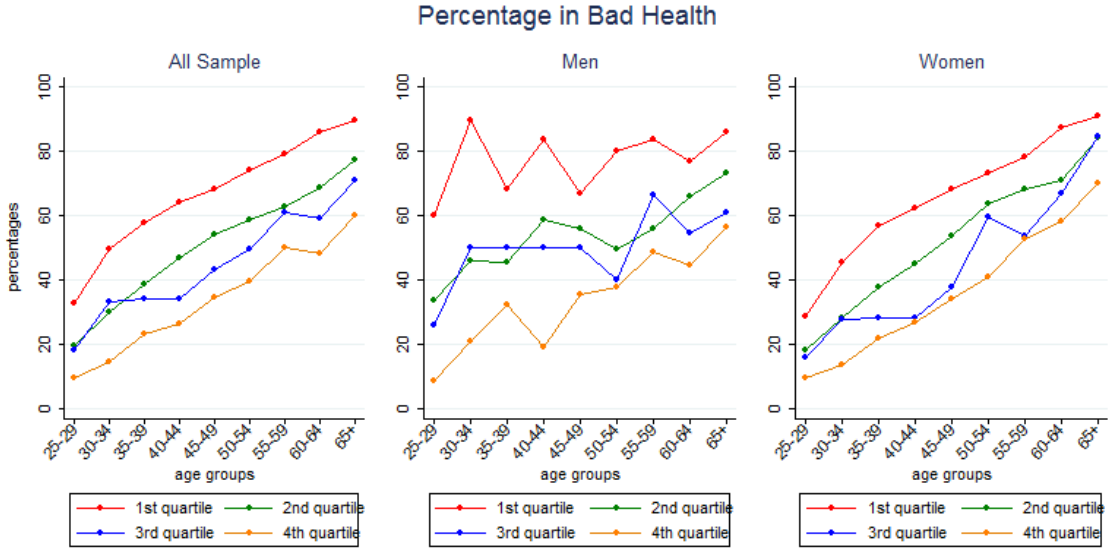
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.11.B: Self Assessed Good Health of Working Individuals by Age According to Education Quartiles



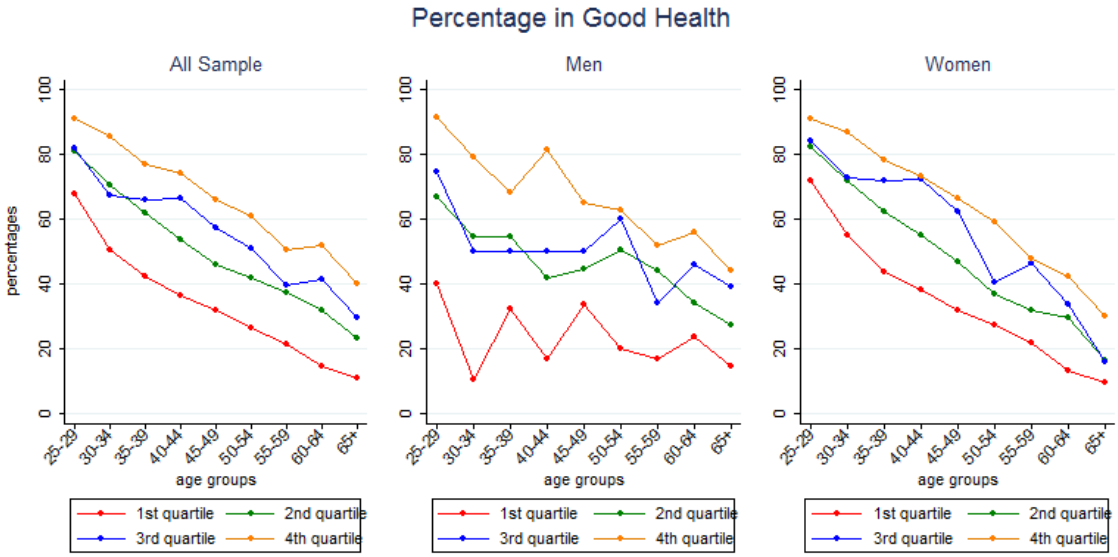
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.12.A: Self Assessed Bad Health of Non-Working Individuals by Age According to Education Quartiles



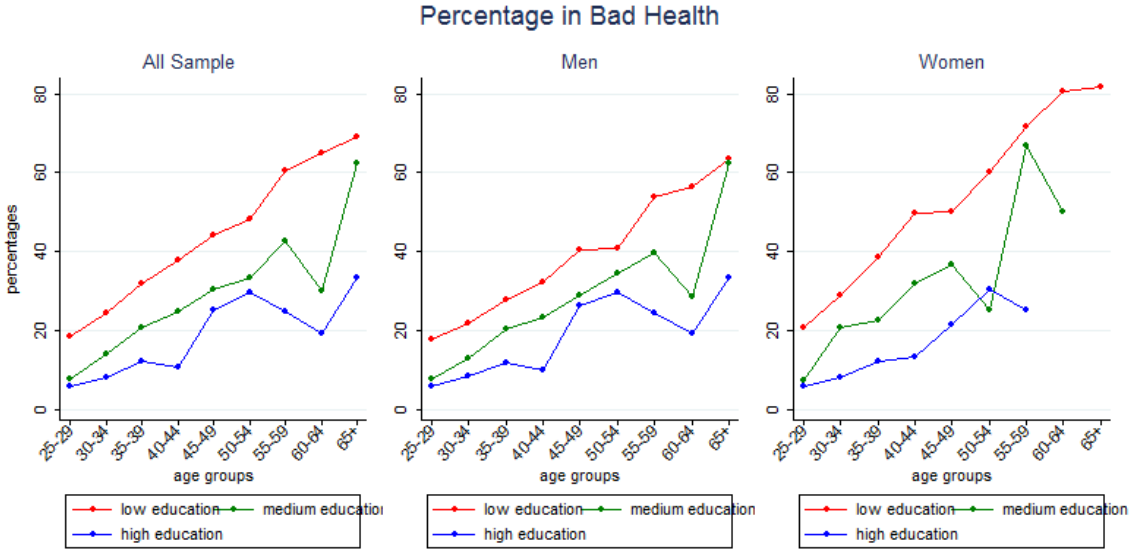
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.12.B: Self Assessed Good Health of Non-Working Individuals by Age According to Education Quartiles



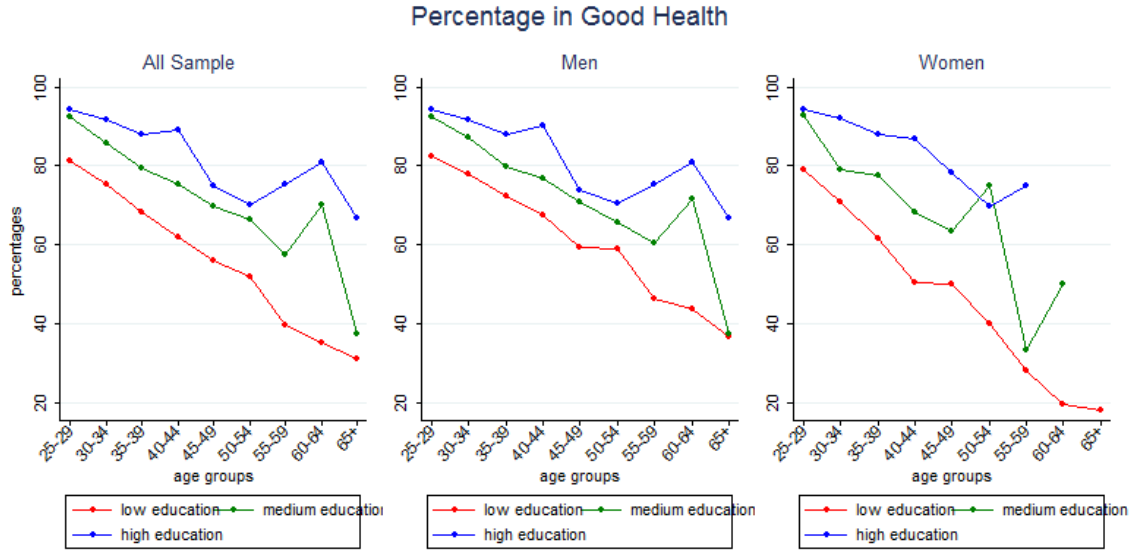
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.13.A: Self Assessed Bad Health of Working Individuals by Age According to Education Levels



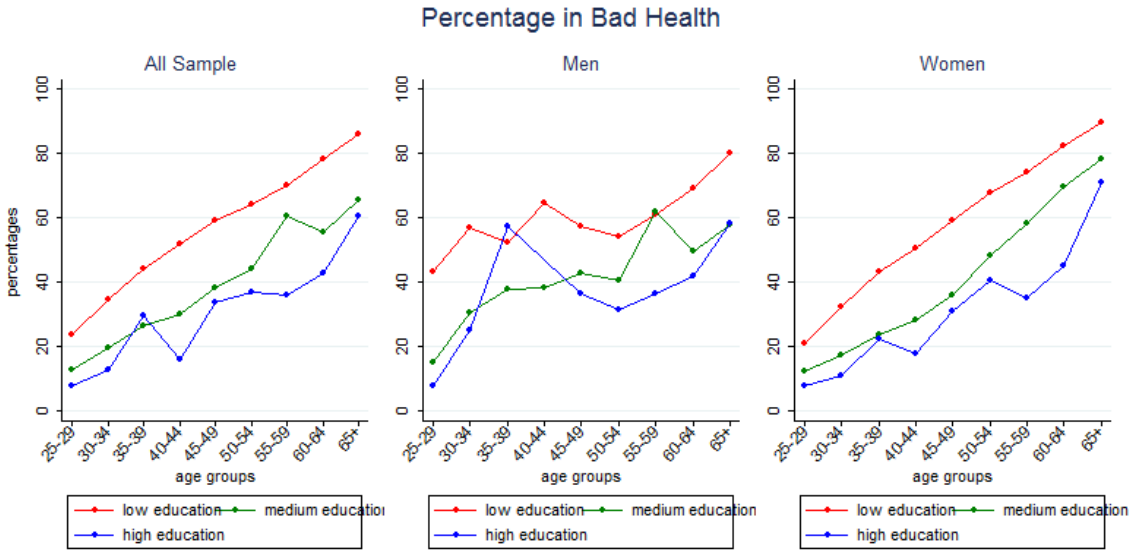
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.13.B: Self Assessed Good Health of Working Individuals by Age According to Education Levels



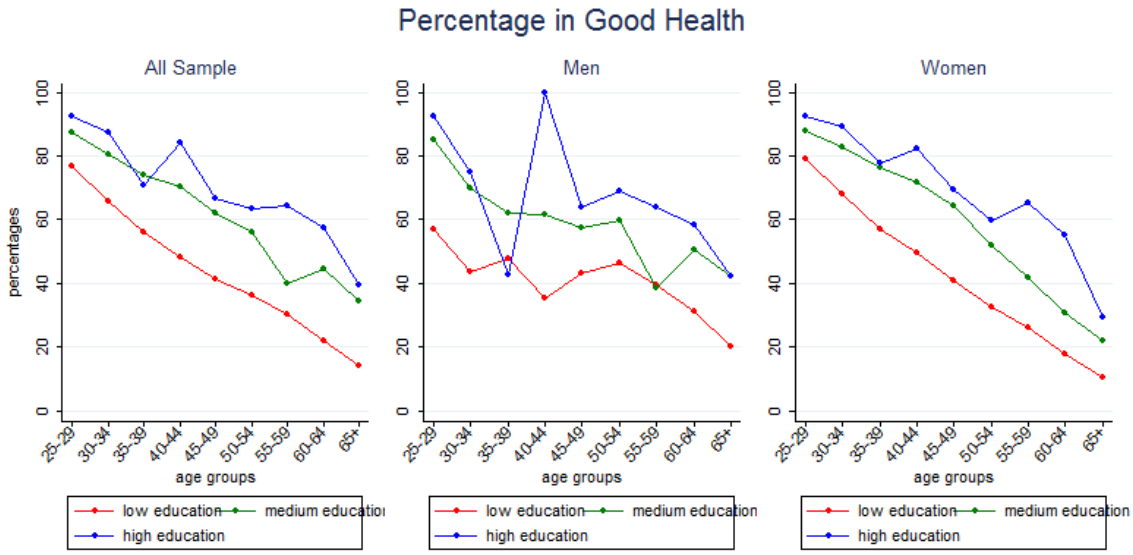
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.14.A: Self Assessed Bad Health of Non-Working Individuals by Age According to Education Levels



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.14.B: Self Assessed Good Health of Non-Working Individuals by Age According to Education Levels



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

On the contrary for women the gradient is always wide even from the young ages and becomes even more pronounced after age 50-54. The change in pattern in education gradient which is conditioned on work status would be explained bay the fact of the occupation effect of education. Since low educated people work mostly in physically demanding jobs, they have higher deterioration of health over life cycle. Moreover, the widening of education gradient in health when we conditioned education on work status reveals that education has a huge impact on occupation for women and thus on their health. One policy implication of this situation would be women's health can be improved by applying policies directed to increasing women education and thus labor force participation.

3.3 How Does the Gradients Behave if Different Indicators of Health Are Used?

In the previous section self assessed health status was the indicator of general health status of the individuals. Now we turn attention to a different indicators of health; limitation in daily activity and having a chronic illness. Limitation in daily activity is treated as a very strong sign of disability and chronic illness variable would reveal which SES groups especially which occupations suffer from severe illnesses.

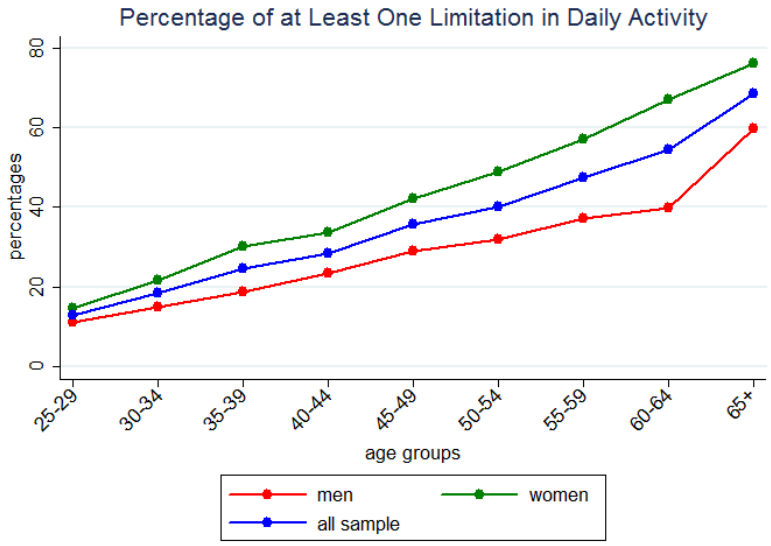
3.3.1 Disability as an Indicator of Health Status

Trends in disability need not to correspond to those in self assessed health, since the two measures are sensitive to different dimensions of health with potential distinct life cycle profiles (Freedman et. al, 2007:461). Although limitation in daily activity is not a perfect indicator of disability it can serve as a good predictor. Furthermore disability is often measured only in the older population so it is more difficult to establish whether its socioeconomic gradient varies with age (Van Doorslaer et al.,2008:21). In this respect limitation in daily activity which is measured for individuals across all ages, would reveal interesting patterns about the structure of disability.

Figure 3.15 shows individuals who report they have at least one limitation in daily activity by age according to gender. We select the percentage of at least one limitation

in daily activity to compare it with bad health status to see if there is a difference in the behavior of gradients.

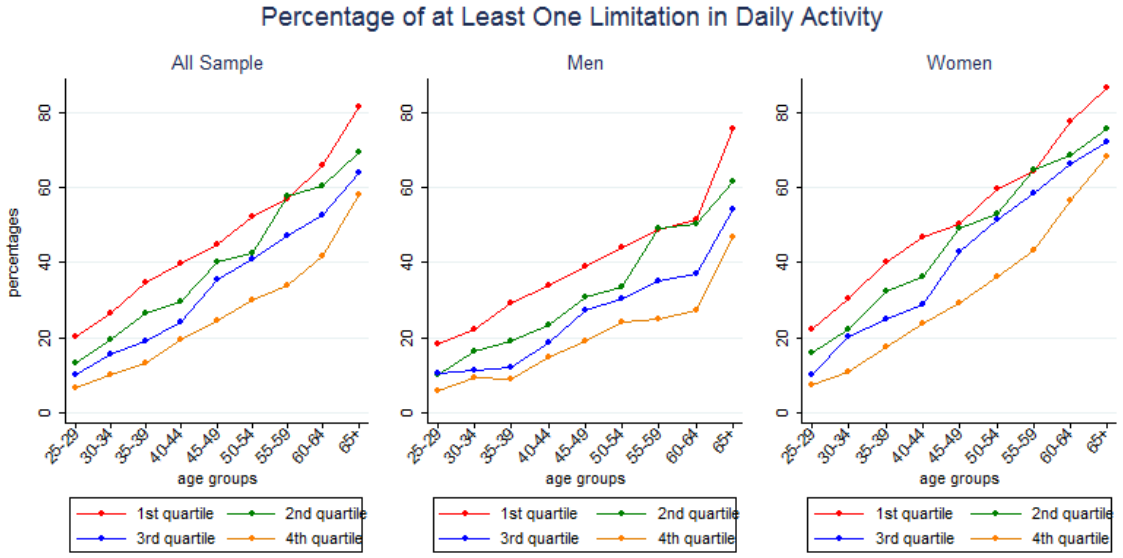
Figure 3.15: Percentage Reporting Disability by Age According to Gender



When we compare Figure 3.15 with the left panel of Figure 3.1 we observe a similar pattern in terms of behavior of the curves. The percentage of women report they have at least one limitation in daily activity(disability) is always greater than men in every age category. We also observe that the difference between men and women begins to widen after age 45-49 and then narrows after 60-64, probably due to selective mortality. However one striking difference of Figure 3.15 is lies on the percentages of individuals who report disability in old ages. For instance about 60% and 78% of men and women report disability at the age 65+, whereas those ratio were 72% for men and 88% for women when the health indicator was self assessed health status. The reason for this difference may be due to justification bias working in opposite directions. When self assessed health status is used as an indicator of general health individuals tend to exaggerate their poor health in order to justify being out of labor force. On the other hand, people tend not to report that they have disability. For example being classified as disabled do not justify being out of labor force as the former case since Turkey does not have a well-structured disability scheme that citizens benefit as in European Union (EU) countries.

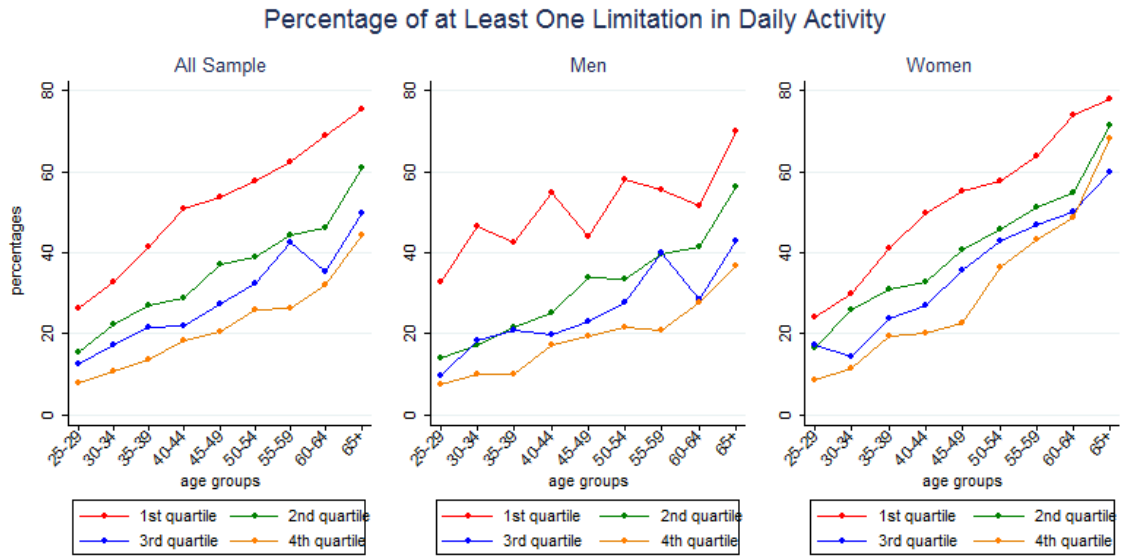
Now let's turn attention to income and education quartiles in disability. Figure 3.16 shows percentage of individuals who report at least one disability by age according to income quartiles and Figure 3.17 according to education quartiles.

Figure 3.16: Percentage Reporting Disability by Age According to Income Quartiles and Gender



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.17: Percentage Reporting Disability by Age According to Education Quartiles and Gender

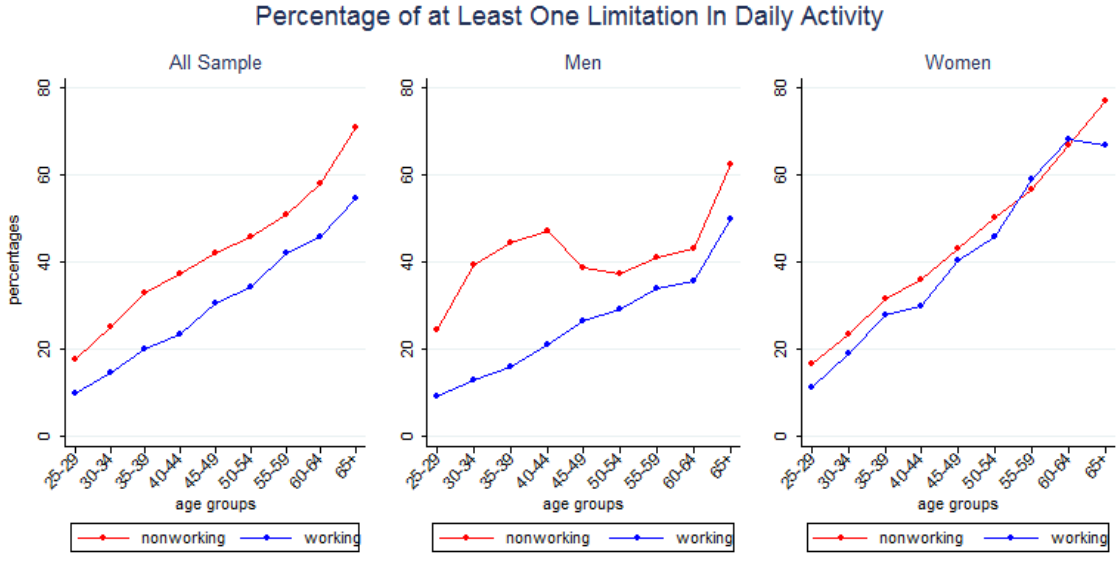


Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

The pattern observed in Figure 3.16 is similar to the pattern in Figure 3.2.A; gradient in disability widens in middle-ages and begin to narrow moderately in old ages both for men and women. Women always report they have more limitation in daily activities than men. When we look at the Figure 3.17 we also observe the striking widening of the gradient. In other words, education gradient in disability is wider than income gradient in disability especially for men. Again we observe at old ages individuals reporting disability is less than individuals reporting poor health which is consistent with the above discussion.

Figure 3.18 shows percentage reporting of disability (at least one limitation in daily activity) by age according to work status. Working individuals report less disability than non-working counterparts. Slight decrease of prevalence of disability for men aged 55-59 and 60-64 could be due to selective mortality or instituzation. However we observe similar kind of fall in disability for women after age 64. Full picture that can depict selective mortality can be attained only if we had more age groups after 65. Work status gradient in disability in Figure 3.18 is slightly wider for men with respect to Figure 3.6.A and almost the same for women.

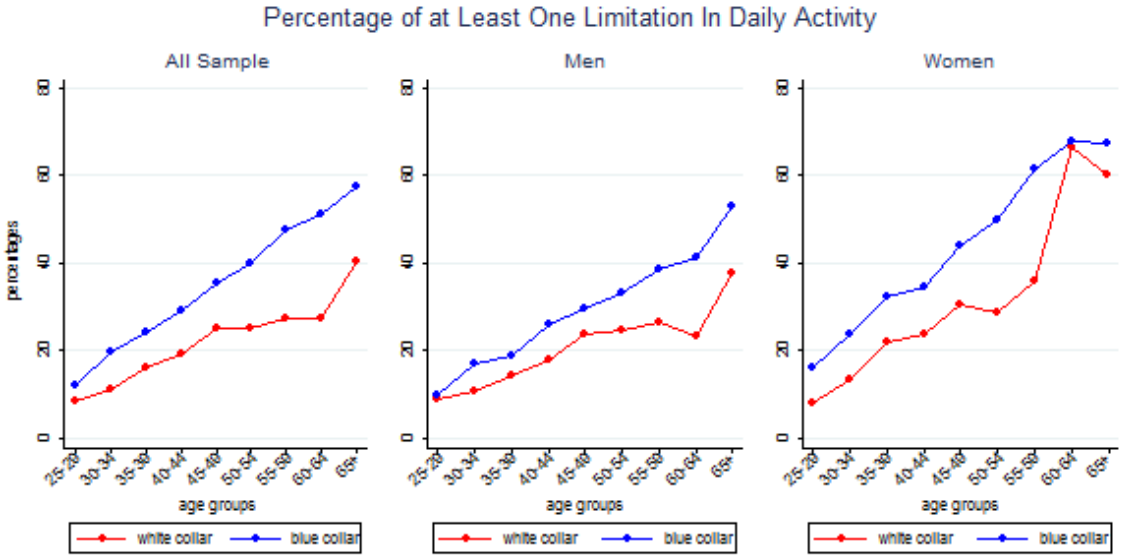
Figure 3.18: Percentage Reporting Disability by Age According to Work Status and Gender



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.19 shows percentage reporting of disability(at least one limitation in daily activity) by age according to work type. Again we observe similar picture as in Figure 3.8.A. White collar workers report less limitation in daily activity than blue collar correspondents. Additionally the pace of deterioration of health proxied by disability is larger for blue collar workers for both men and women. Both the graphs for work status and work type reveal that in old ages individuals who report they have disability is less than individuals who report poor health. As discussed before this difference could arise from the fact that people do not want to be perceived as disabled and some other type of justification bias that operates.

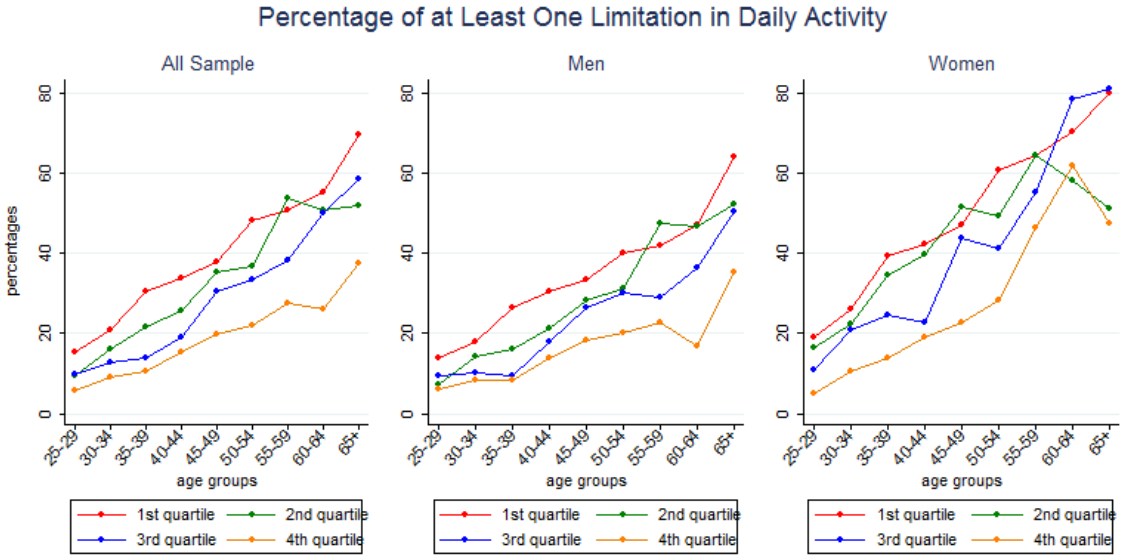
Figure 3.19: Percentage Reporting Disability by Age According to Work Type and Gender



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

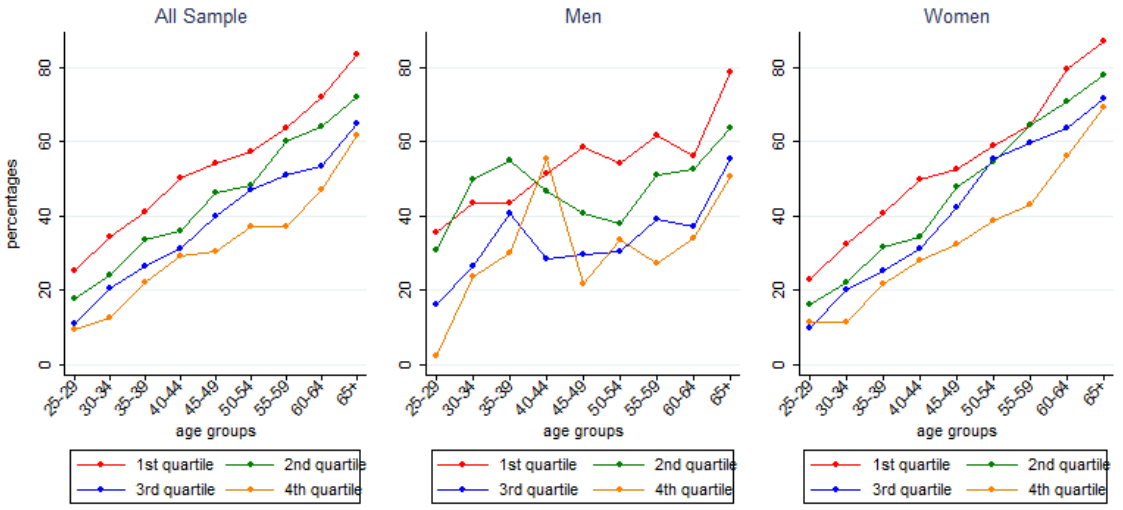
Figure 3.20.A and Figure 3.20.B present percentage reporting disability by age according to income quartiles for workers and non-workers respectively. When we compare Figure 3.20.A with Figure 3.16, we observe that size of income gradient in disability increases when income is contingent on work status. In contrast to the picture in self assessed health, income gradient in disability widens also for women implying that work is an important contributor to limitation in daily activity according to income quartiles.

Figure 3.20. A: Percentage Reporting Disability of Working Individuals by Age According to Income Quartiles and Gender



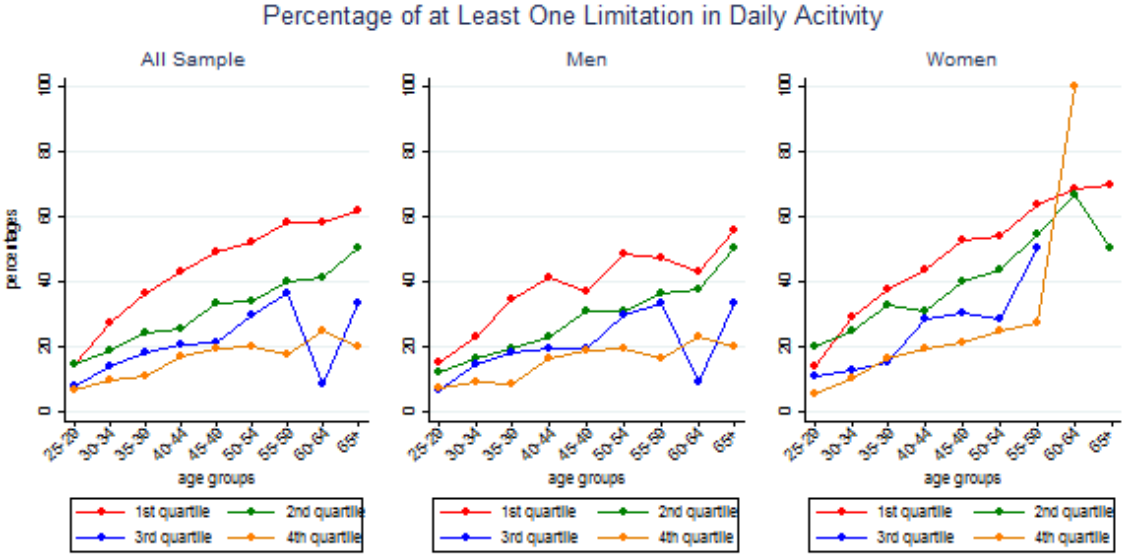
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.20. B: Percentage Reporting Disability of Non-Working Individuals by Age According to Income Quartiles and Gender



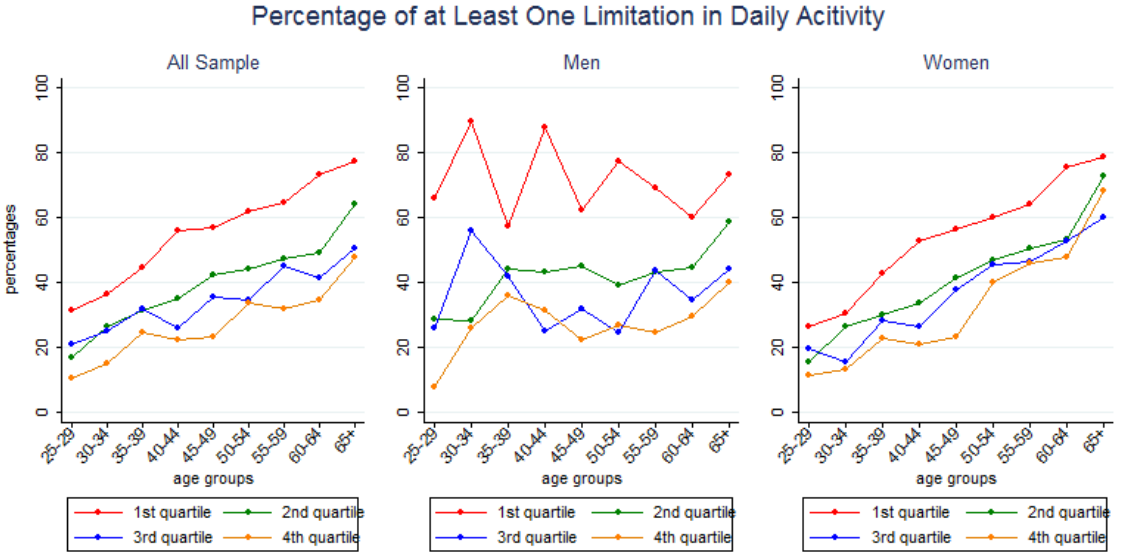
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.21. A: Percentage Reporting Disability of Working Individuals by Age According to Education Quartiles and Gender



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.21. B: Percentage Reporting Disability of Non-Working Individuals by Age According to Education Quartiles and Gender



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.21.A and Figure 3.21.B give percentage of working and non-working individuals who have at least one limitation in daily activity by age according to education quartiles. When we compare Figure 3.21.A and Figure 3.21.B with Figure 3.17 we observe the narrowing of education gradient in disability for working-men and widening of the gradient for non-working men. As in the analysis conducted by using self assessed health status the change in structure of education gradient for men can be explained by the occupation effect of education. On the other hand, education gradients for working and non-working women do not show a remarkable change implying unresponsiveness of disability to education that is conditioned on work. In other words, education has not a occupation effect for women when we use disability as an indicator of health status.

3.3.2 Chronic Illness as an Indicator of Health Status

We repeat the same analysis conducted in the previous sections by using having at least one chronic illness as an indicator of health status. We can assume that having a chronic illness (hypertension, diabetes, asthma, renal failure, cardiovascular diseases) is a sign of poor health.

Figure 3.22 shows individuals who report at least one chronic illness by age according to gender. If we assume chronic illness variable as an indicator of health status, we observe that again health status of women is worse than men. However we cannot detect which chronic illness is a major issue more for men and women and we also cannot observe which chronic illness is evident more frequently in which income, education and occupation groups.

The comparison of Figure 3.22 with left panel of Figure 3.1 reveals that the ratio of individuals reporting bad health is more than individuals reporting at least one chronic illness. As mentioned before we included very bad, bad and fair health statuses in bad health to present the condition less than good health. Thus the difference between reporting behavior of self assessed health and chronic illness would be due to justification bias or due to the fact that individuals in fair health may not report chronic illnesses.

Figure 3.22: Percentage Reporting Chronic Illness by Age According to Gender

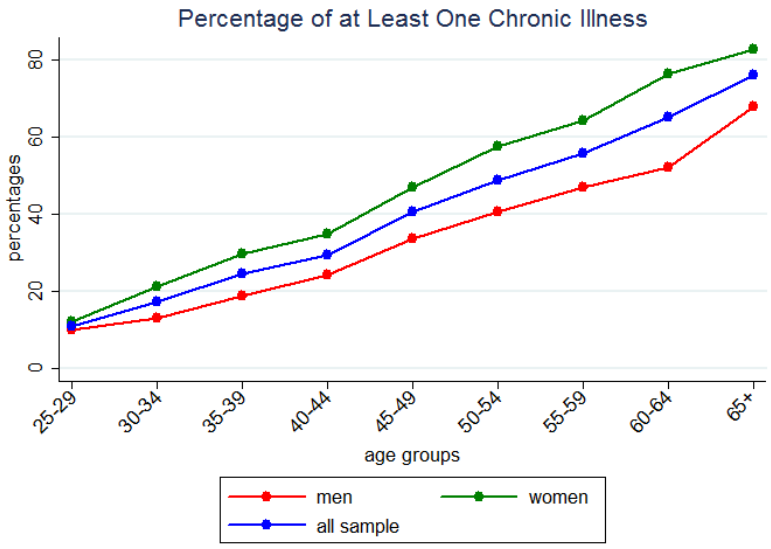
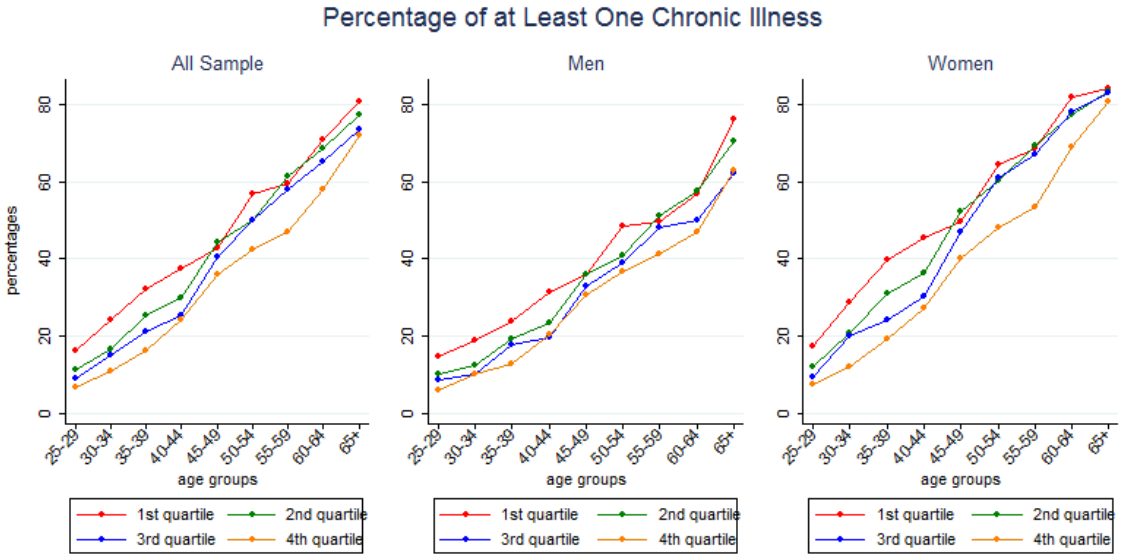


Figure 3.23 and Figure 3.24 present individuals reporting at least one chronic illness by age according to income and education quartiles respectively. Income gradient in chronic illness is not as obvious as the gradients in self assessed health and disability. Furthermore top and bottom income quartiles are very close to each other both for men and women. Education gradient in chronic illness however is more apparent although it is small in size relative to education gradient in self assessed health and disability. Gradient for men is wide at young ages and starts to narrow from middle ages which is more prominent than cases in the education gradients in self assessed health and disability. The significant narrowing of education gradient for men could be due to selective mortality which is more dominant in chronic illness leaving more robust survivors in the sample. For women on the other hand the education gradient is not as wide as gradient for men but gets narrow in old ages.

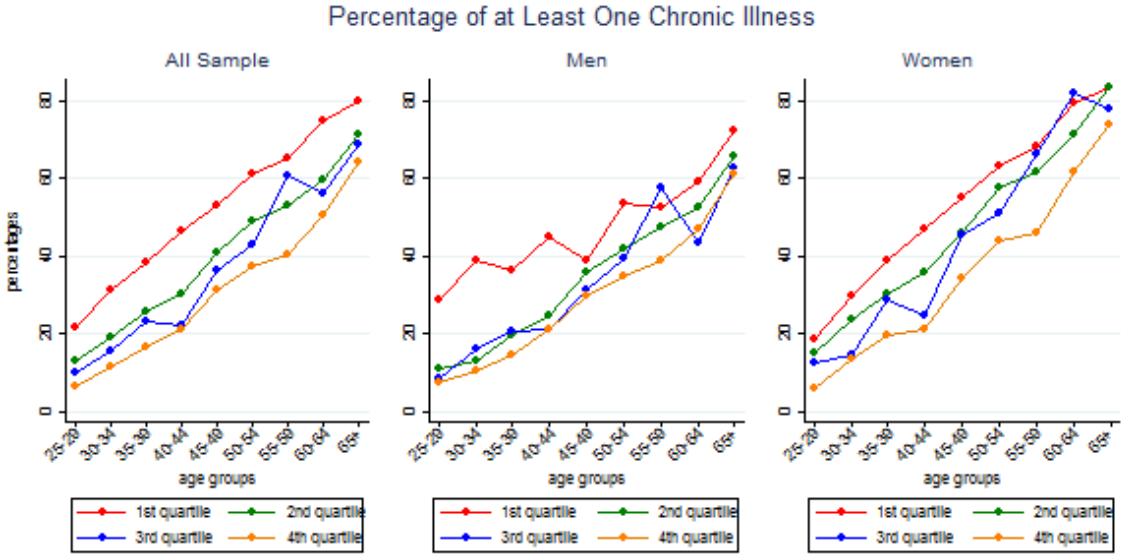
Figure 3.25 and Figure 3.26 show work status and work type gradients in chronic illness respectively. We observe that non-working individuals and blue collar workers suffer chronic illnesses more than working and white-collar counterparts. One apparent characteristics of the work status gradient is that it is not as wide as the gradients in self assessed health in young ages. This situation could result from justification bias. Moreover work type gradient is very small in size presenting a sign for justification bias.

Figure 3.23: Percentage Reporting Chronic Illness by Age According to Income Quartiles and Gender



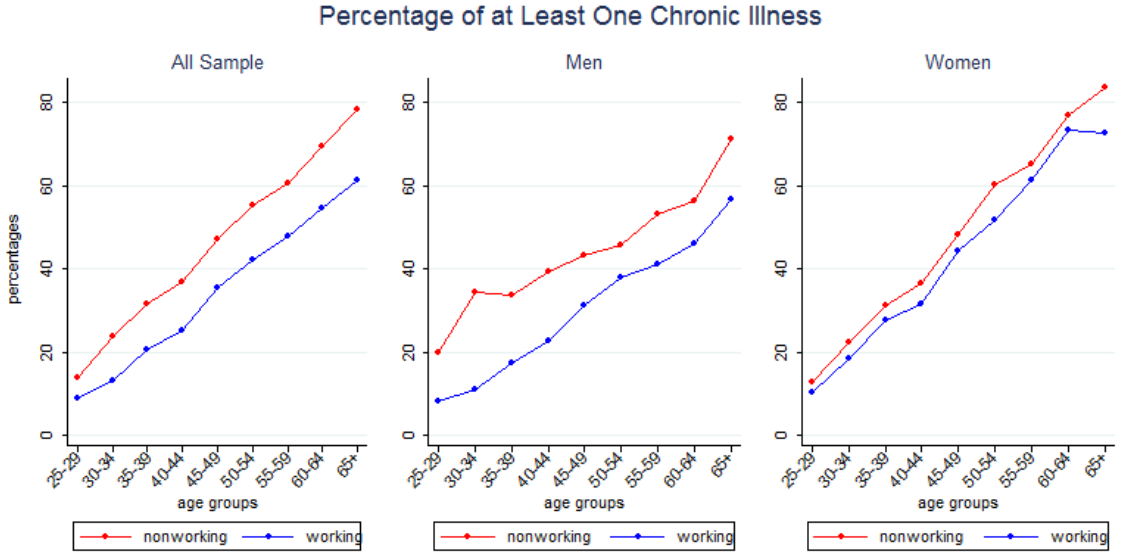
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.24: Percentage Reporting Chronic by Age According to Education Quartiles and Gender



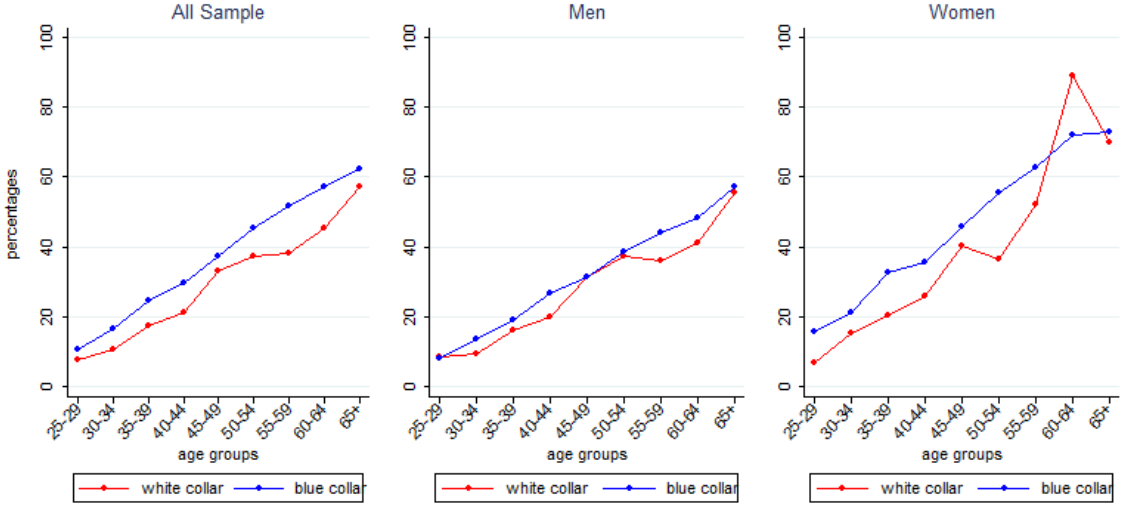
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.25: Percentage Reporting Chronic Illness by Age According to Work Status and Gender



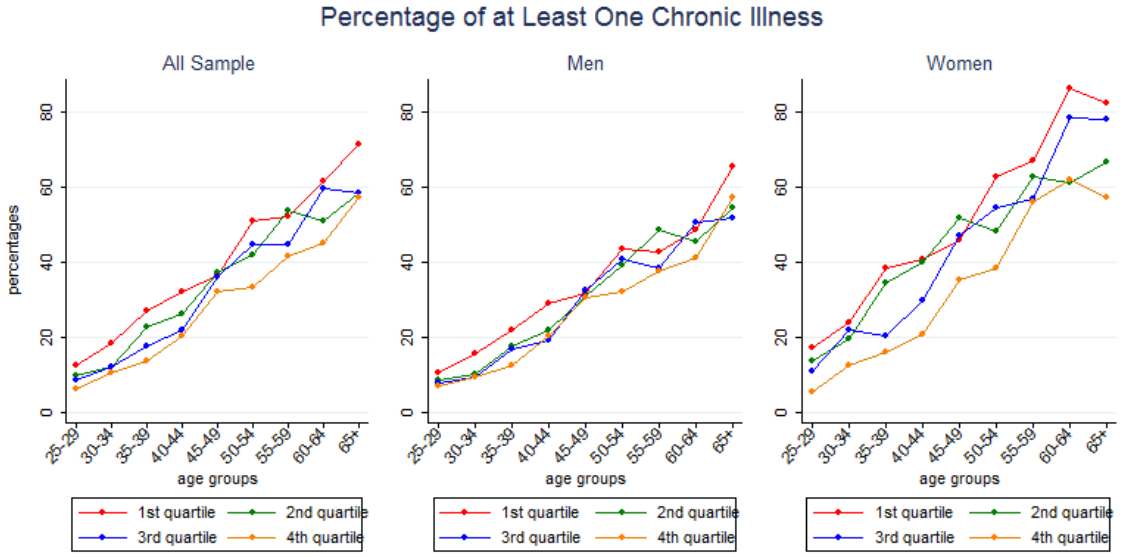
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.26: Percentage Reporting Chronic Illness by Age According to Work Type and Gender



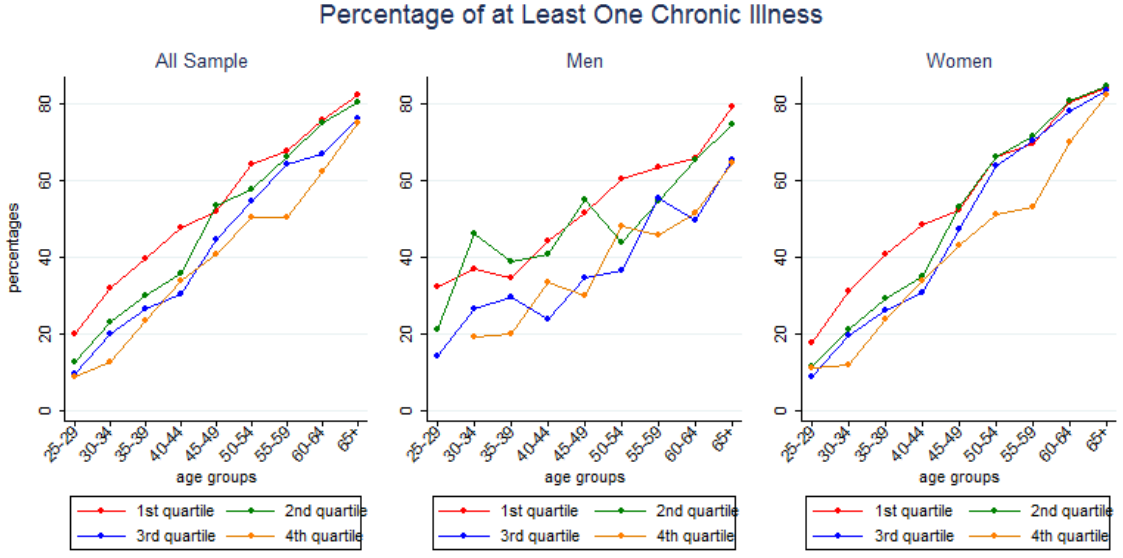
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.27: Percentage of Working Individuals Reporting Chronic Illness by Age According to Income Quartiles and Gender



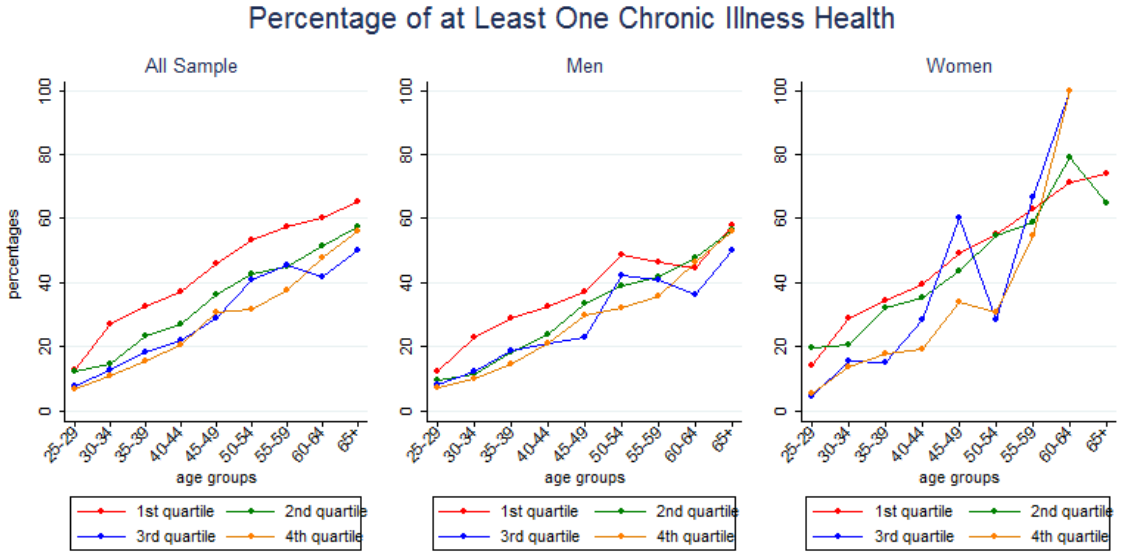
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.28: Percentage of Non-Working Individuals Reporting Chronic Illness by Age According to Income Quartiles and Gender



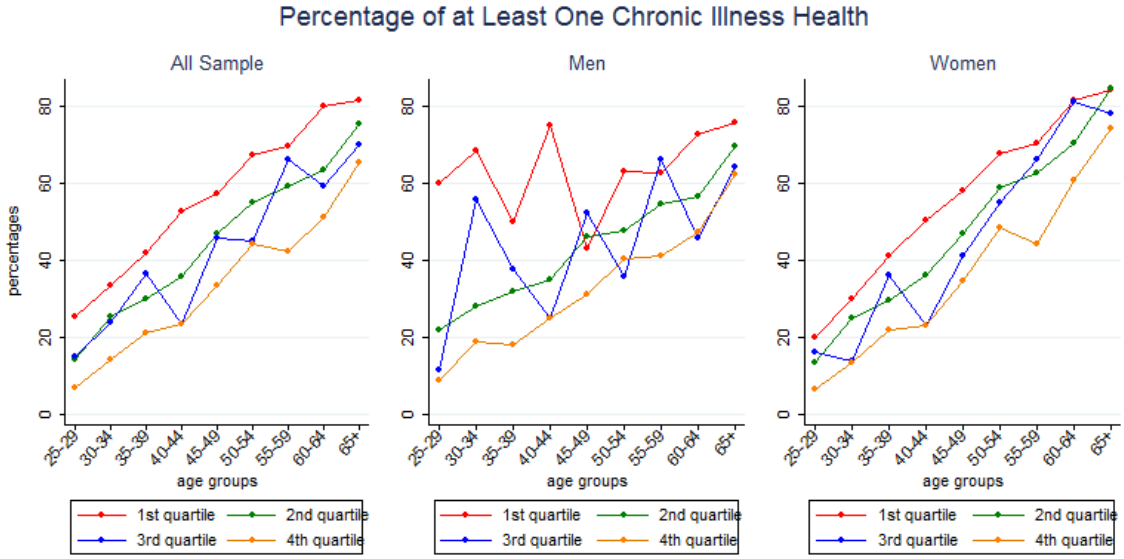
Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.29: Percentage of Working Individuals Reporting Chronic Illness by Age According to Education Quartiles and Gender



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.30: Percentage of Non-Working Individuals Reporting Chronic Illness by Age According to Education Quartiles and Gender



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations. Sample weights applied.

Figure 3.27 and Figure 3.28 depict percentage of working and non-working individuals according to income quartiles to see the impact of work status on income for people

who report at least one chronic illness. Although bottom income quartiles always lies above the top income quartiles for working and non-working men and women, the gradient is not obvious as it was in the previous graphs. This would suggest that income does not a significant effect on chronic illness which is probably mainly affected by biological factors.

When we look at the education gradients conditioned on work status the gradient gets narrow for working men and wider for non-working men when we compare Figure 3.29 and Figure 3.30 with Figure 3.24. Again narrowing of the gradient for working men implies that education conditioned on work status does not an essential impact on reporting behavior of chronic illness which is probably a more biological situation. Widening of the gradient for non-working men comes mainly from shifting of bottom quartile upwards which may signify that low educated non-working men are more prone to chronic illness probably to biological factors or previous work conditions.

On the other hand, we do not see a regular pattern for working women's education gradient in health and very similar pattern in gradient of non-working women to the education gradient in Figure 3.24. This similar pattern implies the unresponsiveness of women's health to work status which may due to being out of labor force voluntarily and biological factors that dominate.

3.4 Discussion

We mentioned that socio-economic status (SES) has a substantial impact on health in which socially and economically favored individuals enjoy better health and individuals with lower SES suffer from poor health. However a snapshot of socio-economic differences in health at a given age gives a rather incomplete information of the extent of health disparities over life cycle since diversified dimensions of SES-health nexus are important for policy designs (Smith 2005, Smith 2007, Van Doorslaer et al. 2008, Van Kipperluis et al., 2009b). For instance if fundamental relationships between income, education work, occupation and health do not vary over life course or varies identically in all countries

then SES gradient in health is unresponsive to policy environment. In this respect in this section we try to bring a life cycle perspective on the relationship between health status and SES in Turkey. Our aim here is not to form a causal relationship but to develop precedent analysis. But the descriptive analysis conducted here would reveal the nature of the relationship and helpful in suggesting the mechanism that operates from SES to health.

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 leverer 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 health status of women. Furthermore policies directed at more equal income distribution would also contribute better health

When we repeat the descriptive analysis by using different measures for health such as disability and possessing a chronic illness the conclusions differ in some aspects. For example the behavior of gradients in disability or chronic illness differ from the behavior of gradient in self assessed health status. This difference may be due to justification bias or biological factors that are more dominant in disability and chronic illness measures.

In the following sections we try to build a two period life cycle model that aims to develop the causal link from SES to health and then we test the model empirically. We continue our analysis by using self assessed health status as an indicator for general health since we believe that it is a good predictor and justification bias it possesses is random.[5]

[5]For more information on justification bias (reporting heterogeneity) see section 5.

4. THEORETICAL MODEL

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. Our theoretical model mainly stems from the models of Grossman(1972) and Case and Deaton(2005). First we present the models of Grossman and Case and Deaton(2005) and then we exhibit three versions of life cycle models that account for the impact of SES on health status.

4.1 The Models of Grossman(1972) and Case and Deaton(2005)

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. Individual's stock of knowledge affects his market and non-market productivity, whereas his stock of health determines the total amount of time he can spend producing money earnings and commodities (Grossman, 1972:224).

Furthermore, it is assumed that health of individuals depreciate over time and can be increased by investment in health. Investment in health capital are produced by household production functions whose direct inputs include the own time of the consumer and market goods such as medical care, diet, exercise, recreation and housing (Grossman, 1972:225). This production function also depends on education since it is assumed that more educated people are more adequate producers of health.

Inter-temporal utility function of a representative consumer is as follows:

[4.1.1] $$U = U(\phi_0 H_0, ...\phi_n H_n; Z_{0,.....Z_n})$$

where H_0 is health endowment, H_t is the stock of health at ith time period, ϕ_i service

flow per unit stock, $h_i = \phi_i H_i$ consumption of health services and Z_i is the consumption of other goods.

Net investment in the stock of health equals gross investment minus depreciation:

[4.1.2] $$H_{i+1} - H_i = I_i - \delta_i H_i$$

where δ is the depreciation rate for health.

Household production functions are as fallows:

[4.1.3] $$I_i = I_i(M_i, TH_i; E_i)$$

[4.1.4] $$Z_i = Z_i(X_i T_i; E_i)$$

where M_i is medical care, X_i are inputs for production of good Z, TH_i and T_i are time inputs and E_i is the stock of human capital. All production functions are homogenous of degree 1 in goods and time inputs.

Gross investment function:

[4.1.5] $$I_i = M_i g(t_i; E_i)$$

where $t_i = TH_i/M_i$

Marginal products of time and medical care are:

[4.1.6] $$\frac{\partial T_i}{\partial TH_i} = \frac{\partial g}{\partial t_i} = g'$$

[4.1.7] $$\frac{\partial I_i}{\partial M_i} = g - t_i g'$$

The goods budget constraint:

[4.1.8] $$\sum \frac{P_i M_i + V_i X_i}{(1+r)^i} = \sum \frac{W_i TW_i}{(1+r)^i} + A_0$$

where P_i and V_i are prices, W_i is wage rate, TW_i is hours of work, and A_0 is initial wealth.

Time constraint requires that ω, the total amount of time available in any period must be exhausted by all possible uses:

[4.1.9] $$TW_i + TL_i + TH_i + T_i = \omega$$

where TL_i is the time loss due to illness. Substituting TW_i into the budget constraint yields:

[4.1.10] $$\sum \frac{P_i M_i + V_i X_i + W_i(TL_i + TH_i + T_i)}{(1+r)^i} = \sum \frac{W_i \omega}{(1+r)^i} + A_0 = R$$

According to the new budget constraint; part of wealth is spent on market goods, part of it is spent on non-market production time and part of it is lost due to illness. The problem that determines the demand for health becomes:

[4.1.1] $$maxU = U(\phi_0 H_0, ...\phi_n H_n; Z_{0,.....Z_n})$$

subject to

[4.1.2] $$H_{i+1} - H_i = I_i - \delta_i H_i$$

[4.1.3] $$I_i = I_i(M_i, TH_i; E_i)$$

[4.1.4] $$Z_i = Z_i(X_i T_i; E_i)$$

[4.1.10] $$\sum \frac{P_i M_i + V_i X_i + W_i(TL_i + TH_i + T_i)}{(1+r)^i} = \sum \frac{W_i \omega}{(1+r)^i} + A_0 = R$$

The solution of the system after few manipulations leads the following equation:[6]

[6]See Grossman (1972) for detailed information on the model and solution.

[4.1.11] $$G_i[W_i + (\frac{Uh_i}{\lambda})(1+r)^i] = \Pi_{i-1}(r - \tilde{\Pi_{i-1}} + \delta_i)$$

where $Uh_i = \frac{\partial U}{\partial h_i}$ is the marginal utility of healthy days, λ is the marginal utility of wealth. $G_i = \frac{\partial h_i}{\partial H_i} = -\frac{\partial TL_i}{\partial H_i}$ is the marginal product of the stock of health in the production of healthy days. Π_{i-1} is the marginal cost of gross investment in health in period $i-1$ and $\tilde{\Pi_{i-1}}$ is percentage rate of change in marginal cost between period $i-1$ and period i (Grossman, 1972:228,230).

Equation [4.1.11] determines the demand for capital goods in a perfect market and it indicates that the undiscounted value of the marginal product of the optimal stock of health capital must be equal to the supply price of the capital that is $\Pi_{i-1}(r - \tilde{\Pi_{i-1}} + \delta_i)$ (Grossman, 1972:230). Furthermore in Grossman (1972)'s model stock of health capital cannot be sold in the capital market implying that gross investment must be non-negative.

Case and Deaton (2005) work with a simple inter-temporal model of Grossman(1972) to untangle the links between work, earnings, health and education. In their model there is a instantaneous felicity function $v(c_t, H_t)$ where c_t is consumption and H_t is health stock. Health is updated according to :

[4.1.12] $$H_{t+1} = \theta m_t + (1 - \delta_t)H_t$$

where m_t is the quantity of health promoting activities, θ is the efficiency with which such purchases create health and δ is the depreciation rate of health.

Consumers maximize a life-cycle utility function:

[4.1.13] $$U = \sum_0^T (1+\rho)^t v(c_t, H_t)$$

where ρ is the time preference and T is the length of life. The lifetime present-value budget constraint is as the following:

[4.1.14] $$\sum_0^T \frac{c_t}{(1+r)^t} + \sum_0^T \frac{p_m m_t}{(1+r)^t} = A_0 + \sum_0^T \frac{y_t H_t}{(1+r)^t}$$

where r is the market rate of interest, p_m is the price of health-repair goods, A_0 is initial assets, and $y_t H_t$ is earnings, which depends on health. Price of consumption is

normalized to 1. When the health updating function is substituted in the budget constraint, new budget constraint that respects both the financial and the health identities is developed:

[4.1.15] $\sum_0^T \frac{c_t}{(1+r)^t} \sum_0^T \frac{H_t}{(1+r)^t} \frac{p_m}{\theta}(r+\delta_t) = A_0 + \sum_0^T \frac{y_t H_t}{(1+r)^t} - \frac{p_m}{\theta}(1+r)[\frac{H_{T+1}}{(1+r)^{T+1}} - H_0]$

First order conditions for consumption and health are:

[4.1.16] $v_{ct} = \lambda(\frac{1+\rho}{1+r})^t$

[4.1.17] $v_{ht} = \lambda(\frac{1+\rho}{1+r})^t[\frac{p_m}{\theta}(r+\delta_t) - y_{ht}]$

Provided that there is diminishing marginal utility of health as well as diminishing marginal productivity of health on earnings, the health stock throughout life will be higher i) the lower is the price of health repair, p_m, ii)the higher is the efficiency of medical care or other purchases in repairing health, θ, iii)the lower the rate of depreciation, δ_t, iv) the lower is the rate of time preference, ρ, v)the higher are initial assets, initial health, or lifetime earnings, and the lower are prices over the lifetime.

4.2 Two-Period Life Cycle Model Version 1

The purpose of this section is to provide a loose structure in the light of Grossman(1972) and Case and Deaton(2005) to assess the effect of socio-economic indicators on health. Although our models presented in section 4 are similar to those of Grossman(1972) and Case and Deaton(2005), we aim to see the effect of model parameters on health along with the coefficients in order to help to interpret empirical findings more accurately. We begin with specifying a simple two-period life cycle model in this section and improve it by adding new variables and parameters into the system in the sections 4.3 and 4.4.

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 and health status 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 an income w_1 which is fixed throughout the period. They save for retirement, s_1, and spend for medical services, m_1.[7] Furthermore, individuals invest their health through a health investment function similar to Grossman (1972) and Case and Deaton (2005). In the second period, people retire and consume their savings from the first period. They continue to invest their health by making medical expenses, m_2 and die when health status falls below a certain level. We normalize prices of consumption and medical services and working hours to 1 for simplicity and assume that the only source of income is labor-income.[8]

In the light of above assumptions time separable logarithmic utility function of the two-period life cycle model is:.

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

where c_t is consumption, h_t is health status and β is the time discount, $0 < \beta < 1$. Greater β means individuals value future more then present time; in other words, individuals have higher time preference for future.

Budget constraints for period 1 and period 2 are:

[4.2.2] $$c_1 + m_1 + s_1 = w_1$$

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

where m_t shows the quantity purchased of medical services as in Case and Deaton

[7] m_t include all medical services plus services for diet, exercise and etc.

[8] Since the price of medical services is normalized to 1, we can also treat m_t as medical expenses.

(2005). The price of consumption and price of medical services are normalized to 1 and w_1 is the hourly labor income in the first period. For simplicity we also normalize working hours to 1. s_1 is the savings from first period and r is the fixed interest rate.

Inter-temporal budget constraint that is formed from equations [4.2.2] and [4.2.3] is:

[4.2.4] $$c_1 + \frac{c_2}{1+r} = w_1 - m_1 - \frac{m_2}{1+r}$$

Health is updated according to health investment(status) 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:

[4.2.5] $$h_1 = \bar{h} - \delta\bar{h} + \psi m_1 + \phi w_1$$

[4.2.6] $$h_2 = h_1 - \delta h_1 + \psi m_2$$

where $\bar{h}$ is health endowment (initial stock of health), δ is the depreciation rate of health $0 < \delta < 1$, ψ is the efficiency of medical services that creates health, $0 < \psi < 1$, and ϕ is the efficiency of income that creates health, $0 < \phi < 1$.

We use health investment functions provided in equations [4.2.5] and [4.2.6] to substitute for medical services, m_t, as in Case and Deaton(2005).

[4.2.7] $$m_1 = \frac{h_1 - \bar{h} + \delta\bar{h} - \phi w_1}{\psi}$$

[4.2.8] $$m_2 = \frac{h_2 - h_1 + \delta h_1}{\psi}$$

Substituting m_t into the inter-temporal budget constraint gives a single integrated constraint that respects both the financial and the health identities and inter-temporal budget constraint becomes:

[4.2.9] $$c_1 + \frac{c_2}{1+r} = w_1 - \left(\frac{h_1 - \bar{h} + \delta\bar{h} - \phi w_1}{\psi}\right) - \left(\frac{h_2 - h_1 + \delta h_1}{\psi(1+r)}\right)$$

where c_1 and c_2 are the consumption in the first and second periods respectively. r

is the fixed interest rate. w_1 is the labor income that is constant throughout first period. $\bar{h}$ is the initial stock of health, h_1 is the health status in first period and h_2 is the health status in second period. ψ is the efficiency of medical services that creates health. ϕ is the efficiency of income that creates health. Finally δ is the depreciation rate of health.

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

[4.2.1] Max. $U = log(c_1) + log(h_1) + \beta log(c_2) + \beta log(h_2)$

subject to

[4.2.9] $c_1 + \frac{c_2}{1+r} = w_1 - \left(\frac{h_1 - \bar{h} + \delta\bar{h} - \phi w_1}{\psi}\right) - \left(\frac{h_2 - h_1 + \delta h_1}{\psi(1+r)}\right)$

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

[4.2.10] $L = log(c_1) + log(h_1) + \beta log(c_2) + \beta log(h_2) + \lambda[w_1 - \left(\frac{h_1 - \bar{h} + \delta\bar{h} - \phi w_1}{\psi}\right) - \left(\frac{h_2 - h_1 + \delta h_1}{\psi(1+r)}\right) - c_1 - \frac{c_2}{1+r}]$

First-order conditions are:

[4.2.11] $\frac{\partial L}{\partial c_1} = 0 \Rightarrow \frac{1}{c_1} = \lambda$

[4.2.12] $\frac{\partial L}{\partial c_2} = 0 \Rightarrow \frac{\beta}{c_2} = \frac{\lambda}{1+r}$

[4.2.13] $\frac{\partial L}{\partial h_1} = 0 \Rightarrow \frac{1}{h_1} = \frac{\lambda(r+\delta)}{\psi(1+r)}$

[4.2.14] $\frac{\partial L}{\partial h_2} = 0 \Rightarrow \frac{\beta}{h_2} = \frac{\lambda}{\psi(1+r)}$

[4.2.15] $w_1 - \left(\frac{h_1 - \bar{h} + \delta\bar{h} - \phi w_1}{\psi}\right) - \left(\frac{h_2 - h_1 + \delta h_1}{\psi(1+r)}\right) - c_1 - \frac{c_2}{1+r} = 0$

Simultaneous solutions of equations [4.2.11]-[4.2.15] lead the following health and consumption functions[9]:

[4.2.16] $$h_1 = \frac{(1+r)[w_1(\phi+\psi)+\bar{h}(1-\delta)]}{2(r+\delta)(1+\beta)}$$

[4.2.17] $$h_2 = \frac{\beta(1+r)[w_1(\phi+\psi)+\bar{h}(1-\delta)]}{2(1+\beta)}$$

[4.2.18] $$c_1 = \frac{[w_1(\phi+\psi)+\bar{h}(1-\delta)]}{2(1+\beta)\psi}$$

[4.2.19] $$c_2 = \frac{\beta(1+r)[w_1(\phi+\psi)+\bar{h}(1-\delta)]}{2(1+\beta)\psi}$$

4.2.1 The Effect&Behavior of Parameters and Comparative Statics (Version1)

Equations [4.2.16]-[4.2.19] show health and consumption functions through life cycle. We observe health and consumption functions depend on exogenous variables and the parameters of the model. To put differently, the effect of exogenous variables on health and consumption build upon the parameters. In this sense, before looking at the comparative statics we present how health and consumption changes according to changes in the parameters.

Table 4.2.1 shows how consumption and health react to the increases in the parameters. Increase in the interest rate causes health to worsen in first period and to improve in the second period while causes consumption to rise in the second period and has no effect on the consumption in the first period. 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

[9]See Appendix B for the solution of the model.

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.

Increase in ϕ, 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 4.2.1:Responses of Consumption and Health to Parameter Changes(Version1)

	h_1	h_2	c_1	c_2
increase in parameter				
r	falls	rises	no effect	rises
ϕ	rises	rises	rises	rises
ψ	rises	rises	falls	falls
δ	falls	falls	falls	falls
β	falls	rises	falls	rises

On the other hand rise in ψ; the efficiency of medical services that creates health causes an increase in health status of individuals over life-cycle, whereas causes a fall in consumption in both periods. This behavior of health and consumption in response to increase in ψ may be attributable to the fact that individuals devote their constant income and effort to health producing activities rather than consumption. 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. Finally, 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.

Now we provide comparative statics to show how health and consumption change in response to changes in exogenous variables (w_1, $\bar{h}$) in the model and how those comparative statics respond to changes in parameters. First let's look how health functions response to changes in income, w_1 and health endowment (initial stock of health), $\bar{h}$:

[4.2.20] $$\frac{\partial h_1}{\partial w_1} = \frac{(1+r)(\phi+\psi)}{2(r+\delta)(1+\beta)} > 0$$

[4.2.21] $$\frac{\partial h_2}{\partial w_1} = \frac{(1+r)(\phi+\psi)\beta}{2(1+\beta)} > 0$$

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

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

According to [4.2.20], [4.2.21], [4.2.22] and [4.2.23] partial derivatives of health status in both periods with respect to income and health endowment are positive, indicating that health status of individuals improves with the rise in income and better initial health through life cycle. Higher income increases the resources that can be devoted to medical services and thus health investment. Additionally rise in initial health stock mean individuals always will have better health at the beginning of each period.

[4.2.24] $$\frac{\partial c_1}{\partial w_1} = \frac{(\phi+\psi)}{2(1+\beta)\psi} > 0$$

[4.2.25] $$\frac{\partial c_2}{\partial w_1} = \frac{\beta(1+r)(\phi+\psi)}{2(1+\beta)\psi} > 0$$

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

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

Comparative statics for the consumption, which are presented through equations [4.2.24]

- [4.2.27] presents the same conclusion; consumption rises with income and higher initial level of health. However the magnitudes of changes in consumption and health depend on the parameters of the model and it is crucial to determine how the sizes of comparative statics change with respect to changes in the parameters of the model.

Equation [4.2.20] shows the positive effect of income on health in the first period. However as mentioned above, 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 income and medical expenses create $(\phi + \psi)$. Both the rise in the efficiency that income and medical expenses create causes the positive impact of income to increase by creating more efficient resources that can be devoted to health investment. On the other hand, the positive effect of income 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 income. The increase in the depreciation rate will cause health to decline as expected and increase in time preference will cause individuals to value future more and thus their health in the second period.

Equation [4.2.21] shows the positive effect of income on health in the second period. Rise in the parameters (r, ϕ, ψ, β) of the equation [4.2.21] 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 [4.2.22] 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 decrease 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 [4.2.23] shows 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 that can be devoted to produce health in the second period. Furthermore as individuals value future more, the positive impact of initial health on the second period's health is also stimulated.

When we look at the parameter responses of comparative statics for consumption functions the results are similar. The positive effect of income on first period consumption which is given by equation [4.2.24] rises with the efficiency that income creates, ϕ, implying the bigger impact of income on consumption when the efficiency it creates is larger. Furthermore rise in efficiency of medical expenses creates will cause a reduction in the positive effect since individuals will allocate their resources from consumption to medical expenses. On the other hand increase in time preference β and efficiency that medical expenses create ψ causes a fall in the positive effect of income on consumption in the first period. Additionally the positive impact of income on the consumption of the second period, which is given by the equation [4.2.25], also rises with the efficiency that income creates, interest rate and time preference and falls with the efficiency that medical expenses creates in line with the same reasoning before.

The responses of consumption in both periods to changes in initial level of health that are given by equations [4.2.26] and [4.2.27] also indicate rise in the depreciation rate will cause a fall of the positive effect in both periods. We see that depreciation of health not only affects the health status of individuals both also their consumption levels since unhealthy individuals will have less opportunity to consume. Again higher time preference for future will reduce consumption in the first period, rise consumption in the second period and thus augment the effect of initial health status on consumption for the second period and diminish it in the first period.

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. Now we proceed by expanding our simple model by adding education, non-labor income and working hours in the following two sub-sections.

4.3 Two-Period Life Cycle Model Version 2

In the second version of our two-period life cycle model we add education as an exogenous variable to cover the influence of education services on health over life cycle. Now, people receive education and work in the first period. We normalize the price of education to 1. All other assumptions identified in the previous section hold. We still have time separable logarithmic utility function:

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

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

Since people also spend on education services in the first period budget constraint of period 1 alters. Budget constraint in the first and second periods are:

[4.3.2] $$c_1 + m_1 + s_1 + e_1 = w_1$$

[4.3.3] $$(1 + r)s_1 = c_2 + m_2$$

where m_t shows the quantity purchased of medical services, s_1 is the savings from first period, w_1 is the hourly labor income in the first period and e_1 is the quantity of education services. The price of consumption, price of medical services, working hours and price of education services are normalized to 1. r is the fixed interest rate.

Inter-temporal budget constraint becomes:

[4.3.4] $c_1 + \frac{c_2}{1+r} = w_1 - m_1 - e_1 - \frac{m_2}{1+r}$

Health investment functions also alter due to the inclusion of education in the model. We assume that education has a positive effect on health through efficiency it creates as in Grossman (1972)[10]. Health investment functions of the model are:

[4.3.5] $h_1 = \bar{h} - \delta\bar{h} + \psi m_1 + \phi w_1 + \epsilon e_1$

[4.3.6] $h_2 = h_1 - \delta h_1 + \psi m_2$

where ϵ is the efficiency that education creates better health. Medical services functions that are derived from [4.3.5] and [4.3.6] are:

[4.3.7] $m_1 = \frac{h_1 - \bar{h} + \delta\bar{h} - \phi w_1 - \epsilon e_1}{\psi}$

[4.3.8] $m_2 = \frac{h_2 - h_1 + \delta h_1}{\psi}$

Thus integrated inter-temporal budget constraint which respects both financial and health identities becomes:

[4.3.9] $c_1 + \frac{c_2}{1+r} = w_1 - e_1\left(\frac{h_1 - \bar{h} + \delta\bar{h} - \phi w_1 - \epsilon e_1}{\psi}\right) - \left(\frac{h_2 - h_1 + \delta h_1}{\psi(1+r)}\right)$

The problem becomes:

[4.3.1] max. $U = log(c_1) + log(h_1) + \beta log(c_2) + \beta log(h_2)$

subject to

[10]The positive affect of education on health is multi-dimensional. Higher education leads better jobs and thus income. Furthermore higher education socially and personally benefits individuals and plays a crucial role in the socialization process by supporting and embedding habits, skills and values conducive to social cooperation and increased participation in society. Additionally better educated people care more about their health through exercising and dieting.

[4.3.9] $$c_1 + \frac{c_2}{1+r} = w_1 - e_1\left(\frac{h_1-\bar{h}+\delta\bar{h}-\phi w_1-\epsilon e_1}{\psi}\right) - \left(\frac{h_2-h_1+\delta h_1}{\psi(1+r)}\right)$$

The Lagrangian:

[4.3.10] $$L = log(c_1) + log(h_1) + \beta log(c_2) + \beta log(h_2) + \lambda[w_1 - e_1 - \left(\frac{h_1-\bar{h}+\delta\bar{h}-\phi w_1-\epsilon e_1}{\psi}\right) - \left(\frac{h_2-h_1+\delta h_1}{\psi(1+r)}\right) - c_1 - \frac{c_2}{1+r}]$$

First-order conditions are:

[4.3.11] $$\frac{\partial L}{\partial c_1} = 0 \Rightarrow \frac{1}{c_1} = \lambda$$

[4.3.12] $$\frac{\partial L}{\partial c_2} = 0 \Rightarrow \frac{\beta}{c_2} = \frac{\lambda}{1+r}$$

[4.3.13] $$\frac{\partial L}{\partial h_1} = 0 \Rightarrow \frac{1}{h_1} = \frac{\lambda(r+\delta)}{\psi(1+r)}$$

[4.3.14] $$\frac{\partial L}{\partial h_2} = 0 \Rightarrow \frac{\beta}{h_2} = \frac{\lambda}{\psi(1+r)}$$

[4.3.15] $$w_1 - e_1 - \left(\frac{h_1-\bar{h}+\delta\bar{h}-\phi w_1-\epsilon e_1}{\psi}\right) - \left(\frac{h_2-h_1+\delta h_1}{\psi(1+r)}\right) - c_1 - \frac{c_2}{1+r} = 0$$

First four FOCs are the same. Only the first-order condition related to budget constraint changes due to inclusion of education. Simultaneous solutions of equations [4.3.11]-[4.3.15] lead the following consumption and health functions:

[4.3.16] $$h_1 = \frac{(1+r)[w_1(\phi+\psi)+e_1(\epsilon-\psi)+\bar{h}(1-\delta)]}{2(r+\delta)(1+\beta)}$$

[4.3.17] $$h_2 = \frac{\beta(1+r)[w_1(\phi+\psi)+e_1(\epsilon-\psi)+\bar{h}(1-\delta)]}{2(1+\beta)}$$

[4.3.18] $$c_1 = \frac{[w_1(\phi+\psi)+e_1(\epsilon-\psi)+\bar{h}(1-\delta)]}{2(1+\beta)\psi}$$

[4.3.19] $$c_2 = \frac{\beta(1+r)[w_1(\phi+\psi)+e_1(\epsilon-\psi)+\bar{h}(1-\delta)]}{2(1+\beta)\psi}$$

Now education enters all the equations for health and consumption indicating its crucial impact through the efficiency it creates. However the size of the influence depends on the relative magnitudes of ϵ and ψ. Thus we can argue that education has two opposing effects on health and consumption which is discussed in the following section.

4.3.1 The Effect&Behavior of Parameters and Comparative Statics (Version2)

Table 4.3.1 gives how health and consumption response to the changes in the model parameters. The results are similar to Table 4.2.1. However the impact of ψ that is the efficiency of medical services is ambiguous now. For example ψ has a positive effect on h_1 through $w_1(\psi + \phi)$ and has a negative effect on h_1 through $-e_1\psi$. 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 $\psi + \phi$. 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. In addition to results in Table 4.2.1, we observe that efficiency that education creates, ϵ, has a positive impact on both health and consumption functions in two periods.

As in the previous section 4.2.1 we obtain comparative statics of the arguments of the utility function in order to see the behavior of health and consumption to the changes in exogenous variables in the system. Equations [4.3.20]- [4.3.25] give the partial derivatives of health with respect to income, initial stock of health and education. Income and initial stock of health have positive effects on health while the effect of education depends on the relative sizes of ϵ and ψ. If the efficiency that is created by education is greater than the efficiency that is created by medical services, then education causes health to improve. The reason why ψ enters the equations [4.3.24] and [4.3.25] negatively is due to the transfer of income spent on medical services to education services. Thus as we mentioned before

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 receive.

Table 4.3.1:Responses of Consumption and Health to Parameter Changes(Version2)

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

[4.3.20] $\frac{\partial h_1}{\partial w_1} = \frac{(1+r)(\phi+\psi)}{2(r+\delta)(1+\beta)} > 0$

[4.3.21] $\frac{\partial h_2}{\partial w_1} = \frac{(1+r)(\phi+\psi)\beta}{2(1+\beta)} > 0$

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

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

[4.3.24] $\frac{\partial h_1}{\partial e_1} = \frac{(1+r)(\epsilon-\psi)}{2(r+\delta)(1+\beta)}$ ambiguous and depends on the relative sizes of ϵ and ψ.

[4.3.25] $\frac{\partial h_2}{\partial e_1} = \frac{(1+r)\beta(\epsilon-\psi)}{2(1+\beta)}$ ambiguous and depends on the relative sizes of ϵ and ψ.

Equations [4.3.26]-[4.3.31] show comparative statics of consumption functions with respect to income, initial health stock and education. Consumption in the first and second

period rises with income and initial stock of health. However the behavior of consumption in both periods is ambiguous depending on the relative sizes of the parameters ϵ and ψ as in the case of health functions.

[4.3.26] $$\frac{\partial c_1}{\partial w_1} = \frac{(\phi+\psi)}{2(1+\beta)\psi} > 0$$

[4.3.27] $$\frac{\partial c_2}{\partial w_1} = \frac{\beta(1+r)(\phi+\psi)}{2(1+\beta)\psi} > 0$$

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

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

[4.3.30] $\frac{\partial c_1}{\partial e_1} = \frac{(\epsilon-\psi)}{2(1+\beta)\psi}$ ambiguous and depends on the relative sizes of ϵ and ψ.

[4.3.31] $\frac{\partial c_2}{\partial_1} = \frac{\beta(1+r)(\epsilon-\psi)}{2(1+\beta)\psi}$ ambiguous and depends on the relative sizes of ϵ and ψ.

Now we present how the comparative statics respond to the changes in the parameters. Equations [4.3.20]-[4.3.23] and [4.3.26]-[4.3.29] give the same results as the previous ones. Hence let's focus on the impact of education on health and consumption functions. As mentioned before, according to equations [4.3.24] and [4.3.25] we observe that the effect of education on health in both periods is ambiguous depending on the relative sizes of ϵ and ψ. First assume that ϵ is greater than ψ and the effect of education on health is positive in both periods. The rise in interest rate then 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 in the second period rise in the interest rate causes an increase in the positive effect of education on health. 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 causes a decrease in the positive impact of education in the first period and rise in time preference leads a decrease in the positive effect of education on health in the first period and an increase in the second period.

If the efficiency of medical expenses create is greater than the efficiency that education create, that is $\psi > \epsilon$, 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.

4.4 Two-Period Life Cycle Model Version 3

In this section we expand the previous two models by adding working hours, n_t and non-labor income, y_t. We assume that non-labor income has a health improving influence. On the other hand working hours has a positive effect on health through the labor income it creates and a negative effect through the loss in leisure and depreciation it causes. All other assumptions of the previous two models are still valid. The utility function is the following:

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

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

Since we include working hours and non-labor income in the model, the budget constraints alter as the following:

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

[4.4.3] $(1+r)s_1 = c_2 + m_2$

Now individuals have two sources of income; the income through labor supply ($w_1 n_1$) and income through non-labor activities such as rent, interest or benefits (y_1). n_1 shows the working hours. In the first period of their lives individuals spend for consumption, medical services and education and save for retirement. In the second period they use their savings and spend for consumption and medical services. We combine equations [4.4.2] and [4.4.3] to obtain inter-temporal budget constraint:

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

Health investment functions becomes as the following:

[4.4.5] $h_1 = \bar{h} - \delta\bar{h} + \psi m_1 + \phi w_1 n_1 - \tau n_1 + \sigma y_1 + \epsilon e_1$

[4.4.6] $h_2 = h_1 - \delta h_1 + \psi m_2$

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. By using equations of health investments we obtain medical services functions:

[4.4.7] $m_1 = \frac{h_1 - \bar{h} + \delta\bar{h} - \phi w_1 n_1 + \tau n_1 - \sigma y_1 - \epsilon e_1}{\psi}$

[4.4.8] $m_2 = \frac{h_2 - h_1 + \delta h_1}{\psi}$

When we use equations [4.4.7] and [4.4.8] to produce inter-temporal budget constraint that respects both financial and health identities, new inter-temporal budget constraint is as the following:

[4.4.9] $c_1+\frac{c_2}{1+r} = w_1n_1+y_1-e_1(\frac{h_1-\bar{h}+\delta\bar{h}-\phi w_1n_1+\tau n_1-\sigma y_1-\epsilon e_1}{\psi})-(\frac{h_2-h_1+\delta h_1}{\psi(1+r)})$

The problem becomes:

[4.4.1] max. $U = log(c_1) + log(h_1) + \beta log(c_2) + \beta log(h_2)$

subject to

[4.4.9] $c_1+\frac{c_2}{1+r} = w_1n_1+y_1-e_1(\frac{h_1-\bar{h}+\delta\bar{h}-\phi w_1n_1+\tau n_1-\sigma y_1-\epsilon e_1}{\psi})-(\frac{h_2-h_1+\delta h_1}{\psi(1+r)})$

The Lagrangian becomes:

[4.4.10] $L = log(c_1) + log(h_1) + \beta log(c_2) + \beta log(h_2) + \lambda[w_1n_1 + y_1 - e_1 - (\frac{h_1-\bar{h}+\delta\bar{h}-\phi w_1n_1+\tau n_1-\sigma y_1-\epsilon e_1}{\psi}) - (\frac{h_2-h_1+\delta h_1}{\psi(1+r)}) - c_1 - \frac{c_2}{1+r}]$

First-Order conditions:

[4.4.11] $\frac{\partial L}{\partial c_1} = 0 \Rightarrow \frac{1}{c_1} = \lambda$

[4.4.12] $\frac{\partial L}{\partial c_2} = 0 \Rightarrow \frac{\beta}{c_2} = \frac{\lambda}{1+r}$

[4.4.13] $\frac{\partial L}{\partial h_1} = 0 \Rightarrow \frac{1}{h_1} = \frac{\lambda(r+\delta)}{\psi(1+r)}$

[4.4.14] $\frac{\partial L}{\partial h_2} = 0 \Rightarrow \frac{\beta}{h_2} = \frac{\lambda}{\psi(1+r)}$

[4.4.15] $w_1n_1 + y_1 - e_1 - (\frac{h_1-\bar{h}+\delta\bar{h}-\phi w_1n_1+\tau n_1-\sigma y_1-\epsilon e_1}{\psi}) - (\frac{h_2-h_1+\delta h_1}{\psi(1+r)}) - c_1 - \frac{c_2}{1+r} = 0$

The equations of first-order conditions are the same as before except the condition for the budget constraint since the dynamics of the system changes due to the alterations in the budget constraint and health investment functions. Again the simultaneous solutions of equations [4.4.11]-[4.4.15] yield the following health and consumption functions:

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

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

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

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

4.4.1 The Effect&Behavior of Parameters and Comparative Statics

As in the previous two versions of the two-period model Table 4.4.1 shows the responses of health and consumption to parameter changes. The results presented in the previous two sections are still valid. The additional parameters are τ and σ which measure the inefficiency of working and efficiency of non-labor income respectively. Increase 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. We still observe the ambiguous effect of education emerging from the positive effect through the efficiency it creates to produce health and negative effect through the loss in medical services that individual would attain.

Table 4.4.1:Responses of Consumption and Health to Parameter Changes(Version3)

	h_1	h_2	c_1	c_2
increase in parameter				
r	falls	rises	no effect	rises
ϕ	rises	rises	rises	rises
ψ	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

Now let's look at the comparative statics of the version 3 of the two-period model. Equations [4.4.20]-[4.4.29] present how health functions in the first and second period react to the changes in exogenous variables in the model. 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 both in two periods. Working hours has a positive effect through the increase in wage income which makes it possible to devote more resources 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.

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

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

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

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

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

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

[4.4.26] $\frac{\partial h_1}{\partial e_1} = \frac{(1+r)(\epsilon-\psi)}{2(r+\delta)(1+\beta)}$ ambiguous, depends on the relative sizes of ϵ and ψ.

[4.4.27] $\frac{\partial h_2}{\partial e_1} = \frac{\beta(1+r)(\epsilon-\psi)}{2(1+\beta)}$ ambiguous, depends on the relative sizes of ϵ and ψ.

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

[4.4.29] $\frac{\partial h_2}{\partial y_1} = \frac{\beta(1+r)(\psi+\sigma)}{2(1+\beta)} > 0$

Equations [4.4.30]-[4.4.39] 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 income, education and initial stock of health, whereas the effect of working hours is ambiguous.

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

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

[4.4.32] $\frac{\partial c_1}{\partial n_1} = \frac{[w_1(\phi+\psi)-\tau]}{2\psi(1+\beta)}$ ambiguous, increases with the wage but de-

creases with the inefficiency that working creates.

[4.4.33] $\frac{\partial c_2}{\partial n_1} = \frac{\beta(1+r)[w_1(\phi+\psi)-\tau]}{2\psi(1+\beta)}$ ambiguous, increases with the wage but decreases with the inefficiency that working creates.

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

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

[4.4.36] $\frac{\partial c_1}{\partial e_1} = \frac{(\epsilon-\psi)}{2\psi(1+\beta)}$ ambiguous, depends on the relative sizes of ϵ and ψ.

[4.4.37] $\frac{\partial c_2}{\partial e_1} = \frac{\beta(1+r)(\epsilon-\psi)}{2\psi(1+\beta)}$ ambiguous, depends on the relative sizes of ϵ and ψ.

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

[4.4.39] $\frac{\partial c_2}{\partial y_1} = \frac{\beta(1+r)(\psi+\sigma)}{2\psi(1+\beta)} > 0$

However in order to fully understand the behavior of comparative statics we need to determine how the derivatives respond to changes in parameters. Equation [4.4.20] shows the positive effect of labor income on health in the first period. As in the previous two sections the positive effect of labor income on health in the first period rises with the efficiency that income and medical expenses create $(\psi + \phi)$, decreases with the rise in interest rate r, time preference β and depreciation rate of health δ. In addition to those responses the positive effect of labor income rises with working hours, n_1. Higher working hours will cause an increase in labor income and thus in financial resources that can be used to produce health. The same conclusion is also valid for equation [4.4.21]. Rise in working hours will also increase the financial resources available to individuals that can

be invested in health in the second period as well. Now, increase in time preference will cause a rise in the positive effect of labor income on health 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 $w_1(\phi+\psi)$ and τ. If the inefficiency of working creates is grater 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 [4.4.22], 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 [4.4.23] 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 $w_1(\phi+\psi)$ in the second period.

According to equations [4.4.28] and [4.4.29] the impact of non-labor income on health is positive in both periods. The positive effect rises with $(\psi+\phi)$ in both periods, falls with interest rate in the first period and rises with interest rate in the second period. Furthermore, when individuals value future more, that is 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. The response of comparative statics of consumption functions to the changes in parameters are similar to the comparative statics of the health functions.

4.5 Discussion

In this section we try to put forward a simple two-period life cycle model in line with the models of Grossman (1972) and Case and Deaton (2005). The main purpose is to establish the structure in which socio-economic status(SES) affects health. We only presented the health gradient according to SES in the third section without giving the causal mechanisms. However determining the pathways of which SES influence health is crucial in policy designs. Policies aimed at improving health are important for maintaining

financial stability of pension systems, extending working lives and prevent health related labor force exits.

Since our models presented in this section are similar to those of Grossman(1972) and Case and Deaton(2005), our major point of discussion is how the parameters of interest alter the behavior of health function. We believe that by determining the impact of parameters of the system would help to interpret the differences between men and women and among different age groups. For instance when we include education in the second and third model, the impact of education becomes ambiguous depending on the relative sizes of ϵ and ψ. The efficiency created by better education, ϵ and efficiency of medical services that creates health,ψ, may be larger in certain ages or differ by gender. In this respect we use the conclusions of the theoretical model presented here to interpret the empirical results in section 5 and observe how the parameters of the model and response of health status to SES changes over life cycle.

5. ESTIMATION METHODOLOGY AND 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, 2007:746). We discussed how health-SES gradient varies and how cumulative advantage and age-as-leverer hypothesis operate over the life course in section 3. Processes of cumulative advantage represents a major challenge and getting closer to goal of equality of opportunity could raise national wealth by breaking the connection between socially disadvantaged groups, poor health and early labor force exit (Van Kippersluis et al., 2009:24). Of course breaking this connection requires identifying the specific mechanisms that affect health status. Furthermore, we also tried to put forward a two-period life cycle model to formulate how socio-economic status would influence health in section 4 and concluded that behavior of the model parameters are essential to cover the effect of SES on health.

Now in this section we aim to establish the causal relation from SES to health empirically by employing Turkstat Income and Living Conditions Survey 2010. The estimation methodology requires the determination of variables to be used in the analysis, testing the validity of the identification assumptions and correcting for endogeneity. Our dependent variable, health status, is a binary variable and the estimation technique is probit. However we also present Linear Probability Model (LPM) results. Furthermore endogeneity is corrected by applying different methods. There are many variants of instrumental variable (IV) estimation for binary dependent variable such as IV-LPM(2SLS), IV-Probit, Two-Stage Residual Inclusion (2SRI) and Full Information Maximum Likelihood bivariate probit(FIML). Bhattacharya et al. (2006) showed that IV-Probit and IV-LPM estimators exhibited greater bias than 2SRI estimator even in the presence of misspecification of the distribution of error terms. Additionally Terza et al. (2007) presented the consistency of

the 2SRI estimator in the class of non-linear models and emphasize the inconsistency of the alternative approaches. In this respect we present results from IV-LPM, IV-Probit and 2SRI as a robustness check and compare the results.

5.1 Variables and Estimation Methodology

In order to investigate how SES affects health status, we employ Turkstat Income and Living Conditions Survey 2010, which is a nationally representative cross section survey of approximately 25000 individuals and has a sufficient of information on demographics, socio-economic status (SES) and health status.[11] The model to be estimated is:

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

where H_i is the self assessed health status and is a function of X_i and SES_i. X_i represents the vector of demographic and household characteristics such as age, gender, marital status and region, number of children below 15 in the household and living quartiles per person in the household. 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 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 affect of gender. Dummies of married, divorced and widowed aim to assess the impact of marital status and reference group is the individuals who are single. Urban dummy shows whether the

[11] See section 3 and Appendix A for detailed information about the data.

individual lives in a urban area. Number of children shows how many children (below 15) live in the household. Living quartiles is a continuous variable showing per capita living area for each person in the household. Medium and high education dummies are used to measure the impact of education on health and the reference category is low education in which illiterate individuals and individuals completed primary school are included. Medium education category includes secondary and high school education and high education category includes university or higher degrees. White collar dummy is used to assess whether people work in less physically demanding jobs has better health with respect to individuals working in physically demanding occupations. Household income per capita is a continuous variable in logarithmic form calculated from yearly income of the household and adjusted by Oxford Equivalence Scale which is explained in section 3. 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. That is in the first estimation we only look at the effect of working hours on health. However 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. More information about the estimation process on extensive and intensive margins of labor are presented in section 5.2.

Table 5.1 Definition of Variables Used in Estimation

Variable	Definition
dependent variable	
health status	assessment of own health (1=if good, 0=if bad)
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 or equal to 65
male	=1 if individual is male
married	=1 if individual is married
divorced	=1 if individual is divorced or separated
widowed	=1 if individual is widowed
urban	=1 if individual lives in a urban area
number of children	number of children below 15 living in the household
living quartiles	size of living area per person in the household
socio-economic status	
medium education	=1 if individual completed secondary, high or vocational high school
high education	=1 if individual completed university or higher
white collar	=1 if individual is a white collar worker
hh income	total yearly income per capita adjusted by Oxford scale
work hours	total weekly work hours of the individual
employment	=1 if the individual is employed full time or part time

Source:Turkstat Income and Living Conditions Survey 2010 and author's calculations.

The main estimation methodology used in this study is probit which is a binary outcome model and we also present linear probability model (LPM) estimation results. Cameron and Trivedi (2005) explains the probit model as the following: For binary out-

come data the dependent variable y takes one of two values:

$y = 1$ with probability p
$= 0$ with probability $1 - p$

There is no loss of generality in setting values to 1 and 0 if all that is being modeled is p, which determines the probability of outcome. A regression model is formed by parameterizing the probability p to depend on a regressor vector **x** and a $Kx1$ parameter vector β. The commonly used models are of single-index form with conditional probability given by

[5.2] $$y_i = Pr[y_i = 1/x] = F(\mathbf{x'}_i\beta)$$

where $F(.)$ is a specified function. To ensure that $0 \leq p \leq 1$ it is natural to specify $F(.)$ to be a cumulative function (Cameron and Trivedi, 2005:466). Probit model arises if $F(.)$ is the standard normal cdf:

[5.3] $$F(.) = \theta(x'\beta) = \int_{-\infty}^{x'\beta} \phi(z)dz$$

The model to be estimated becomes:

[5.4] $$H_i = F(X_i'\beta_1 + SES_i'\beta_2 + \epsilon_i)$$

where $F(.)$ is the standard normal distribution.

5.1.1 Marginal Effects

In order to successfully apply binary response models (probit or logit), it is crucial to know how to interpret the coefficients on both discrete and continuous explanatory variables (Wooldridge, 2001:458). If one is interested in the outcome y, the probit and

logit will still tell the direction and statistical significance associated with the impact of increasing an explanatory variable just like Ordinary Least Squares (OLS) coefficients. Hence, a positive and significant coefficient β_j reports that an explanatory variable X_j significantly increases the probability of outcome being equal to 1; $y = 1$.

However, probit or logit coefficients do not tell how much the probability that $y = 1$ will change when explanatory variable x_k changes. In other words, the interest lies in determining the marginal effect of change in a regressor on the conditional probability that $y = 1$ (Cameron and Trivedi, 2005:467). With binary independent variables, marginal effects measure discrete change, i.e. how do predicted probabilities change as the binary independent variable changes from 0 to 1. In this sense, marginal effects from probit estimations are presented for the estimation results in section 5.2.

For the binary response models described above and change in kth regressor, assumed to be continuous (Greene, 2006:712). That is:

[5.5] $$\frac{\delta y}{\delta x_k} = \frac{\delta F(x_i\beta)}{\delta x_k} = \frac{\delta F(x_i\beta)}{\delta x_i\beta}.\frac{\delta x_i\beta}{\delta x_k} = F'(x_i\beta)\beta_k = f(x_i\beta)\beta_k$$

In the case of probit marginal effects are calculated as:

[5.6] $$\frac{\delta y_i}{\delta x_k} = \frac{\delta \Phi(x_i\beta)}{\delta x_k} = \Theta(x_i\beta)\beta_k$$

where Θ is the pdf of standard normal cdf.

5.1.2 Probit Versus Linear Probability Model (LPM)

Linear probability model has advantages over nonlinear binary response models such as probit and logit for its simplicity and direct estimation of marginal effects. As stated in the previous section parameters of a binary response model, such as the probit model, are not particular interest to us, what we care is the marginal effects. The linear probability model (LPM) does a good job in estimating marginal effects, but it does not give the true

marginal effects from the right nonlinear model. In other words, LPM does not estimate structural parameters of a non-linear model and does not give consistent estimates of the marginal effects (Horrace and Oaxaca, 2006:322). Additional problems that may arise could be; non-normal errors, heteroscedasticity of error terms and non-boundness of coefficients on the unit interval. LPM does not lend itself towards dealing with measurement error in the dependent variable. Horrace and Oaxaca(2006) show bias and inconsistency of the results for OLS on linear probability model even if they do not present probit or logit as a remedy for LPM in which OLS estimated probabilities are not bounded on the unit interval and OLS implies heteroscedasticity.

Since outcome variable y can only take two possible values the error terms can also take only two values:

if $y = 1$ then $\epsilon = 1 - p(x)$ with probability $p(x)$

if $y = 0$ then $\epsilon = p(x)$ with probability $1 - p(x)$

Thus, the assumption of normally distributed error terms is violated since one can not have a normal distribution when the error terms are only free to take on two possible values. Furthermore, the distribution of ϵ will have mean 0 and variance equal to $p(x)(1 - p(x))$ which will lead heteroscedastic variances.

There may also be problems with the plausibility of the model and its coefficient estimates. As mentioned before estimated outcome y can only be interpreted as the estimated probability of certain situation occurrence and probabilities can only vary between 0 and 1. However, in OLS, there is no constraint that outcome estimates lie in the 0-1 range and is free to change between negative infinity and positive infinity.

As indicated above, what we care about is the marginal effects and LPM do not give the true marginal effects from the "right" nonlinear model. However the reverse could also be the case in which probit and logit don't report correct marginal effects from "wrong" nonlinear model. In this respect, the choice of model requires many important steps in order to adjust for covariates to improve precision.

5.1.3 Measurement Error Due to Reporting Heterogeneity

Although self assessed health status is a convenient and informative indicator widely used in studies of health determinants as well as the economic consequences of bad health, heterogeneity in reporting of health potentially biases the measurement of health disparities. For a given true but unobserved health state, people will report health differently depending upon conceptions of health in general, expectations for own health, financial incentives and strategic behavior to report poor health and comprehension of the survey questions (Bago d'Uva et al., 2006:342).

In many contexts, reporting heterogeneity need not be a major concern provided that it is random. However reporting heterogeneity becomes a problem if there are systematic differences in the way in which health is reported across demographic and SES characteristics against which inequality is being assessed (Kerkhofs and Lindeboom,1995:223).

One of the approaches to solve reporting heterogeneity in ordinal variables is to obtain more objective indicators such as indices, doctor reports and mortality rates (Bound, 1991; Kerkhofs and Lindeboom, 1995; O'Donnel 1998; Kreider, 1999) One problem with this approach is that objective indicators may not be available. Less objective indicators such as health conditions or health problems are more likely to be available but are also subject to error (Bago d'Uva et al., 2006:342). Another approach would be using vignettes. Rather than attempt to identify reporting behavior from variation in self reported health beyond that explained by objective indicators, an alternative is to examine variation in the evaluation of given health states represented by hypothetical case vignettes (Kapteyn et. al, 2007, King and Wand, 2007; Salamon et al. 2001, Bago d'Uva et al., 2006). The vignettes represent fixed levels of latent health and so all variation in the rating of them can arguably be attributed to reporting behavior, which can be examined in relation to observed characteristics (Bago d'Uva et al., 2006:343). Under the assumption that individuals rate the vignettes in the same way as they rate their own health, it is possible to identify a measure of health that is free of reporting heterogeneity.

Endogeneity between health status and SES would also arise due to reporting errors,

unobserved factors and reverse causality. The problem of endogeneity will be discussed in the following section. In the absence of state dependent errors the endogeneity problems boil down to standard problems that can be solved with IV approaches. However the data used in this study does not allow to correct for measurement error resulted from reporting heterogeneity due to lack of more objective measures of health and any vignettes. In this respect one should keep in mind that the further analysis conducted in the following sections only correct measurement error due to endogeneity, not reporting heterogeneity.

5.1.4 Measurement Error Due to Endogeneity and Two Stage Residual Inclusion (2SRI)

Another considerable weakness of self assessed health status (SAH) 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, 2005:3). In other words, one key issue in the broader area of health and SES is the possible endogeneity of SAH and, in particular, justification bias. 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 (Wing Han Au et al., 2004:6).

In the model used there are two variables that may create endogeneity bias; income and work hours(employment). We have depicted health-income gradient in the third section and showed the evolution of the gradient over life cycle. 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, 1996:68). 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, 1996:68).

Endogeneity between work hours and health status could also be the reason for mea-

surement error. The problem may arise due to reverse causality; working hours affects health but also health affects working hours, or omitted factors that might influence health and work hours(employment) at the same time.

To sum up, 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, 2013:129). 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, spousal education and interactions between regional unemployment and age.

Specifically the following first stage reduced form equations are estimated in order to obtain instrumented variables:

[5.7] $$income_i = \alpha_1 + \alpha_2 X_i + \alpha_3 S_i + \alpha_4 unemp_i + \alpha_5 exp_i + \alpha_6 speduc_i + \alpha_7 (unemp_i * age_i) + u_i$$

[5.8] $$hours_i = \theta_1 + \theta_2 X_i + \theta_3 S_i + \theta_4 unemp_i + \theta_5 exp_i + \theta_6 speduc_i + \theta_7 (unemp_i * age_i) + u_i$$

[5.9] $$employment_i = \gamma_1 + \theta_2 X_i + \gamma_3 S_i + \gamma_4 unemp_i + \gamma_5 exp_i + \gamma_6 speduc_i + \gamma_7 (unemp_i * age_i) + u_i$$

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, $speduc_i$ is a binary variable showing the education level of the spouse and $unemp_i * age_i$ is the interaction between unemployment and age.

The efficiency of IV approach relies on the fact that whether the instruments are suffi-

ciently 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, 2013:129). 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, 2013:219). In addition, higher unemployment rates lead unemployed individuals to work for lower wages and thus causes income to fall.

The interaction terms between age and regional unemployment rates are used to capture the different responses of different age groups to regional economic activity. This specification is motivated by the cyclical volatility of hours of work is U-shaped function of age (Becker, 1967:93). The employment and work hours of young individuals are much more variable than that of prime-aged people and thus income over the business cycle (Xu, 2013:130). Furthermore, individuals who are married derive non-earnings income through the income of the spouse thus spousal education is also used as an instrument (Ettner, 1996:77). Parental education is also a good IV candidate but does not exist in our data set.

As we mentioned before there are many variants of IV estimation for binary response models. Although Bhattacharya et al.(2006) and Terza et al. (2007) argues that 2SRI results show less bias and are more consistent, we present results from IV-LPM(2SLS), IV-Probit and 2SRI-Probit and we compare the results to see if there is a significant difference.

Two-stage residual inclusion (2SRI) is a common nonlinear modeling framework which is widely used in empirical research in health economics and health services research. Before continuing with 2SRI, it is worthwhile to mention two other familiar IV estimation techniques; 2SLS (IV-LPM in the current framework) and two-stage predictor substitution (2SPS). 2SPS is the rote extension (to nonlinear models) of the popular linear 2SLS estimator. The 2SRI estimator is similar except that in the second-stage regression,

the endogenous variables are not replaced by first-stage predictors. Instead, first-stage residuals are included as additional regressors (Terza et al., 2007:531).

In a linear model all of the three two-step IV methods will give the same results, that is 2SLS=2SPS=2SRI. Therefore, all three methods are consistent. These identities do not, however, hold in the generic nonlinear case so the consistency of each method must be individually examined (Terza et al., 2007:531). Terza et al. (2007) show the consistency of the 2SRI estimator in the class of non-linear models and emphasize the inconsistency of the alternative 2SLS and 2SPS approaches. Their goal is to demonstrate the superiority of the 2SRI method, to guide applied researchers in carrying out 2SRI estimation when they are trying to address endogeneity in nonlinear models (Terza et al., 2007:532).[12]

In the estimation process we employ the following nonlinear framework as in Terza et al. (2007):

[5.10] $$E[y/x_o, x_e, x_u] = M(x_o\beta_0 + x_e\beta_e + x_u\beta_u)$$

[5.11] $$y = M(x_o\beta_0 + x_e\beta_e + x_u\beta_u) + e$$

where $M(.)$ is a known nonlinear function, x_0 is a 1xK vector of observable exogenous regressors, x_e denotes a 1xS vector of endogenous regressors and x_u shows unobservable omitted variables that influence the outcome and are correlated with the endogenous variables. e is the random error term. The essence of the endogeneity problem is the correlation between x_e and x_u (Terza et al., 2007:533). To formalize the relationship between x_e and x_u and thereby provide a means for dealing with endogeneity bias through the use of instrumental variables (IV), Terza et al. (2007) define the following linear reduced form equation:[13]

[12]See Garrido et al., 2012, Terza 1998, Terza et al., 2007, Wooldridge, 2001 Chapter 12 for further information on nonlinearity, endogeneity and 2SRI

[13]The auxiliary equation could also be in nonlinear form. See Terza et al., 2007.

[5.12] $$x_{es} = w\alpha_s + x_{us}$$

[5.13] $$\hat{x_{us}} = x_{es} - w\hat{\alpha}_s$$

where w is a 1xS vector of identifying instruments. α_s is a $(K+S)1$ column vector of parameters. The elements of w must satisfy the following three conditions: (1) they cannot be correlated with x_u; (2) they must be sufficiently correlated with x_e (i.e. they must not be weak); and (3) they can neither have a direct influence on y nor be correlated with the error term in [5.11] (Terza et al., 2007:533). In the first-stage requires obtaining consistent estimates of the vectors α_s by applying the appropriate linear or nonlinear technique and then computing the predictors of x_e. In the second stage following regression is estimated:

[5.14] $$y = M(x_o\beta_0 + x_e\beta_e + \widehat{x_u}\beta_u) + e^{2SRI}$$

where e^{2SRI} is the regression error term. Note that the actual observed value of the endogenous regressors x_e are maintained in the second-stage regression model while the residuals from the auxiliary regressions are substituted for the unobserved confounders x_u (Terza et al. 2007:534). [14]

According to information above, the model to be estimated to assess the affect of SES on health becomes:

[5.15] $$H_i = F(X_i'\beta_1 + SES_i'\beta_2 + \epsilon_i) = F(X_i'\beta_1 + SES_i'\beta_2 + SES_e'\beta_3) + \epsilon_i^{2SRI}$$

where X_i' is a vector of exogenous regressors that shows demographic and household characteristics. SES_i' is the vector of exogenous socio-economic regressors and SES_e' is

[14] See Terza et al. 2007 for further information on consistency of 2SRI both in linear and nonlinear cases.

the vector of endogenous socio-economic regressors. The vector of unobserved omitted variables is ignored for simplicity. Since the estimation methodology is probit, $F(.)$ is the standard normal cdf.

5.2 Estimation Results

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 the following:

[5.15] $H_i = F(X_i'\beta_1 + SES_i'\beta_2 + \epsilon_i) = F(X_i'\beta_1 + SES_i'\beta_2 + SES_e'\beta_3) + \epsilon_i^{2SRI}$

Vector X_i contains demographic and household characteristics, vector SES_i shows exogenous socio-economic characteristics such as education and occupation. Vector SES_e stands for endogenous variables; income and work hours (employment). As discussed in the previous section, the IV estimation methodology is IV-LPM(2SLS), IV-Probit and IV approach with 2SRI. We assume that first stage regressions are in the linear form and the estimation method of first stage equations are OLS. Linear first stage regressions which are presented in the previous section are as the following:

[5.7] $income_i = \alpha_1 + \alpha_2 X_i + \alpha_3 S_i + \alpha_4 unemp_i + \alpha_5 exp_i + \alpha_6 speduc_i + \alpha_7(unemp_i * age_i) + u_i$

[5.8] $hours_i = \theta_1 + \theta_2 X_i + \theta_3 S_i + \theta_4 unemp_i + \theta_5 exp_i + \theta_6 speduc_i + \theta_7(unemp_i * age_i) + u_i$

[5.9] $employment_i = \gamma_1 + \theta_2 X_i + \gamma_3 S_i + \gamma_4 unemp_i + \gamma_5 exp_i + \gamma_6 speduc_i + \gamma_7(unemp_i * age_i) + u_i$

We obtain estimates of the effect of demographic and household characteristics and socio-economic status on health behaviors using the variations in these factors by using the equations 5.15, 5.7, 5.8 and 5.9.

5.2.1 Estimation Results When Work Hours is Labor Status Indicator

Table 5.2 shows the marginal effects of estimation results from LPM, Probit, 2SLS, IV-Probit and 2SRI-Probit respectively for all sample.[15] First two columns show the estimations without endogeneity correction and last three columns with endogeneity correction. Table 5.3 duplicates the estimation for men and Table 5.4 for women. Standard errors from 2SRI-Probit are obtained by bootstrapping the results and sample weights are applied in all estimations.

According to the results in 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 in conception of subjective health status. For instance, being 65 or older increases the probability of poor health about 50 % under every estimation methodology. Coefficients of age dummies show that the impact of age on health do not vary very much under endogeneity corrected or uncorrected estimations.

Being male has a positive effect on health and increases the probability of being in good health about 0.06 % when the model is not corrected for endogeneity which can be seen in the columns 1 and 2 of Table 5.2. On the other hand, when we correct the estimation results the effect of being male increases to 11% under IV-LPM and about 13% under IV-Probit and 2SRI-Probit. We use three marital status variables and our reference category was being single. Married individuals have better health when the results are not corrected for endogeneity and are corrected by using IV-LPM. On the other hand when

[15] See Appendix C for probit estimation results.

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

Dep. Var:SAH	**LPM**	**Probit**	**IV-LPM**	**IV-Probit**	**2SRI-Probit**
	(1)	(2)	(3)	(4)	(5)
endogeneity correction	(no)	(no)	(yes)	(yes)	(yes)
age 35-44	-0.145***	-0.151***	-0.152***	-0.159***	-0.158***
	(0.00773)	(0.00775)	(0.00802)	(0.00783)	(0.00778)
age 45-54	-0.281***	-0.268***	-0.304***	-0.298***	-0.297***
	(0.00879)	(0.00833)	(0.0110)	(0.0112)	(0.0106)
age 55-64	-0.425***	-0.386***	-0.465***	-0.440***	-0.439***
	(0.0104)	(0.00958)	(0.0171)	(0.0173)	(0.0159)
age 65+	-0.524***	-0.488***	-0.567***	-0.550***	-0.549***
	(0.0117)	(0.0109)	(0.0221)	(0.0206)	(0.0217)
male	0.0627***	0.0599***	0.117***	0.131***	0.132***
	(0.00650)	(0.00644)	(0.0202)	(0.0203)	(0.0203)
married	0.0320***	0.0237**	0.0208*	0.0151	0.0134
	(0.0112)	(0.0119)	(0.0118)	(0.0125)	(0.0115)
divorced	-0.0562***	-0.0722***	-0.0471***	-0.0592***	-0.0590***
	(0.0160)	(0.0168)	(0.0169)	(0.0179)	(0.0158)
widowed	-0.0315	-0.0407*	-0.0180	-0.0226	-0.0245
	(0.0210)	(0.0208)	(0.0215)	(0.0196)	(0.0193)
urban	0.0175***	0.0162**	-0.0187*	-0.0214**	-0.0203**
	(0.00645)	(0.00639)	(0.0100)	(0.00926)	(0.00976)
nr child	0.00623**	0.00507**	0.0186***	0.0176***	0.0173***
	(0.00244)	(0.00240)	(0.00373)	(0.00356)	(0.00324)
living quartiles	-0.000155	-0.000101	-0.00118***	-0.00110***	-0.00109***
	(0.000179)	(0.000185)	(0.000298)	(0.000278)	(0.000280)
medium education	0.0867***	0.0787***	0.0573***	0.0505***	0.0527***
	(0.00743)	(0.00731)	(0.0117)	(0.0122)	(0.0117)
high education	0.112***	0.123***	0.0377	0.0501**	0.0565**
	(0.0110)	(0.0117)	(0.0247)	(0.0245)	(0.0242)
white collar	0.0211***	0.0175**	0.0824***	0.101***	0.100***
	(0.00785)	(0.00779)	(0.0242)	(0.0244)	(0.0239)
hh income	0.0994***	0.0986***	0.218***	0.222***	0.218***
	(0.00501)	(0.00496)	(0.0260)	(0.0262)	(0.0255)
work hours	0.00123***	0.00121***	-0.000927	-0.00172**	-0.00177**
	(0.000137)	(0.000136)	(0.000883)	(0.000853)	(0.000872)
Observations	25,503	25,503	25,503	25,503	25,503
R-squared	0.251	0.204	0.230	0.192	0.205

Standard errors in parentheses

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

we use IV-LPM and 2SRI being married has no significant effect on health. However being divorced has a significant negative impact on health under all five estimation methodologies. Another interesting observation is that living in urban areas also has a significant positive effect on health when the estimation is not corrected for endogeneity and has a negative impact on health when endogeneity correction is applied. Living in urban areas increases the probability of good health probably due to easy access to health care services. On the contrary, unobserved factors that affect income and employment would change the sign of urban areas when endogeneity correction is employed. Number of children under 15 living in the household has positive and living quartiles per household member has negative impact on health when results are corrected for endogeneity.

So far we discussed the affect of biological factors which are proxied by age and household characteristics. Another important observation is the impact of education on health which is one of the main elements of socio-economic status. We observe positive effect of education on health and high education has greater impact than medium education. However both the effect of medium and high education decreases when we use endogeneity correction. For instance medium education increases the probability of being in good health about 8% and 12% respectively when we use LPM and Probit. However when we estimate the equations by using IV-Probit and 2SRI-Probit the impact of both medium and high education on probability of good health drop to about 5%. Furthermore being a white collar worker, which is an indiicator of work type, increases the probability of good health and the size of the impact increases when the results are corrected for endogeneity.

Now let's focus on the effects of endogenous covariates, household income per capita and work hours. As we mentioned before 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 underestimated results. Moreover, reverse causality could also be an issue between health 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 by

endogeneity the impact of income still stays positive but increases while the effect of work hours turns to negative. The significant increase in the effect of income on health imply that reverse causality is not an important issue in Turkish data and unobserved factors such as cultural-social characteristics, and probable error in measuring income are essential for individuals. On the other hand, LPM and Probit results suggest that work hours increases the probability of good health while IV-Probit and 2SRI-Probit results exhibit rise in work hours increases the probability of being in poor health.

The change in sizes and magnitudes of urban, education, income and white collar variables when endogeneity correction is applied implies the essential impact of income and labor force status on health status for Turkey. Since there are huge income gaps according to region, education status and occupation the changes of the coefficients may reflect this income gap and unobserved factors play an essential role. Moreover, work hours also change dramatically due to education level and region which also may cause the variation in coefficients.

Table 5.3 and Table 5.4 repeat the estimations for men and women respectively. The structure of the change in coefficients under different estimation methods (with or without endogeneity correction) are similar to those for all sample. The impact of age on health is greater for women and the difference gets bigger as individuals age. For example 2SRI results show that men older than 65 has 44% probability of being in poor health whereas this ratio is 70% for women. Another striking feature on the effect of age on health is that the size of coefficients are similar to each other with and without endogeneity corrected estimations for men while the impact of age increases for women when we apply endogeneity correction. Being married has no significant effect for both men and women when we look at the IV-LPM, IV-Probit and 2SRI-Probit results. On the other hand being divorced has a negative impact on health and probability of being in poor health for divorced men is higher than women. Other household characteristics such as living in a urban area and living quartiles per individual in the household have no significant effect on health of men. On the other hand, living in a urban area and living quartiles per individual increases the probability of poor health for women. The negative

impact of living quartiles would be due to increase in household work for women when the size of house increases.

The relative size of the effects of covariates from 2SRI-Probit can also be seen in Figure 5.1 and Figure 5.2 for all sample, men and women respectively. Figures show that the impact of age is the biggest on the probability on good health and followed by income and education. Additionally the effects of age, income and education for women are bigger than men and variations are higher.

Results in Table 5.3 and Table 5.4 suggest that probability of being in good health increases with education, but the impact of education is greater for women. For instance, 2SRI results for present that men with medium education increases the probability of good health by 5.8 % and men with high education increases the probability of good health by 7.2%. However these number are 5.4% and 9.3% for women. IV-LPM and IV-Probit estimates show that high education has no significant impact on health for men which is unlikely.

We also observe that occupation has no significant effect for men whereas being a white collar worker increase the probability of good health for women. Household income per capita rises the probability of good health for both genders, however the size of impact is greater for women. Again 2SRI results show that household income rises the probability of good health about 15% for women and 26% for women. Work hours has a positive effect on men's and women's health when results are not corrected for endogeneity. On contrary when endogeneity correction is employed impact of work hours on the probability of good health becomes insignificant for men and negative for women.

The relative size of the effects of covariates from 2SRI-Probit can also be seen in Figure 5.1 and Figure 5.2 for all sample, men and women respectively. Figures show that the impact of age is the biggest on the probability on good health and followed by income and education. Additionally the effects of age, income and education for women are bigger than men and variations are higher.

Table 5.3: Marginal Effects- Men (Work Hours as Labor Status Indicator)

Dep. Var:SAH	**LPM**	**Probit**	**IV-LPM**	**IV-Probit**	**2SRI-Probit**
	(1)	(2)	(3)	(4)	(5)
endogeneity correction	(no)	(no)	(yes)	(yes)	(yes)
age 35-44	-0.105***	-0.121***	-0.116***	-0.132***	-0.124***
	(0.0113)	(0.0118)	(0.0124)	(0.0126)	(0.0134)
age 45-54	-0.217***	-0.223***	-0.252***	-0.238***	-0.238***
	(0.0127)	(0.0125)	(0.0212)	(0.0181)	(0.0156)
age 55-64	-0.333***	-0.314***	-0.396***	-0.336***	-0.342***
	(0.0155)	(0.0146)	(0.0366)	(0.0285)	(0.0287)
age 65+	-0.449***	-0.412***	-0.528***	-0.434***	-0.445***
	(0.0176)	(0.0164)	(0.0483)	(0.0417)	(0.0398)
married	0.0240	0.0188	0.0434**	0.0211	0.0185
	(0.0157)	(0.0170)	(0.0197)	(0.0179)	(0.0188)
divorced	-0.0624**	-0.0707**	-0.0414	-0.0741**	-0.0630*
	(0.0301)	(0.0315)	(0.0321)	(0.0317)	(0.0368)
widowed	-0.0450	-0.0485	-0.0372	-0.0467	-0.0407
	(0.0348)	(0.0348)	(0.0352)	(0.0363)	(0.0376)
urban	0.0151	0.0116	-0.00492	-0.0101	-0.00764
	(0.00916)	(0.00903)	(0.0138)	(0.0153)	(0.0147)
nr child	0.00312	0.00296	0.0111**	0.0121**	0.00973*
	(0.00358)	(0.00349)	(0.00539)	(0.00545)	(0.00579)
living quartiles	0.000339	0.000413	-0.000302	-8.35e-05	-0.000126
	(0.000281)	(0.000287)	(0.000469)	(0.000441)	(0.000443)
medium education	0.0741***	0.0679***	0.0571***	0.0361**	0.0587***
	(0.00975)	(0.00959)	(0.0140)	(0.0163)	(0.0163)
high education	0.101***	0.107***	0.0503	0.0372	0.0727**
	(0.0145)	(0.0150)	(0.0311)	(0.0317)	(0.0351)
white collar	0.0160*	0.0109	0.0563**	-0.00970	0.0581
	(0.00968)	(0.00961)	(0.0233)	(0.0467)	(0.0487)
hh income	0.0924***	0.0920***	0.164***	0.160***	0.158***
	(0.00732)	(0.00726)	(0.0375)	(0.0418)	(0.0389)
work hours	0.00198***	0.00182***	-0.000111	0.00231	8.02e-05
	(0.000178)	(0.000171)	(0.00119)	(0.00181)	(0.00187)
Observations	12,310	12,310	12,310	12,310	12,310
R-squared	0.208	0.170	0.179	0.151	0.170

Standard errors in parentheses

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

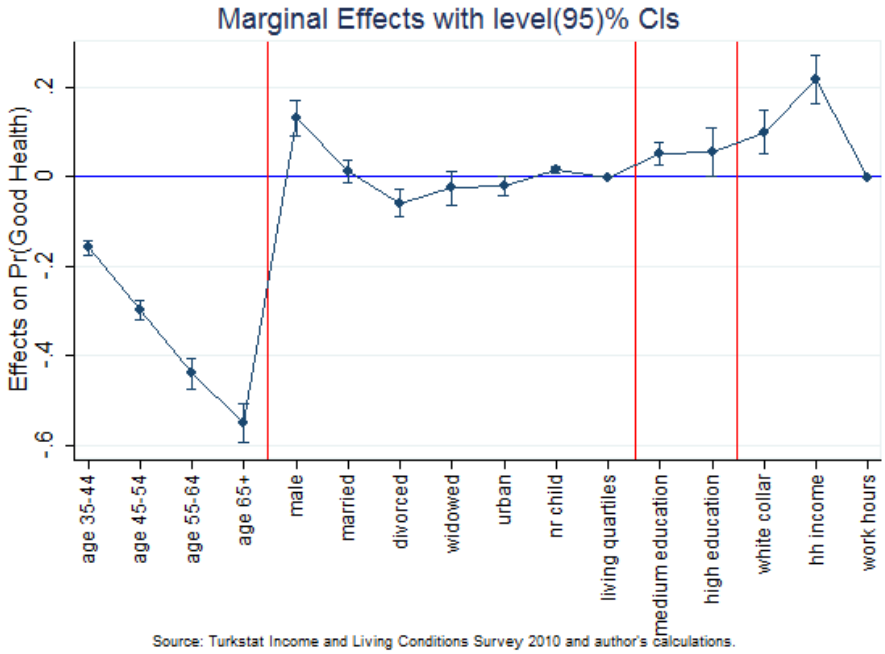
Table 5.4: Marginal Effect- Women (Work Hours as Labor Status Indicator)

Dep. Var:SAH	**LPM**	**Probit**	**IV-LPM**	**IV-Probit**	**2SRI-Probit**
	(1)	(2)	(3)	(4)	(5)
endogeneity correction	(no)	(no)	(yes)	(yes)	(yes)
age 35-44	-0.176***	-0.168***	-0.178***	-0.184***	-0.182***
	(0.0107)	(0.0103)	(0.0116)	(0.0109)	(0.00964)
age 45-54	-0.332***	-0.293***	-0.365***	-0.365***	-0.363***
	(0.0124)	(0.0112)	(0.0143)	(0.0175)	(0.0151)
age 55-64	-0.496***	-0.435***	-0.542***	-0.564***	-0.562***
	(0.0143)	(0.0128)	(0.0177)	(0.0269)	(0.0218)
age 65+	-0.581***	-0.548***	-0.618***	-0.707***	-0.708***
	(0.0159)	(0.0152)	(0.0198)	(0.0335)	(0.0275)
married	0.0131	0.00684	-0.0643***	-0.0204	-0.0237
	(0.0164)	(0.0168)	(0.0214)	(0.0199)	(0.0167)
divorced	-0.0504**	-0.0634***	-0.109***	-0.0411*	-0.0420**
	(0.0209)	(0.0215)	(0.0241)	(0.0246)	(0.0203)
widowed	-0.0431	-0.0531**	-0.0318	-0.0243	-0.0283
	(0.0268)	(0.0265)	(0.0283)	(0.0276)	(0.0280)
urban	0.0197**	0.0220**	-0.0379**	-0.0301**	-0.0328***
	(0.00911)	(0.00907)	(0.0154)	(0.0147)	(0.0112)
house owner	0.00101	0.00114	-0.0353***	-0.0367***	-0.0376***
	(0.00849)	(0.00843)	(0.0115)	(0.0122)	(0.0114)
nr child	0.00615*	0.00579*	0.0185***	0.0195***	0.0212***
	(0.00337)	(0.00333)	(0.00602)	(0.00530)	(0.00498)
living quartiles	-0.000442*	-0.000444*	-0.00178***	-0.00167***	-0.00167***
	(0.000232)	(0.000244)	(0.000408)	(0.000436)	(0.000390)
medium education	0.112***	0.100***	0.0841***	0.0608***	0.0546***
	(0.0115)	(0.0113)	(0.0226)	(0.0188)	(0.0167)
high education	0.138***	0.153***	0.134**	0.105**	0.0937**
	(0.0178)	(0.0191)	(0.0572)	(0.0413)	(0.0377)
white collar	0.0392***	0.0353**	0.309***	0.250***	0.228***
	(0.0142)	(0.0140)	(0.0675)	(0.0393)	(0.0298)
hh income	0.100***	0.0997***	0.276***	0.260***	0.264***
	(0.00690)	(0.00682)	(0.0398)	(0.0370)	(0.0315)
work hours	0.000541**	0.000643**	-0.00695***	-0.00671***	-0.00623***
	(0.000257)	(0.000259)	(0.00187)	(0.00136)	(0.00103)
Observations	13,193	13,193	13,193	13,193	13,193
R-squared	0.271	0.220	0.195	0.212	0.223

Standard errors in parentheses

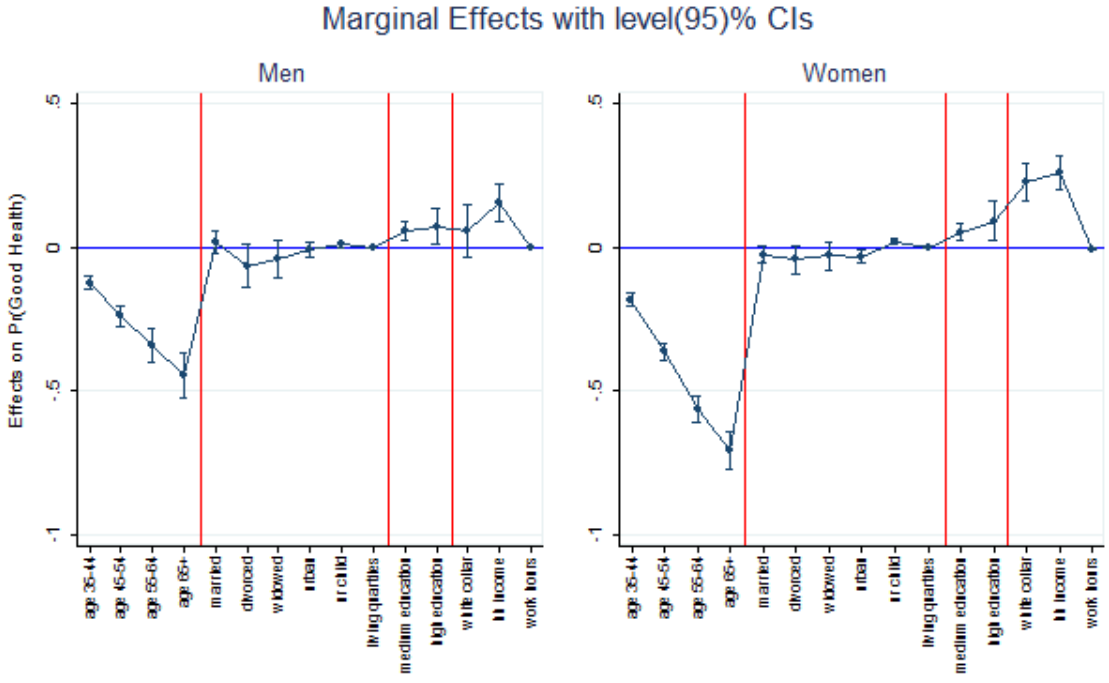
*** p<0.01, ** p<0.05, * p<0.1

Figure 5.1 Marginal Effects of 2SRI-Probit of All Sample (Work Hours as Labor Status Indicator)



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations.

Figure 5.2 Marginal Effects of 2SRI-Probit According to Gender (Work Hours as Labor Status Indicator)



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations.

5.2.2 Estimation Results When Employment is Labor Status Indicator

In the previous sub-section we presented estimation results when work hours is included as an indicator of labor status. Since 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 an one hour change in labor supply, including the effects of changes at the extensive margin (changes in employment) and the effects of changes at the intensive margin (changes in work hours conditional on employment) (Xu, 2013:133). In order to calibrate the effect of changes at the extensive margin, we replaced the endogenous variable work hours with the binary variable employment status and duplicated estimations. New estimations with the endogenous dichotomous employment variable can be seen in Table 5.5 for all sample, Table 5.6 for men and Table 5.7 for women. They are estimated effects of a 100 percentage change in the probability of being employed and thus show the impact of changes at the extensive margin of labor supply (Xu, 2013:133).

According to results in Table 5.5, 5.6 and 5.7 all variable coefficients other than employed are so similar to previous ones. Now we observe how binary explanatory employment variable effect probability of good health. In other words, Table 5.5, 5.6 and 5.7 show the estimation results when continuous variable work hours is replaced by a binary indicator of employment which is equal to 1 if individual is employed full time or part time and equal to 0 if the individual is unemployed or out of labor force. Results in the mentioned tables suggest that the sign of employment is the same of the sign of working hours implying the same direction of the impact on the probability of good health. All sample estimates suggest that being employed has a negative impact on health and the magnitude of this negative impact increases when estimations are corrected for endogeneity. Being employed has a positive effect on health for men when results are obtained by LPM and Probit, and insignificant when IV-LPM, IV-Probit and 2SRI-Probit are used. On the other hand, being employed is insignificant for women when estimations are not corrected for endogeneity and increases the probability of poor health when results are corrected for endogeneity. Figure 5.3 and Figure 5.4 also show marginal effects from 2SRI-Probit when employment is included as a labor force status.

Table 5.5: Marginal Effects-All Sample (Employment as Labor Status Indicator)

Dep. Var:SAH	**LPM**	**Probit**	**IV-LPM**	**IV-Probit**	**2SRI-Probit**
	(1)	(2)	(3)	(4)	(5)
endogeneity correction	(no)	(no)	(yes)	(yes)	(yes)
age 35-44	-0.146***	-0.151***	-0.152***	-0.158***	-0.157***
	(0.00774)	(0.00774)	(0.00805)	(0.00808)	(0.00795)
age 45-54	-0.283***	-0.269***	-0.305***	-0.296***	-0.296***
	(0.00878)	(0.00831)	(0.00988)	(0.00912)	(0.00939)
age 55-64	-0.427***	-0.387***	-0.468***	-0.440***	-0.440***
	(0.0104)	(0.00955)	(0.0144)	(0.0122)	(0.0137)
age 65+	-0.526***	-0.490***	-0.571***	-0.550***	-0.551***
	(0.0117)	(0.0109)	(0.0181)	(0.0148)	(0.0176)
male	0.0673***	0.0638***	0.119***	0.128***	0.129***
	(0.00631)	(0.00623)	(0.0141)	(0.0139)	(0.0141)
married	0.0324***	0.0240**	0.0210*	0.0151	0.0134
	(0.0112)	(0.0119)	(0.0118)	(0.0131)	(0.0123)
divorced	-0.0537***	-0.0702***	-0.0479***	-0.0618***	-0.0618***
	(0.0160)	(0.0168)	(0.0164)	(0.0179)	(0.0170)
widowed	-0.0309	-0.0404*	-0.0177	-0.0231	-0.0251
	(0.0210)	(0.0208)	(0.0214)	(0.0202)	(0.0209)
urban	0.0190***	0.0179***	-0.0202**	-0.0231**	-0.0221**
	(0.00646)	(0.00640)	(0.0101)	(0.00933)	(0.00993)
nr child	0.00614**	0.00495**	0.0185***	0.0175***	0.0171***
	(0.00244)	(0.00240)	(0.00373)	(0.00386)	(0.00371)
living quartiles	-0.000154	-9.52e-05	-0.00116***	-0.00107***	-0.00107***
	(0.000179)	(0.000185)	(0.000298)	(0.000246)	(0.000301)
medium education	0.0851***	0.0769***	0.0606***	0.0546***	0.0570***
	(0.00744)	(0.00732)	(0.0119)	(0.0121)	(0.0118)
high education	0.0993***	0.110***	0.0543**	0.0737***	0.0826***
	(0.0113)	(0.0119)	(0.0275)	(0.0252)	(0.0280)
white collar	0.00764	0.00230	0.103***	0.126***	0.127***
	(0.00872)	(0.00871)	(0.0271)	(0.0262)	(0.0273)
hh income	0.0991***	0.0983***	0.218***	0.221***	0.217***
	(0.00502)	(0.00497)	(0.0258)	(0.0224)	(0.0259)
employed	0.0727***	0.0736***	-0.0718*	-0.111***	-0.117***
	(0.00832)	(0.00821)	(0.0416)	(0.0385)	(0.0418)
Observations	25,503	25,503	25,503	25,503	25,503
R-squared	0.251	0.204	0.229	0.192	0.205

Standard errors in parentheses

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

Table 5.6: Marginal Effects- Men (Employment as Labor Status Indicator)

Dep. Var:SAH	**LPM**	**Probit**	**IV-LPM**	**IV-Probit**	**2SRI-Probit**
	(1)	(2)	(3)	(4)	(5)
endogeneity correction	(no)	(no)	(yes)	(yes)	(yes)
age 35-44	-0.107***	-0.122***	-0.116***	-0.133***	-0.123***
	(0.0113)	(0.0118)	(0.0120)	(0.0124)	(0.0136)
age 45-54	-0.216***	-0.222***	-0.252***	-0.244***	-0.236***
	(0.0126)	(0.0125)	(0.0184)	(0.0141)	(0.0144)
age 55-64	-0.326***	-0.308***	-0.396***	-0.346***	-0.338***
	(0.0155)	(0.0146)	(0.0318)	(0.0211)	(0.0245)
age 65+	-0.437***	-0.402***	-0.529***	-0.448***	-0.439***
	(0.0176)	(0.0165)	(0.0424)	(0.0301)	(0.0308)
married	0.0216	0.0159	0.0436**	0.0231	0.0161
	(0.0156)	(0.0170)	(0.0186)	(0.0194)	(0.0161)
divorced	-0.0598**	-0.0688**	-0.0415	-0.0695**	-0.0611**
	(0.0301)	(0.0315)	(0.0311)	(0.0341)	(0.0308)
widowed	-0.0419	-0.0468	-0.0374	-0.0443	-0.0388
	(0.0347)	(0.0347)	(0.0351)	(0.0364)	(0.0330)
urban	0.0192**	0.0158*	-0.00520	-0.0102	-0.00633
	(0.00917)	(0.00902)	(0.0141)	(0.0157)	(0.0143)
nr child	0.00296	0.00281	0.0112**	0.0124**	0.0100*
	(0.00357)	(0.00348)	(0.00528)	(0.00548)	(0.00531)
living quartiles	0.000336	0.000419	-0.000303	-0.000112	-0.000132
	(0.000280)	(0.000287)	(0.000466)	(0.000512)	(0.000450)
medium education	0.0698***	0.0642***	0.0573***	0.0348*	0.0602***
	(0.00974)	(0.00957)	(0.0139)	(0.0196)	(0.0172)
high education	0.0772***	0.0867***	0.0516*	0.0191	0.0773*
	(0.0145)	(0.0151)	(0.0299)	(0.0452)	(0.0401)
white collar	-0.00866	-0.0126	0.0577**	-0.0150	0.0703
	(0.0103)	(0.0102)	(0.0284)	(0.0534)	(0.0480)
hh income	0.0887***	0.0884***	0.164***	0.165***	0.159***
	(0.00734)	(0.00728)	(0.0369)	(0.0403)	(0.0375)
employed	0.149***	0.135***	-0.00853	0.105	0.00498
	(0.0117)	(0.0110)	(0.0662)	(0.0867)	(0.0778)
Observations	12,310	12,310	12,310	12,310	12,310
R-squared	0.211	0.172	0.195	0.151	0.172

Standard errors in parentheses

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

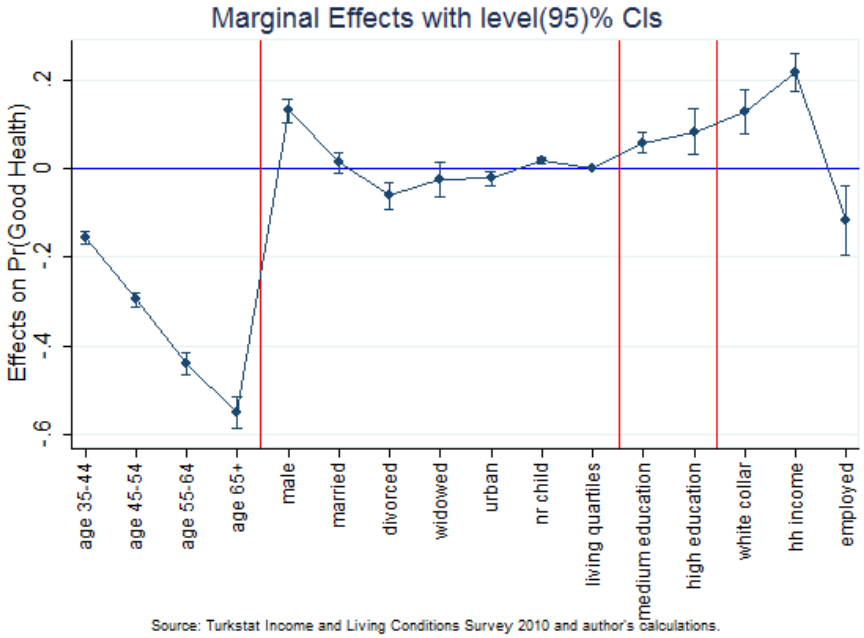
Table 5.7: Marginal Effects- Women (Employment As Labor Status Indicator)

Dep. Var:SAH	**LPM**	**Probit**	**IV-LPM**	**IV-Probit**	**2SRI-Probit**
	(1)	(2)	(3)	(4)	(5)
endogeneity correction	(no)	(no)	(yes)	(yes)	(yes)
age 35-44	-0.176***	-0.167***	-0.175***	-0.181***	-0.179***
	(0.0107)	(0.0103)	(0.0117)	(0.00997)	(0.0104)
age 45-54	-0.333***	-0.294***	-0.364***	-0.354***	-0.351***
	(0.0124)	(0.0112)	(0.0138)	(0.0146)	(0.0144)
age 55-64	-0.498***	-0.437***	-0.546***	-0.549***	-0.546***
	(0.0143)	(0.0128)	(0.0173)	(0.0202)	(0.0200)
age 65+	-0.584***	-0.550***	-0.623***	-0.689***	-0.687***
	(0.0159)	(0.0151)	(0.0194)	(0.0272)	(0.0247)
married	0.0107	0.00515	-0.0594***	-0.0206	-0.0252
	(0.0164)	(0.0167)	(0.0204)	(0.0180)	(0.0167)
divorced	-0.0525**	-0.0649***	-0.107***	-0.0550**	-0.0583***
	(0.0209)	(0.0215)	(0.0234)	(0.0221)	(0.0178)
widowed	-0.0424	-0.0518*	-0.0338	-0.0298	-0.0332
	(0.0268)	(0.0265)	(0.0282)	(0.0309)	(0.0264)
urban	0.0192**	0.0216**	-0.0327**	-0.0346**	-0.0374**
	(0.00911)	(0.00908)	(0.0154)	(0.0144)	(0.0155)
nr child	0.00580*	0.00540	0.0183***	0.0187***	0.0201***
	(0.00337)	(0.00332)	(0.00593)	(0.00567)	(0.00494)
living quartiles	-0.000444*	-0.000446*	-0.00159***	-0.00159***	-0.00160***
	(0.000232)	(0.000244)	(0.000413)	(0.000375)	(0.000417)
medium education	0.114***	0.102***	0.101***	0.0706***	0.0649***
	(0.0115)	(0.0113)	(0.0236)	(0.0178)	(0.0192)
high education	0.144***	0.157***	0.235***	0.174***	0.161***
	(0.0185)	(0.0197)	(0.0688)	(0.0456)	(0.0455)
white collar	0.0517***	0.0440***	0.457***	0.308***	0.283***
	(0.0170)	(0.0169)	(0.0886)	(0.0392)	(0.0446)
hh income	0.101***	0.101***	0.258***	0.249***	0.254***
	(0.00690)	(0.00682)	(0.0400)	(0.0333)	(0.0365)
employed	0.00751	0.0156	-0.432***	-0.366***	-0.343***
	(0.0143)	(0.0145)	(0.0960)	(0.0569)	(0.0637)
Observations	13,193	13,193	13,193	13,193	13,193
R-squared	0.271	0.220	0.197	0.212	0.223

Standard errors in parentheses

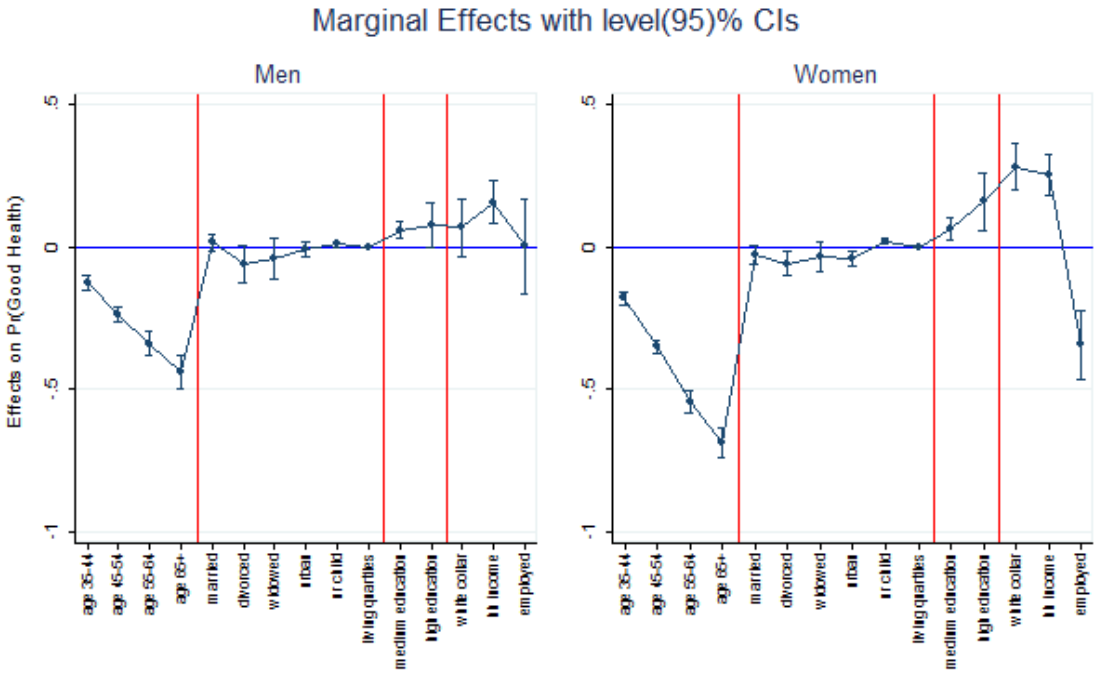
*** p<0.01, ** p<0.05, * p<0.1

Figure 5.3 Marginal Effects of 2SRI-Probit of All Sample (Employment as Labor Status Indicator)



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations.

Figure 5.4 Marginal Effects of 2SRI-Probit According to Gender (Employment as Labor Status Indicator)



Source: Turkstat Income and Living Conditions Survey 2010 and author's calculations.

In order to interpret the estimates of employment one should keep in mind that the effect of being employed with respect to being unemployed and out of labor force could have more than one dimension. It has been documented that losing ones job leads to a lot of psychological distress (Bender and Habermalz, 2005:6). Therefore we expect unemployment to have a negative impact on health satisfaction. However, some individuals choose to exit the labor force voluntarily such as maternity leave while others do so involuntarily as discouraged workers (Bender and Habermalz, 2005:6). Thus, expectations about the relationship between health satisfaction and being out of the labor force could be both positive or negative. In the light of this information, we can interpret the negative coefficient of employment for women as women would be voluntarily out of labor force in general.

5.2.3 Comparing The Effects of Intensive and Extensive Margins of Labor

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 an one hour change in labor supply, including the effects of changes at the extensive margin. Table 5.8 shows both the effect 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 calculated from the estimates in Table 5.2, 5.3 and 5.4. 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, an one-hour change in average work hours can be brought by a 2 percent change in employment. 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, 2013:133).

In Table 5.8 coefficients for extensive margin of labor is obtained by multiplying employment coefficients in Table 5.5 Table 5.6 and Table 5.7 by 0.02 in order to compare it with intensive margin of labor (work hours). In other words, coefficients for extensive

margin of labor presents the effects of 2% change in employment.

Table 5.8: Comparison Between Extensive and Intensive Margin of Labor

	LPM	**Probit**	**IV-LPM**	**IV-Probit**	**2SRI-Probit**
endogeneity correction	(no)	(no)	(no)	(yes)	(yes)
All Sample					
Effect of 1 hour increase in work hours (Intensive Margin of Labor)	0.00123***	0.00121***	-0.000927	-0.00172**	-0.00177**
Effect of 2% increase in employment (Extensive Margin of Labor)	0.00145***	0.00147***	-0.00144***	-0.00222***	-0.00234***
Men					
Effect of 1 hour increase in work hours (Intensive Margin of Labor)	0.00198***	0.00182***	-0.000111	0.00231	8.02e-05
Effect of 2% increase in employment (Extensive Margin of Labor)	0.00298***	0.0027***	-0.00017	0.0021	0.0000996
Women					
Effect of 1 hour increase in work hours (Intensive Margin of Labor)	0.000541**	0.000643**	-0.00695***	-0.00671***	-0.00623***
Effect of 2% increase in employment (Extensive Margin of Labor)	0.00015	0.00031	-0.00864***	-0.00732***	-0.00686***

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

Coefficients for intensive margin of labor are directly from Table 5.2 for all sample, Table 5.3 for men and Table 5.4 for women. Coefficients for extensive margin of labor are calculated by multiplying the coefficients of variable employed in Tables 5.5, 5.6 and 5.7 by 2%. We observe that when results are not corrected for endogeneity in all sample estimations, 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 both the effects of work hours and employment turns to negative and the effect of extensive margin is still greater.

Results for men show that both extensive and intensive margin of labor is insignificant when endogeneity correction is applied and both of them have positive impact on the probability of good health when results are not corrected for endogeneity. On the other hand, both intensive and extensive margin of labor is insignificant for women when estimations are run by LPM and Probit and they have negative impact on the probability of good health when endogeneity correction is applied. Overall results in Table 5.8 suggest that negative impact of labor force status on health is originated from changes in employment not changes in work hours.

5.3 Validity Analysis

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., 2007:533). 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 to check the robustness of our results.

Table 5.9 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

Table 5.9 First Stage Regression Results(All Sample)

dep. var:	hh income	work hours	employment
work exp.	0.000663**	0.221***	0.00533***
	(0.000316)	(0.0116)	(0.000191)
unemp.	-3.403***	-18.66***	-0.186***
	(0.114)	(4.186)	(0.0687)
unemp*age 35-44	-3.874***	-15.12	-0.0709
	(0.318)	(11.70)	(0.192)
unemp*age 45-54	-4.047***	-40.18***	-0.461**
	(0.339)	(12.48)	(0.205)
unemp*age 55-64	-3.191***	-71.49***	-0.753***
	(0.399)	(14.68)	(0.241)
unemp*age 65+	-3.415***	-12.24	-0.0931
	(0.403)	(14.80)	(0.243)
sp.low educ.	0.0151	-3.418***	-0.0411***
	(0.0131)	(0.481)	(0.00789)
sp. medium educ.	0.105***	-9.989***	-0.173***
	(0.0190)	(0.699)	(0.0115)
sp. high educ.	0.203***	-0.779	-0.0317**
	(0.0266)	(0.977)	(0.0160)
age 35-44	0.513***	1.088	-0.00156
	(0.0382)	(1.405)	(0.0230)
age 45-54	0.548***	-4.509***	-0.0982***
	(0.0412)	(1.513)	(0.0248)
age 55-64	0.438***	-10.61***	-0.239***
	(0.0481)	(1.769)	(0.0290)
age 65+	0.364***	-25.24***	-0.452***
	(0.0493)	(1.813)	(0.0297)
male	-0.0390***	15.88***	0.196***
	(0.0118)	(0.434)	(0.00712)
married	0.0724***	2.854***	0.0358***
	(0.0149)	(0.547)	(0.00897)
divorced	-0.00685	3.914***	0.0383***
	(0.0203)	(0.746)	(0.0122)
widowed	-0.0827***	1.653*	0.0164
	(0.0260)	(0.957)	(0.0157)
urban	0.255***	0.416	-0.00354
	(0.00811)	(0.298)	(0.00489)
nr child	-0.0911***	-0.208*	-0.00283
	(0.00302)	(0.111)	(0.00182)
living quartiles	0.00920***	0.0462***	0.000816***
	(0.000214)	(0.00786)	(0.000129)
medium education	0.304***	6.755***	0.146***
	(0.0105)	(0.388)	(0.00636)
high education	0.781***	10.28***	0.363***
	(0.0145)	(0.534)	(0.00876)
white collar	0.0465***	-24.58***	0.594***
	(0.00880)	(0.324)	(0.00531)
R-squared	0.463	0.505	0.593
F-stat(24, 25478)	915.42	1085.01	1548.49

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

specification of the first stage functional form. According to Table 5.9 the identifying instruments are jointly significant in the first stage regressions implying that IV parameter estimates are consistent if the exclusion restrictions are valid (Bound et al., 1993:112).

However F-stat being above 10 is not sufficient for the validity of results. Table 5.10 exhibits endogeneity and weak IV identification tests. We use Hausman-Durbin-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 endogeneity in the model and instruments used are not weak.

Table 5.10 Endogeneity and Weak IV Identification Tests

Endogeneity Test		
	hh income	work hours
Hausman-Durbin-Wu Stat (when hh income and work hours are endogenous variables	342.88 (p<0.000)	85.04 (p<0.000)
	hh income	employed
Hausman-Durbin-Wu Stat (when hh income and employed are endogenous variables	337.12 (p<0.000)	86.54 (p<0.000)
Weak IV Identification Test		
Cragg-Donald Wald F Stat (when hh income and work hours are endogenous variables	72.19	(Critical Value at 5%:18.30)
Cragg-Donald Wald F Stat (when hh income and employed are endogenous variables	112.80	(Critical Value at 5%:18.30)

Null of Hausman-Durbin-Wu Test:exogeneity
Null of Cragg-Donald Wald Test:instruments are weak

Table 5.11 and Table 5.12 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 5.11 shows the 2SRI-Probit estimations results when work hours is used as an indicator of labor force status and Table 5.12 presents when employment is used as an indicator of labor force status.

Table 5.12 Sensitivity of Estimation Results to Choice of Instruments (Work Hours as Labor Status Indicator)

	(1) unemp.t&work exp. as instruments	(2) unemp.& spouse low educ. as instruments	(3) work exp.& spouse high educ. as instruments
age 35-44	-0.158***	-0.165***	-0.243***
	(0.00856)	(0.00807)	(0.0218)
age 45-54	-0.313***	-0.101*	-0.454***
	(0.0110)	(0.0565)	(0.0351)
age 55-64	-0.474***	-0.168	-0.656***
	(0.0195)	(0.0122)	(0.0450)
age 65+	-0.597***	-0.612	-0.701***
	(0.0264)	(0.0172)	(0.0331)
male	0.182***	0.148***	0.141***
	(0.0246)	(0.0176)	(0.0273)
married	0.0153	0.0265*	0.134***
	(0.0130)	(0.0155)	(0.0352)
divorced	-0.0471***	-0.209***	-0.0365**
	(0.0172)	(0.0466)	(0.0180)
widowed	-0.0158	-0.124***	0.0773**
	(0.0236)	(0.0341)	(0.0319)
urban	-0.0270**	0.0168	-0.0414***
	(0.0117)	(0.0166)	(0.0088)
nr child	0.0184***	0.0204***	0.161***
	(0.00433)	(0.00392)	(0.0323)
living quartiles	-0.00117***	-0.00169***	-0.0132***
	(0.000344)	(0.000321)	(0.00273)
medium education	0.0578***	0.0651*	0.0349***
	(0.0131)	(0.0245)	(0.0939)
high education	0.0677**	0.0819**	0.0949***
	(0.0304)	(0.0374)	(0.0235)
white collar	0.160***	0.142***	0.139**
	(0.0288)	(0.0210)	(0.0378)
hh income	0.236***	0.155***	0.154***
	(0.0331)	(0.0365)	(0.0296)
work hours	-0.00402***	-0.0266***	-0.0108***
	(0.00109)	(0.00804)	(0.00180)
Observations	25,503	25,503	25,503
R-squared	0.205	0.205	0.205

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

Table 5.13 Sensitivity of Estimation Results to Choice of Instruments (Employment as Labor Status Indicator)

	(1) unemp.t&work exp. as instruments	(2) unemp.& spouse low educ. as instruments	(3) work exp.& spouse high educ. as instruments
age 35-44	-0.156***	-0.223***	-0.220***
	(0.00800)	(0.0182)	(0.0167)
age 45-54	-0.302***	-0.0728	-0.395***
	(0.00926)	(0.0866)	(0.0241)
age 55-64	-0.453***	-0.501**	-0.567***
	(0.0142)	(0.220)	(0.0325)
age 65+	-0.570***	-0.802**	-0.612***
	(0.0189)	(0.317)	(0.0225)
male	0.148***	0.108***	0.281***
	(0.0172)	(0.0282)	(0.0361)
married	0.0133	0.0754***	0.106***
	(0.0116)	(0.0256)	(0.0301)
divorced	-0.0590***	-0.294***	-0.0655***
	(0.0160)	(0.0597)	(0.0162)
widowed	-0.0219	-0.223***	0.0436*
	(0.0192)	(0.0538)	(0.0265)
urban	-0.0271**	-0.115***	-0.330***
	(0.0121)	(0.0343)	(0.0715)
nr child	0.0180***	0.0328***	0.129***
	(0.00461)	(0.00532)	(0.0259)
living quartiles	-0.00113***	-0.00355***	-0.0105***
	(0.000347)	(0.000729)	(0.00221)
medium education	0.0596***	-0.036***	-0.026***
	(0.0133)	(0.0096)	(0.00745)
high education	0.0948***	0.139***	0.166***
	(0.0314)	(0.0344)	(0.0180)
white collar	0.163***	0.395***	0.347***
	(0.0311)	(0.0588)	(0.0569)
hh income	0.228***	0.169***	0.238***
	(0.0349)	(0.0345)	(0.0248)
employed	-0.173***	-0.139***	-0.139***
	(0.0484)	(0.0437)	(0.0459)
Observations	25,503	25,503	25,503
R-squared	0.205	0.205	0.206

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

The estimates in Table 5.12 and Table 5.13 are reasonably stable and quite close to original coefficients with couple of exceptions. The 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. Moreover the results that the estimated income, work hours and employment increase after instrumenting is not attributable to the choice of identifying instruments. Lastly the coefficients in Table 5.12 and 5.13 are still significant, despite the reduction in efficiency from relying on fewer instruments.

5.4 Comparing Estimation Results with the Implications of Two-Period Life Cycle Model

Since we mentioned that the main aim of the theoretical model developed in the previous section is to help interpreting estimation results, now we present how the parameters of two-period life cycle model behave in the light of estimation results. We base our discussion on the two-period life cyle model version 3 and endogeneity corrected estimation results.

In the two-period life cycle model we have two sources of income; labor and non-labor. The effect of labor income depends on $(\phi + \psi)$ and non-labor income depends on $(\psi + \sigma)$ both of which are positive. Although we did not make any distinction between labor and non-labor income in the estimation process we also observe this positive impact in the estimation results for all sample, men and women. The effect of total income can be proxied by $(\phi + \psi) + (\psi + \sigma)$. Estimation results show that the effect of income on health status for women is greater than the effect of income for men, that is:

$$[(\phi + \psi) + (\psi + \sigma)]_{women} > [(\phi + \psi) + (\psi + \sigma)]_{men}$$

The effect of education on health is ambigious accroding to two-period model and depends on $(\epsilon - \psi)$. In other words the contribution of education to better health depends on the relative sizes of ϵ and ψ. Despite the fact that medical expenses is not included as a

regressor in the estimation, we observe the positive effect of education both for all sample, men and women. Estimation results imply that the efficiency that education creates (ϵ) might be greater then the efficiency that medical expenses creates (ψ). However the relative sizes of ϵ and ψ can be calculated more accurately by including medical expenses in the estimated model which is not possible due to data limitations. If we assume that $\epsilon > \psi$, the estimation results also present that the effect of education for women is higher than the effect for men. That is:

$$(\epsilon - \psi)_{women} > (\epsilon - \psi)_{men}$$

Another important issue of the two-period model was the impact of working hours on health which was ambigious. The effect of work hours depends on $(\phi + \psi) - \tau$. If the efficiency that labor income creates is larger than and the inneficiency that working creates, then the impact of work hours on health is positive. According to estimation results work hours increases the probability of poor health for all sample and women and insignificant for men implying that:

$$\tau_{allsample} > (\phi + \psi)_{allsample} \text{ and } \tau_{women} > (\phi + \psi)_{women}$$

We also presented the effects of intensive and extensive margins of labor in Table 5.8 and concluded that the negative effect of working originates from changes in employment not changes in work hours. Same reasoning can be applied to the two-period life cycle model. Although only work hours is included as a labor force indicator in the theoretical model, it also shows whether the individual is working or not. Thus if τ is greater than $(\phi + \psi)$, the inefficiency of work status comes from employment not from increase in work hours.

Lastly, depreciation rate of health (δ) can be proxied by the age coefficients in the estimated model. Estimation results show that depreciation of health increases with age and both the rate of depreciation and pace of depreciation is higher for women:

$$\delta_{old} > \delta_{young} \qquad \text{and} \qquad \delta_{women} > \delta_{men}$$

5.5 Discussion

In this section we try to present the empirical results on how demographic& household characteristics and socio-economic status (SES) affect health satisfaction over life cycle since knowing which aspect of SES affects health is important for the policy design surrounding the SES-health gradient. A sharper deterioration of a lower initial stock of health possessed by the socially disadvantaged groups would likely to intensify concerns about socioeconomic inequalities in health, equity and social cohesion. Furthermore, the estimation results also suggest important implications on the parameter magnitudes that are presented in section 4.

Results reveal that getting older for women has a negative impact on health more than men which would suggest that the depreciation rate of women is greater than the depreciation rate for men. Furthermore, the effect of education and income on health satisfaction are also higher for women which may imply greater parameters of ϵ and ψ and policies directed to education and more equal income distribution would be justified in terms of a beneficial impact on health. In addition, labor market conditions such as work hours, employment and occupation also have higher impacts for women. Men's health satisfaction do not respond to changes increase in work hours and employment whereas health satisfaction of women reacts those changes negatively. The reason of this reaction is due to extensive margin of labor rather than the intensive margin. The results imply that women prefer to stay out of labor force (possibly voluntarily) which may due to many dimensions of the health satisfaction and labor market behavior.

Another important point in the empirical analysis conducted in section 5 is the change in parameters when endogeneity correction is applied. Underestimated income coefficients without endogeneity correction implies that reverse causality mentioned before is not a major issue in income-health satisfaction relationship in Turkey. Unobservable factors or error in measuring income plays a significant role in determining health outcomes. Income being such an crucial determiner of health satisfaction exhibits the importance of policies directed to more equal income distribution.

6.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. Further determining the nature of relationship is crucial for effective public policy designs especially for a young-populated country like Turkey, since increase in retirement age and alterations in social security systems are one of the current economic debates. In this respect we tried to bring a life-cycle perspective in alayzing health-SES nexus 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 intitution on the nature of SES-health nexus. 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.

In the third section we analyzed SES gradient in health with the help of basic SES indicators such as education, income, work status and work type. Main aim of this section was not to build a causal relationship but to observe whether cumulative advantage hypothesis, age-as-leverer hypothesis or some mixture of the two operates through life cycle. 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 effect the nature of the gradients.

One of the main observations of the third section was that the 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. Although the size of gradients alter, we still observe poorer health for women when we condition education and income on work status. Worse health of women could arise from expectations for own health,

financial incentives and strategic behavior to report poor health and comprehension of the survey questions, social and cultural roles which are out of scope of this study.

In the forth section we try to build a basic two-period life cycle model inspired from Grossman(1972) and Case and Deaton(2005) in order to build a theoretical mechanism that incorporates causal effects from SES to health. Both of the variables and parameters are important for health status of individuals. 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 leiusure it causes. Nonetheless relative magnitutes of the parameters also plays a crucial role in determining health outcomes. For instance in the last version of two-period model the impact of education becomes ambiguous depending on the relative sizes of ϵ and ψ. The efficiency created by better education, ϵ and efficiency of medical services that creates health,ψ, may be larger in certain ages or differ by gender which can in turn explain the differences among genders and across ages.

Finally in the fifth section we test our two-period model by Turkstat Income and Living Conditions Survey 2010. Although cross section data lacks some important issues such as cohort effects and full life cycle patterns, we believe yet it provides meaningful information. Estimation results show that age is the main determinant of health satisfaction followed by income and education when endogeneity is corrected. One striking feature of the results is that SES variables such as income, education and work status have greater effects for women. We also compare the relative effects of intensive and extensive margins of labor and conclude that work status is important for women whereas it has no significant effect for men. Moreover, we find that it is the extensive margin of labor, not the intensive margin of labor, that alters probability of good health. The direction of the income and education effect is positive while the effect of work hours and employment is negative for women. The results imply that women prefer to stay out of labor force (possibly voluntarily) which may due to many dimensions of the health satisfaction, labor market behavior, social roles and education level.

Another important point in the empirical analysis conducted in section 5 is the change

in parameters when endogeneity correction is applied. Underestimated income coefficients without endogeneity correction implies that reverse causality is not a major issue in income-health satisfaction relationship in Turkey. Unobservable factors or error in measuring income plays a significant role in determining income related health outcomes.

The implications of this study would be policies directed at more equal income distribution and policies aiming to rise women education and hence labor force participation. In other words, changes in income distribution and increase in female education would alleviate the negative effects of aging.

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APPENDIX A

A.1 Information About The Income and Living Conditions Survey 2010

DEMOGRAPHICS **Variable**	**Description**	**Range and/or Values**	**Percentage or Mean (Sd)**
age group	*ordinal variable*	1:00-04	8.72
		2:05-11	12.24
		3:12-14	5.39
		4:15-19	8.71
		5:20-24	7.48
		6:25-29	8.75
		7:30-34	8.45
		8:35-39	7.53
		9:40-44	6.79
		10:45-49	6.10
		11:50-54	5.32
		12:55-59	4.27
		13:60-64	3.23
		14:65+	7.02
gender	*binary variable*	1:male	49.62
		2:female	50.38
region1	*binary variable*	1:rural	31.08
		2:urban	68.92
region2	*categorical variable*	1:istanbul	17.79
		2:west marmara	4.32
		3:eagen	13.02
		4:east marmara	9.38
		5:west anatolia	9.43
		6:mediterranean	12.69
		7:middle anatolia	5.24
		8:west blacksea	6.15
		9:east blacksea	3.50
		10:north-east anatolia	2.95
		11: middle-east anatolia	5.05
		12:south-east anatolia	10.49
marital status	*categorical variable*	1:never married	24.85
		2:married	67.14
		3:separated	5.85
		4:widow	1.86
		5:divorced	0.30

HOUSEHOLD STRUCTURE **Variable**	**Description**	**Range and/or Values**	**Percentage or Mean (Sd)**
relationship to reference person	*categorical variable*	1:reference person	27.08
		2:spouse	22.24
		3:son/daughter	41.35
		4:mother/father	1.80
		5:sibling	0.96
		6:mother/father in law	0.24
		7:son/daughter in law	1.93
		8:grandson/daughter	3.36
		9:other relative	0.68
		10:employee	0.01
		11:other	0.35
household type	*categorical variable*	1:one person hh	2.04
		2:hh without children	21.37
		3:hh with children	76.48
		4:other	0.10
household size	*continous variable* number of people living in the household		4.64 (2.32)
number of children	*continous variable* number of children living in the household		1.44 (1.54)
house type	*categorical variable* indicates the type of the house	1:detached house	45.89
		2:terrace	4.14
		3:apartment	49.89
		4:other	0.09
house owner	*categorical variable* indicates the type of ownership of the house	1:owner	59.95
		2:renter	22.06
		3:housing	1.19
		4:other	16.80
rent expense	*continous variable* indicates the amonth of monthly rent		327.84 (210.74)
house expense	*continous variable* indicates the monthly amonth of house expenses excluding rent		233.20 (209.81)

HEALTH **Variable**	**Description**	**Range and/or Values**	**Percentage or Mean (Sd)**
health status	*ordinal variable* indicates self assesed health status of the individual	1:very good 2: good 3:fair 4:bad 5: very bad	10.59 55.41 20.25 11.78 1.96
chronic illness	*binary variable* indicates whether individual has a chronic illness	1:yes 2:no	30.00 70.00
limited daily activity	*ordinal variable* indicates whether the daily activites are limited due to a health problem in six months	1:limited very much 2:limited 3:not limited	7.80 19.74 72.46
not consult to a doctor	*binary variable* indicates whether individual has consulted to a doctor when needed	1:yes 2:no	21.31 78.69
reason	*categorical variable* indicates the reason why individual has not consulted to a doctor when needed	1:financial reasons 2:too much waiting time 3:no time 4:transportation difficulties 5:scared 6:self treatment 7:dont know where to go 8:other	10.97 0.45 1.51 0.49 0.49 1.45 0.10 0.21

SES **Variable**	**Description**	**Range and/or Values**	**Percentage or Mean (Sd)**
1.Education			
current education status	*binary variable* indicates whether individual attends a educational institution	1:yes 2:no	10.10 89.90
current education level	*ordinal variable* indicates the level of current education	1:primary school 2:high school 3:vocational high school 4:university 5:masters/phd	0.24 2.87 1.61 2.57 0.13
education level	*ordinal variable* indicates the education level completed	1:illeterate 2:primary school 3:secondary school 4:high school 5:vocational high school 6:university or higher	18.97 36.00 18.02 10.22 7.61 9.17
year education level	*continous variable* the year in which education is completed		1988.32 (15.57)
2. Work			
work status	*categorical variable* indicates current work status	1:employed full time 2:employed parttime 3:looking for a job 4:student 5:retired 6:employed seasonally 7:disabled 8:home production 9:other	41.03 5.06 4.53 7.48 7.97 0.24 5.64 26.50 1.55
worked worked last week	*binary variable* indicates whether the individual	1:yes 2:no	46.27 53.73
worked before	*binary variable* indicates whether non-working individual worked before	1:yes 2:no	21.30 18.17
look for a job	*binary variable* indicates whether the individual looked for a job in last four weeks	1:yes 2:no	3.40 36.33

Variable	Description	Range and/or Values	Percentage or Mean (Sd)
start working	*binary variable* indicates whether the individual can start working in two weeks if he/she finds a job	1:yes 2:no	6.80 32.73
channel	*categorical variable* indicates the channel used to apply for a job in last four weeks	1:iskur 2:labor brokers 3:directly to employers 4:relative/friend 5:newspaper/internet 6:written/oral interview 7:own business 8:waited the results of app. 9:other 10:did nothing	0.21 0.02 0.79 1.76 0.42 0.03 0.03 0.07 0.03 0.03
current job status	*categorical variable* indicates current job status	1:wage earner 2:employer 3:own business 4:unpaid family worker	20.62 1.47 6.54 5.48
occupation	*categorical variable* indicates current occupation	1:managers 2:professionals 3:assoc. professionals 4:office clerks 5:service workers 6:agriculture workers 7:artisans 8:skilled workers 9:unskilled workers	2.87 2.44 2.06 1.90 4.05 7.89 4.67 3.34 4.88
working hours	*continous variable* gives weekly working hours		17.10 (25.79)
second job hours	*continous variable* gives weekly working hours of the second job		0.58 (4.47)
reason part time	*categorical variable* indicates the reason of part time work	1:education 2:disabled 3:unable to find fulltime job 4:not want to work more 5:evaluate as fulltime job 6:housework 7:nature of the job 8:other	0.20 0.34 0.35 0.17 0.06 0.67 1.26 0.09

Variable	Description	Range and/or Values	Percentage or Mean (Sd)
firmsize	*ordinal variable*	1:10 or less	20.85
	indicates the size	2:11-19	2.73
	of the firm	3:20-49	3.04
	individual works	4:50 or more	7.13
social security	*categorical variable*	1:registered	18.05
	indicates whether	2:unregistered	16.05
	individual has social security		
months full time	*continuous variable*		
	months spent in full		4.71
	time work in 2009		(5.52)
months part time	*continuous variable*		
	months spent in part		0.57
	time work in 2009		(2.40)
months unemployed	*continuous variable*		
	months spent		0.66
	unemployed in 2009		(2.28)
months retired	*continuous variable*		
	months spent as a		0.91
	retiree in 2009		(3.13)
months student	*continuous variable*		
	months spent as		0.98
	a student in 2009		(3.17)
months home prod	*continuous variable*		
	months spent in home		4.17
	production in 2009		(5.54)
duration of work	*continuous variable*		9.82
	years since first job		(14.12)
last job status	*categorical variable*	1:wage earner	14.18
	indicates the work	2:employer	0.34
	status in last job	3:own business	2.63
		4:unpaid family worker	4.15
last occupation	*categorical variable*	1:managers	0.99
		2:professionals	0.93
		3:assoc. professionals	1.02
		4:office clerks	1.52
		5:service workers	2.23
		6:agriculture workers	4.30
		7:artisans	3.02
		8:skilled workers	2.00
		9:unskilled workers	5.31
months last job	*continuous variable*		
	months spent in		0.32
	last job in 2009		(1.59)

Variable	Description	Range and/or Values	Percentage or Mean (Sd)
3.Income			
wage income	*continuous variable* indicates the wage income of the individual in 2009		2416.77 (6475.54)
entrep. income	*continuous variable* indicates the entrepreneurial income of individual in 2009		1076.86 (6377.82)
unemp. benefit	*continuous variable* indicates unemployment benefit received by individual in 2009		29.44 (483.17)
pension	*continuous variable* indicates pension received in 2009		798.43 (2726.28)
widow and orphanage pen.	*continuous variable* indicates the widow amount of pension received by individual in 2009		160.80 (1027.69)
disability income	continuous variable indicates disability income received by individual in 2009		25.69 (377.94)
paid-sick leave	*continuous variable* indicates the income received by individual during sick leave		1.55 (46.19)
scholarship	*continuous variable* indicates scholarship received		4.89 (134.65)
total income	*continuous variable* indicates the total amount of income in 2009		4747.12 (9897.67)
total hh income	*continuous variable* indicates the total household income in 2009		17940.45 (17007.10)

APPENDIX B

B.1 Solution of Two Period Model Version 1

Lagrangian:

$$L = log(c_1) + log(h_1) + \beta log(h_2) + \beta log(c_2) + \lambda[w_1 - \frac{h_1}{\psi} + \frac{\bar{h}}{\psi} - \frac{\delta\bar{h}}{\psi} + \frac{\phi w_1}{\psi} - \frac{h_2}{\psi(1+r)} + \frac{h_1}{\psi(1+r)} - \frac{\delta h_1}{\psi(1+r)} - c_1 - \frac{c_2}{1+r}]$$

First-order conditions:

[1a] $\frac{\partial L}{\partial c_1} = 0 \Rightarrow \frac{1}{c_1} = \lambda$

[2a] $\frac{\partial L}{\partial c_2} = 0 \Rightarrow \frac{\beta}{c_2} = \frac{\lambda}{1+r}$

[3a] $\frac{\partial L}{\partial h_1} = 0 \Rightarrow \frac{1}{h_1} = \frac{\lambda(r+\delta)}{\psi(1+r)}$

[4a] $\frac{\partial L}{\partial h_2} = 0 \Rightarrow \frac{\beta}{h_2} = \frac{\lambda}{\psi(1+r)}$

[5a] $w_1 - (\frac{h_1 - \bar{h} + \delta\bar{h} - \phi w_1}{\psi}) - (\frac{h_2 - h_1 + \delta h_1}{\psi(1+r)}) - c_1 - \frac{c_2}{1+r} = 0$

From equations [1a] and [2a]:

[6a] $c_2 = c_1\beta(1+r)$

From equations [3a] and [4a]:

[7a] $h_2 = h_1\beta(r+\delta)$

Equations [6a] and [7a] indicates the following:

[6a] $c_2 = c_1\beta(1+r) \Rightarrow c_2 = c_1$ if $\beta(1+r) = 1$

$c_2 > c_1$ if $\beta(1+r) > 1$

$c_2 < c_1$ if $\beta(1+r) < 1$

[7a] $h_2 = h_1\beta(r+\delta) \Rightarrow h_2 = h_1$ if $\beta(r+\delta) = 1$

$h_2 > h_1$ if $\beta(r+\delta) > 1$

$h_2 < h_1$ if $\beta(r+\delta) < 1$

Plug [6a] into [5a]

[8a] $c_1(1+\beta) = w_1 - \frac{h_1}{\psi} + \frac{\bar{h}}{\psi} - \frac{\delta\bar{h}}{\psi} + \frac{\phi w_1}{\psi} - \frac{h_2}{\psi(1+r)} + \frac{h_1}{\psi(1+r)} - \frac{\delta h_1}{\psi(1+r)}$

Plug [7a] into [8a]

[9a] $c_1(1+\beta) = w_1 - \frac{h_1}{\psi} + \frac{\bar{h}}{\psi} - \frac{\delta\bar{h}}{\psi} + \frac{\phi w_1}{\psi} - \frac{h_1\beta(r+\delta)}{\psi(1+r)} + \frac{h_1}{\psi(1+r)} - \frac{\delta h_1}{\psi(1+r)}$

From equations [1a] and [3a]

[10a] $c_1 = \frac{h_1(r+\delta)}{\psi(1+r)}$

Plug [10a] into [9a]

[11a] $\frac{h_1(r+\delta)(1+\beta)}{\psi(1+r)} = w + \frac{\bar{h}}{\psi} - \frac{\delta\bar{h}}{\psi} + \frac{\phi w_1}{\psi} - \left(\frac{h_1}{\psi} + \frac{h_1\beta(r+\delta)}{\psi(1+r)} - \frac{h_1}{\psi(1+r)} + \frac{\delta h_1}{\psi(1+r)}\right)$

[12a] $\frac{2h_1(r+\delta)(1+\beta)}{\psi(1+r)} = \frac{w(\psi+\phi)+\bar{h}(1-\delta}{\psi}$

[13a] $$h_1 = \frac{(1+r)[w_1(\phi+\psi)+\bar{h}(1-\delta)]}{2(r+\delta)(1+\beta)}$$

Plug [7a] into [13a]

[14a] $$h_2 = \frac{(1+r)\beta[w_1(\phi+\psi)+\bar{h}(1-\delta)]}{2(1+\beta)}$$

Plug [10a] into [13a]

[15a] $$c_1 = \frac{[w_1(\phi+\psi)+\bar{h}(1-\delta)]}{2(1+\beta)\psi}$$

Plug [6a] into [15a]

[16a] $$c_2 = \frac{\beta(1+r)[w_1(\phi+\psi)+\bar{h}(1-\delta)]}{2(1+\beta)\psi}$$

Now we have the four health and consumption functions in terms of section 4.2.2 notation:

[4.2.16] $$h_1 = \frac{(1+r)[w_1(\phi+\psi)+\bar{h}(1-\delta)]}{2(r+\delta)(1+\beta)}$$

[4.2.17] $$h_2 = \frac{\beta(1+r)[w_1(\phi+\psi)+\bar{h}(1-\delta)]}{2(1+\beta)}$$

[4.2.18] $$c_1 = \frac{[w_1(\phi+\psi)+\bar{h}(1-\delta)]}{2(1+\beta)\psi}$$

[4.2.19] $$c_2 = \frac{\beta(1+r)[w_1(\phi+\psi)+\bar{h}(1-\delta)]}{2(1+\beta)\psi}$$

B.2 Solution of Two Period Model Version 2

Lagrangian:

$$L = log(c_1) + log(h_1) + \beta log(h_2) + \beta log(c_2) + \lambda[w_1 - e_1 - \frac{h_1}{\psi} + \frac{\bar{h}}{\psi} - \frac{\delta\bar{h}}{\psi} + \frac{\phi w_1}{\psi} + \frac{\epsilon e_1}{\psi} - \frac{h_2}{\psi(1+r)} + \frac{h_1}{\psi(1+r)} - \frac{\delta h_1}{\psi(1+r)} - c_1 - \frac{c_2}{1+r}]$$

First-order conditions:

[1b] $\frac{\partial L}{\partial c_1} = 0 \Rightarrow \frac{1}{c_1} = \lambda$

[2b] $\frac{\partial L}{\partial c_2} = 0 \Rightarrow \frac{\beta}{c_2} = \frac{\lambda}{1+r}$

[3b] $\frac{\partial L}{\partial h_1} = 0 \Rightarrow \frac{1}{h_1} = \frac{\lambda(r+\delta)}{\psi(1+r)}$

[4b] $\frac{\partial L}{\partial h_2} = 0 \Rightarrow \frac{\beta}{h_2} = \frac{\lambda}{\psi(1+r)}$

[5b] $w_1 - e_1 - (\frac{h_1 - \bar{h} + \delta\bar{h} - \phi w_1 - \epsilon e_1}{\psi}) - (\frac{h_2 - h_1 + \delta h_1}{\psi(1+r)}) - c_1 - \frac{c_2}{1+r} = 0$

From equations [1b] and [2b]:

[6b] $c_2 = c_1\beta(1+r)$

From equations [3b] and [4b]:

[7b] $h_2 = h_1\beta(r+\delta)$

Plug [6b] into [5b]

[8b] $$c_1(1+\beta) = w_1 - e_1 - \frac{h_1}{\psi} + \frac{\bar{h}}{\psi} - \frac{\delta\bar{h}}{\psi} + \frac{\phi w_1}{\psi} + \frac{\epsilon e_1}{\psi} - \frac{h_2}{\psi(1+r)} + \frac{h_1}{\psi(1+r)} - \frac{\delta h_1}{\psi(1+r)}$$

Plug [7b] into [8b]

[9b] $$c_1(1+\beta) = w_1 - e_1 - \frac{h_1}{\psi} + \frac{\bar{h}}{\psi} - \frac{\delta\bar{h}}{\psi} + \frac{\phi w_1}{\psi} + \frac{\epsilon e_1}{\psi} - \frac{h_1\beta(r+\delta)}{\psi(1+r)} + \frac{h_1}{\psi(1+r)} - \frac{\delta h_1}{\psi(1+r)}$$

From equations [1b] and [3b]

[10b] $$c_1 = \frac{h_1(r+\delta)}{\psi(1+r)}$$

Plug [10b] into [9b]

[11b] $$\frac{h_1(r+\delta)(1+\beta)}{\psi(1+r)} = w_1 - e_1 + \frac{\bar{h}}{\psi} - \frac{\delta\bar{h}}{\psi} + \frac{\phi w_1}{\psi} + \frac{\epsilon e_1}{\psi} - \left(\frac{h_1}{\psi} + \frac{h_1\beta(r+\delta)}{\psi(1+r)} - \frac{h_1}{\psi(1+r)} + \frac{\delta h_1}{\psi(1+r)}\right)$$

[12b] $$\frac{2h_1(r+\delta)(1+\beta)}{\psi(1+r)} = \frac{w_1(\psi+\phi)+\bar{h}(1-\delta)+e_1(\epsilon-\psi)}{\psi}$$

[13b] $$h_1 = \frac{(1+r)[w_1(\phi+\psi)+\bar{h}(1-\delta)+e_1(\epsilon-\psi)]}{2(r+\delta)(1+\beta)}$$

Plug [7b] into [13b]

[14b] $$h_2 = \frac{(1+r)\beta[w_1(\phi+\psi)+\bar{h}(1-\delta)+e_1(\epsilon-\psi)]}{2(1+\beta)}$$

Plug [10b] into [13b]

[15a] $$c_1 = \frac{[w_1(\phi+\psi)+\bar{h}(1-\delta)+e_1(\epsilon-\psi)]}{2(1+\beta)\psi}$$

Plug [6b] into [15b]

[16a] $$c_2 = \frac{\beta(1+r)[w_1(\phi+\psi)+\bar{h}(1-\delta)+e_1(\epsilon-\psi)]}{2(1+\beta)\psi}$$

In section 4's notation:

[4.3.16] $$h_1 = \frac{(1+r)[w_1(\phi+\psi)+e_1(\epsilon-\psi)+\bar{h}(1-\delta)]}{2(r+\delta)(1+\beta)}$$

[4.3.17] $$h_2 = \frac{\beta(1+r)[w_1(\phi+\psi)+e_1(\epsilon-\psi)+\bar{h}(1-\delta)]}{2(1+\beta)}$$

[4.3.18] $$c_1 = \frac{[w_1(\phi+\psi)+e_1(\epsilon-\psi)+\bar{h}(1-\delta)]}{2(1+\beta)\psi}$$

[4.3.19] $$c_2 = \frac{\beta(1+r)[w_1(\phi+\psi)+e_1(\epsilon-\psi)+\bar{h}(1-\delta)]}{2(1+\beta)\psi}$$

B.3 Solution of Two Period Model Version 3

Lagrangian:

$$L = log(c_1) + log(h_1) + \beta log(h_2) + \beta log(c_2) + \lambda[w_1 n_1 + y_1 - e_1 - \frac{h_1}{\psi} + \frac{\bar{h}}{\psi} - \frac{\delta\bar{h}}{\psi} + \frac{\phi w_1 n_1}{\psi} - \frac{\tau n_1}{\psi} + \frac{\sigma y_1}{\psi} + \frac{\epsilon e_1}{\psi} - \frac{h_2}{\psi(1+r)} + \frac{h_1}{\psi(1+r)} - \frac{\delta h_1}{\psi(1+r)} - c_1 - \frac{c_2}{1+r}]$$

First-order conditions:

[1c] $\frac{\partial L}{\partial c_1} = 0 \Rightarrow \frac{1}{c_1} = \lambda$

[2c] $\frac{\partial L}{\partial c_2} = 0 \Rightarrow \frac{\beta}{c_2} = \frac{\lambda}{1+r}$

[3c] $\frac{\partial L}{\partial h_1} = 0 \Rightarrow \frac{1}{h_1} = \frac{\lambda(r+\delta)}{\psi(1+r)}$

[4c] $\frac{\partial L}{\partial h_2} = 0 \Rightarrow \frac{\beta}{h_2} = \frac{\lambda}{\psi(1+r)}$

[5c] $w_1 n_1 + y_1 - e_1 - (\frac{h_1 - \bar{h} + \delta\bar{h} - \phi w_1 n_1 + \tau n_1 - \sigma y_1 - \epsilon e_1}{\psi}) - (\frac{h_2 - h_1 + \delta h_1}{\psi(1+r)}) - c_1 - \frac{c_2}{1+r} = 0$

From equations [1c] and [2c]:

[6c] $c_2 = c_1\beta(1+r)$

From equations [3c] and [4c]:

[7c] $h_2 = h_1\beta(r+\delta)$

Plug [6c] into [5c]

[8c] $$c_1(1+\beta) = w_1 n_1 + y_1 - e_1 - \frac{h_1}{\psi} + \frac{\bar{h}}{\psi} - \frac{\delta \bar{h}}{\psi} + \frac{\phi w_1 n_1}{\psi} - \frac{\tau n_1}{\psi} + \frac{\sigma y_1}{\psi} + \frac{\epsilon e_1}{\psi} - \frac{h_2}{\psi(1+r)} + \frac{h_1}{\psi(1+r)} - \frac{\delta h_1}{\psi(1+r)}$$

Plug [7c] into [8c]

[9c] $$c_1(1+\beta) = w_1 n_1 + y_1 - e_1 - \frac{h_1}{\psi} + \frac{\bar{h}}{\psi} - \frac{\delta \bar{h}}{\psi} + \frac{\phi w_1 n_1}{\psi} - \frac{\tau n_1}{\psi} + \frac{\sigma y_1}{\psi} + \frac{\epsilon e_1}{\psi} - \frac{h_1 \beta (r+\delta)}{\psi(1+r)} + \frac{h_1}{\psi(1+r)} - \frac{\delta h_1}{\psi(1+r)}$$

From equations [1c] and [3c]

[10c] $$c_1 = \frac{h_1(r+\delta)}{\psi(1+r)}$$

Plug [10c] into [9c]

[11c] $$\frac{h_1(r+\delta)(1+\beta)}{\psi(1+r)} = w_1 n_1 + y_1 - e_1 + \frac{\bar{h}}{\psi} - \frac{\delta \bar{h}}{\psi} + \frac{\phi w_1 n_1}{\psi} - \frac{\tau n_1}{\psi} + \frac{\sigma y_1}{\psi} + \frac{\epsilon e_1}{\psi} - \left(\frac{h_1}{\psi} + \frac{h_1 \beta (r+\delta)}{\psi(1+r)} - \frac{h_1}{\psi(1+r)} + \frac{\delta h_1}{\psi(1+r)}\right)$$

[12c] $$\frac{2h_1(r+\delta)(1+\beta)}{\psi(1+r)} = \frac{w_1 n_1(\psi+\phi) + y_1(\psi+\sigma) - \tau n_1 + \bar{h}(1-\delta) + e_1(\epsilon-\psi)}{\psi}$$

[13c] $$h_1 = \frac{(1+r)[w_1 n_1(\phi+\psi) + y_1(\psi+\sigma) - \tau n_1 + \bar{h}(1-\delta) + e_1(\epsilon-\psi)]}{2(r+\delta)(1+\beta)}$$

Plug [7c] into [13c]

[14c] $$h_2 = \frac{(1+r)\beta[w_1 n_1(\phi+\psi) + y_1(\psi+\sigma) - \tau n_1 + \bar{h}(1-\delta) + e_1(\epsilon-\psi)]}{2(1+\beta)}$$

Plug [10c] into [13c]

[15c] $$c_1 = \frac{[w_1 n_1(\phi+\psi) + y_1(\psi+\sigma) - \tau n_1 + \bar{h}(1-\delta) + e_1(\epsilon-\psi)]}{2(1+\beta)\psi}$$

Plug [6c] into [15c]

[16c] $$c_2 = \frac{\beta(1+r)[w_1 n_1(\phi+\psi) + y_1(\psi+\sigma) - \tau n_1 + \bar{h}(1-\delta) + e_1(\epsilon-\psi)]}{2(1+\beta)\psi}$$

In section 4's notation:

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

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

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

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

APPENDIX C

Table C1: Probit Estimation Results of Table 5.2 (All Sample)

Dep. Var:SAH	**Probit**	**IV-Probit**	**2SRI-Probit**
	(1)	(2)	(3)
endogeneity correction	(no)	(yes)	(yes)
age 35-44	-0.490***	-0.508***	-0.514***
	(0.0256)	(0.0243)	(0.0259)
age 45-54	-0.870***	-0.950***	-0.966***
	(0.0285)	(0.0316)	(0.0333)
age 55-64	-1.255***	-1.404***	-1.427***
	(0.0338)	(0.0538)	(0.0528)
age 65+	-1.585***	-1.755***	-1.784***
	(0.0392)	(0.0670)	(0.0699)
male	0.194***	0.420***	0.429***
	(0.0210)	(0.0595)	(0.0619)
married	0.0770**	0.0481	0.0436
	(0.0386)	(0.0387)	(0.0364)
divorced	-0.234***	-0.189***	-0.192***
	(0.0546)	(0.0586)	(0.0582)
widowed	-0.132*	-0.0723	-0.0796
	(0.0677)	(0.0733)	(0.0645)
urban	0.0527**	-0.0684**	-0.0660**
	(0.0208)	(0.0338)	(0.0297)
nr child	0.0165**	0.0564***	0.0562***
	(0.00780)	(0.0109)	(0.0100)
living quartiles	-0.000327	-0.00350***	-0.00356***
	(0.000601)	(0.000922)	(0.000919)
medium education	0.256***	0.161***	0.171***
	(0.0239)	(0.0341)	(0.0356)
high education	0.399***	0.160**	0.184***
	(0.0381)	(0.0714)	(0.0710)
white collar	0.0567**	0.322***	0.326***
	(0.0253)	(0.0734)	(0.0750)
hh income	0.320***	0.710***	0.709***
	(0.0165)	(0.0772)	(0.0718)
work hours	0.00392***	-0.00548**	-0.00575**
	(0.000444)	(0.00274)	(0.00273)
Observations	25,503	25,503	25,503
R-squared	0.204	0.192	0.205

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

Table C2: Probit Estimation Results of Table 5.3 (Men)

Dep. Var:SAH	**Probit**	**IV-Probit**	**2SRI-Probit**
	(1)	(2)	(3)
endogeneity correction	(no)	(yes)	(yes)
age 35-44	-0.393***	-0.418***	-0.403***
	(0.0387)	(0.0425)	(0.0403)
age 45-54	-0.724***	-0.755***	-0.773***
	(0.0420)	(0.0546)	(0.0558)
age 55-64	-1.021***	-1.066***	-1.113***
	(0.0500)	(0.0971)	(0.0925)
age 65+	-1.341***	-1.378***	-1.447***
	(0.0572)	(0.131)	(0.125)
married	0.0611	0.0669	0.0603
	(0.0553)	(0.0516)	(0.0530)
divorced	-0.230**	-0.236**	-0.205**
	(0.103)	(0.104)	(0.0950)
widowed	-0.158	-0.148	-0.133
	(0.113)	(0.110)	(0.111)
urban	0.0379	-0.0320	-0.0249
	(0.0294)	(0.0524)	(0.0536)
nr child	0.00963	0.0386**	0.0316*
	(0.0114)	(0.0179)	(0.0181)
living quartiles	0.00134	-0.000265	-0.000411
	(0.000934)	(0.00152)	(0.00151)
medium education	0.221***	0.115**	0.191***
	(0.0313)	(0.0530)	(0.0536)
high education	0.349***	0.118	0.237**
	(0.0490)	(0.104)	(0.111)
white collar	0.0355	-0.0308	0.189
	(0.0312)	(0.154)	(0.151)
hh income	0.299***	0.509***	0.515***
	(0.0240)	(0.130)	(0.119)
work hours	0.00592***	0.00734	0.000261
	(0.000562)	(0.00605)	(0.00585)
Observations	12,310	12,310	12,310
R-squared	0.170	0.151	0.170

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

Table C3: Probit Estimation Results of Table 5.4 (Women)

Dep. Var:SAH	**Probit**	**IV-Probit**	**2SRI-Probit**
	(1)	(2)	(3)
endogeneity correction	(no)	(yes)	(yes)
age 35-44	-0.548***	-0.595***	-0.599***
	(0.0346)	(0.0380)	(0.0314)
age 45-54	-0.960***	-1.181***	-1.190***
	(0.0395)	(0.0586)	(0.0492)
age 55-64	-1.423***	-1.823***	-1.846***
	(0.0470)	(0.0864)	(0.0774)
age 65+	-1.792***	-2.286***	-2.323***
	(0.0559)	(0.110)	(0.0990)
married	0.0224	-0.0659	-0.0778
	(0.0548)	(0.0577)	(0.0624)
divorced	-0.208***	-0.133*	-0.138*
	(0.0704)	(0.0759)	(0.0824)
widowed	-0.174**	-0.0786	-0.0928
	(0.0867)	(0.0864)	(0.0920)
urban	0.0720**	-0.0973**	-0.108**
	(0.0297)	(0.0444)	(0.0473)
nr child	0.0189*	0.0630***	0.0697***
	(0.0109)	(0.0157)	(0.0165)
living quartiles	-0.00145*	-0.00541***	-0.00550***
	(0.000797)	(0.00144)	(0.00139)
medium education	0.329***	0.197***	0.179***
	(0.0373)	(0.0532)	(0.0557)
high education	0.502***	0.341***	0.307***
	(0.0629)	(0.118)	(0.109)
white collar	0.115**	0.809***	0.749***
	(0.0458)	(0.121)	(0.106)
hh income	0.326***	0.841***	0.866***
	(0.0228)	(0.112)	(0.119)
work hours	0.00210**	-0.0217***	-0.0204***
	(0.000848)	(0.00416)	(0.00363)
Observations	13,193	13,193	13,193
R-squared	0.220	0.212	0.223

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

Table C4: Probit Estimation Results of Table 5.5 (All Sample)

Dep. Var:SAH	**Probit**	**IV-Probit**	**2SRI-Probit**
	(1)	(2)	(3)
endogeneity correction	(no)	(yes)	(yes)
age 35-44	-0.492***	-0.505***	-0.510***
	(0.0256)	(0.0274)	(0.0263)
age 45-54	-0.874***	-0.946***	-0.963***
	(0.0285)	(0.0280)	(0.0321)
age 55-64	-1.258***	-1.404***	-1.431***
	(0.0337)	(0.0403)	(0.0471)
age 65+	-1.590***	-1.757***	-1.792***
	(0.0390)	(0.0523)	(0.0602)
male	0.207***	0.408***	0.421***
	(0.0204)	(0.0401)	(0.0462)
married	0.0780**	0.0481	0.0435
	(0.0386)	(0.0340)	(0.0400)
divorced	-0.228***	-0.197***	-0.201***
	(0.0546)	(0.0522)	(0.0552)
widowed	-0.131*	-0.0738	-0.0815
	(0.0677)	(0.0629)	(0.0681)
urban	0.0580***	-0.0737**	-0.0720**
	(0.0208)	(0.0317)	(0.0323)
nr child	0.0161**	0.0558***	0.0557***
	(0.00780)	(0.0103)	(0.0121)
living quartiles	-0.000309	-0.00342***	-0.00347***
	(0.000602)	(0.000991)	(0.000980)
medium education	0.250***	0.174***	0.185***
	(0.0239)	(0.0340)	(0.0385)
high education	0.358***	0.235***	0.269***
	(0.0388)	(0.0893)	(0.0911)
white collar	0.00746	0.401***	0.414***
	(0.0283)	(0.0740)	(0.0888)
hh income	0.319***	0.705***	0.706***
	(0.0165)	(0.0800)	(0.0846)
employed	0.239***	-0.354***	-0.381***
	(0.0268)	(0.116)	(0.136)
Observations	25,503	25,503	25,503
R-squared	0.204	0.192	0.205

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

Table C5: Probit Estimation Results of Table 5.6 (Men)

Dep. Var:SAH	**Probit**	**IV-Probit**	**2SRI-Probit**
	(1)	(2)	(3)
endogeneity correction	(no)	(yes)	(yes)
age 35-44	-0.397***	-0.422***	-0.400***
	(0.0387)	(0.0373)	(0.0413)
age 45-54	-0.723***	-0.775***	-0.769***
	(0.0420)	(0.0416)	(0.0471)
age 55-64	-1.003***	-1.101***	-1.104***
	(0.0499)	(0.0809)	(0.0732)
age 65+	-1.312***	-1.423***	-1.432***
	(0.0572)	(0.104)	(0.0947)
married	0.0518	0.0734	0.0524
	(0.0554)	(0.0623)	(0.0546)
divorced	-0.224**	-0.221**	-0.199*
	(0.103)	(0.106)	(0.103)
widowed	-0.153	-0.141	-0.126
	(0.113)	(0.118)	(0.116)
urban	0.0515*	-0.0324	-0.0206
	(0.0294)	(0.0516)	(0.0485)
nr child	0.00917	0.0395**	0.0327**
	(0.0114)	(0.0185)	(0.0160)
living quartiles	0.00137	-0.000356	-0.000432
	(0.000936)	(0.00145)	(0.00142)
medium education	0.209***	0.111**	0.196***
	(0.0314)	(0.0546)	(0.0536)
high education	0.283***	0.0607	0.252**
	(0.0493)	(0.135)	(0.123)
white collar	-0.0410	-0.0476	0.229
	(0.0333)	(0.184)	(0.167)
hh income	0.288***	0.525***	0.520***
	(0.0241)	(0.133)	(0.112)
employed	0.439***	0.333	0.0163
	(0.0364)	(0.303)	(0.277)
Observations	12,310	12,310	12,310
R-squared	0.172	0.151	0.172

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

Table C6: Probit Estimation Results of Table 5.7 (Men)

Dep. Var:SAH	**Probit**	**IV-Probit**	**2SRI-Probit**
	(1)	(2)	(3)
endogeneity correction	(no)	(yes)	(yes)
age 35-44	-0.547***	-0.584***	-0.586***
	(0.0346)	(0.0315)	(0.0349)
age 45-54	-0.963***	-1.146***	-1.151***
	(0.0395)	(0.0478)	(0.0421)
age 55-64	-1.429***	-1.778***	-1.792***
	(0.0471)	(0.0662)	(0.0657)
age 65+	-1.799***	-2.229***	-2.255***
	(0.0559)	(0.0819)	(0.0912)
married	0.0168	-0.0667	-0.0827
	(0.0548)	(0.0650)	(0.0600)
divorced	-0.212***	-0.178**	-0.191***
	(0.0703)	(0.0723)	(0.0710)
widowed	-0.169*	-0.0965	-0.109
	(0.0866)	(0.0873)	(0.0888)
urban	0.0706**	-0.112***	-0.123***
	(0.0297)	(0.0406)	(0.0451)
nr child	0.0177	0.0606***	0.0660***
	(0.0109)	(0.0169)	(0.0168)
living quartiles	-0.00146*	-0.00514***	-0.00525***
	(0.000797)	(0.00132)	(0.00131)
medium education	0.333***	0.229***	0.213***
	(0.0373)	(0.0618)	(0.0604)
high education	0.515***	0.562***	0.529***
	(0.0648)	(0.128)	(0.147)
hite collar	0.144***	0.996***	0.929***
	(0.0554)	(0.118)	(0.142)
hh income	0.329***	0.808***	0.833***
	(0.0228)	(0.116)	(0.112)
employed	0.0512	-1.186***	-1.128***
	(0.0474)	(0.163)	(0.209)
Observations	13,193	13,193	13,193
R-squared	0.220	0.212	0.223

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