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The Effects of Health on Labour Force Participation: Evidence from Turkey

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Abstract

Although the interrelation between health status and labour force participation is an important issue that has been studied mainly for developed countries, little attention has been devoted to empirical researches on health's effect on labour supply decision for developing countries. This study contributes to the literature by investigating the relationship between health status and labour force participation in a developing country, Turkey. Considering possible endogeneity of health, health equation and labour force participation equation are estimated simultaneously. A two-stage estimation method is applied separately for working age groups of men and women. The results suggest that health positively and significantly affects the labour force participation for all age-gender groups as expected. The effect is larger for older men and younger women. The study also finds that labour force participation has significant positive effect on health for younger men and significant negative effect on health for older women. This suggests that rationalization type of endogeneity may exist only for younger men.

Keywords: endogeneity of health, cross-sectional data, health status, labour force participation, self-assessed health, two stage estimation

1. Introduction

Labour force participation decisions are affected by individuals' health status. One reason is that the actors of the labour market value health as a part of human capital (Becker, 1964, 2007; Grossman, 1972). A person with better health tend to get more education and develop skills, have higher earnings, hence improving health could raise labour force participation (Holt, 2010a). On the other hand, a person with poor health may value leisure time more than the working hours by reducing working hours hence lowering productivity at work. Lower productivity cause further output loss. In addition, the costs of improving poor health and value of lost output are the measures of the economic cost of poor health (Holt, 2010b).

Chronic diseases are the main determinant of ill health and deaths in Turkey. The occurrence of chronic diseases is partly compelled by risky life-style habits such as unhealthy diet, tobacco and alcohol consumption and physical activity (Public Health Agency of Turkey, 2013). According to a cause of death examination/research/analysis using the findings of the study conducted by Public Health Agency of Turkey in 2013: around 40% of death in 1994, 45% of death in 1993 and 40% of death in 2013 resulted from heart diseases. A ratio of chronic diseases has been rising in recent years. If the chronic diseases becomes more common among people, its consequences will be increased health care costs and reduced participation into labour market, which might lead to significant negative economic effects (Holt, 2010a).

On the other hand, the possible endogeneity of self-reported health caused by the measurement of health is an issue in this research area. If the health status is more properly measured, health status is less likely to be exposed to the rationalisation endogeneity problem (Benitez et al., 2004). In the case of endogeneity, when the health is taken as exogenous variable in the labour force equations, the estimated effect is probably to be biased (Cai, 2010). Therefore, endogeneity of health suggests simultaneous equation model to estimate the efffect of health on labour force participation. Following Stern (1989), Cai and Kalb (2004, 2006) in building up the model, the two-stage estimation method is applied to estimate the simultaneous equation model using 5 levels of health.

Although the interrelation between health status and labour force participation has been studied mainly for

developed countries (see Curie & Madrian, 1999; Cai, 2010; Cai & Kalb, 2006, 2007; Holt, 2010), little attention has been devoted to empirical researches on health's effect on labour supply decision for developing countries like Turkey (see Bridges & Lawson, 2009; Mushtaq, Mohsin, & Zaman, 2013). Moreover, most of the available literature focuses on the determinants of and trends in labour force participation, particularly for women in Turkey. Hence, this study make a contribution to the literature by exploring relationship between health status and labour force participation of working age men and women in the case of developing country, Turkey. Inclusion of health data in the Survey by Turkish Statistical Institution allowed such analysis to be undertaken. Moreover, applying simultaneous estimation allowed us to analyse the impact of labour force status on health. This study uses data from the Turkish Household Income and Living Conditions Survey. The advantage of these data is that, in addition to standard health status, the data contain information on labour force status and demographic characteristics of persons.

The paper is organized in the following way: after the introduction, evaluation of previous studies in the subject area is presented in Section 1. The theoretical model and estimation method are described in Section 3. Section 4 defines the data and the variables included in the model while the Results of Estimation are given in Section 5, and the Conclusions is in the last Section.

2. Literature Review

Based on the previous empirical studies, the relationship between health and labour force participation can be explained by three different ways: productivity, life expectancy and income effect.

Most of the literature concentrates on the link between health and the productivity. This analysis originally comes from the human capital theory developed by Becker (1964). Human capital theory suggests that good health and labour force participation are positively correlated. Actors of labour market consider health as a part of human capital just like the education. Hence, people with poor health having lower productivity will less likely to be employed. For further discussion on this approach see Grossman (1972), Currie and Madrian (1999), Lavy, Palumba and Stern (1995).

In life expectancy approach, productivity is not the only connection to explain the relation between health and labour force participation. Health may influence individuals' preferences between income and leaving the labour market. People with poor health may value leisure more since they need time to care of bad health. Hence, bad health makes people to leave the labour market, which affects the life expectancy (Chirikos, 1993).

The interrelation between health and labour force participation can also be explained by income effect. Income effect suggests the positive impact of poor health on labour force participation. According to this approach, individuals with poor health can demand more medical care. To take care of the medical care expenses they need to be employed (Dwyer & Mitchell, 1999; Cai & Kalb, 2006).

Literature also implies the endogeneity issue of health to labour participation. In other words, labour force participation can affect health. Two types of endogeneity are suggested in the theory: True endogeneity and rationalization endogeneity. While true endogeneity exists when health is accurately measured, rationalization endogeneity occurs when health is not accurately measured.

If the true endogeneity is under consideration, there is a potential of reverse causality or simultaneous feedback effect from higher participation to better health. Since the good health is not completely predetermined at birth, individuals need to spend more time and money on their health to keep or improve their health status. Hence, improving or maintaining health status depends on individuals' past or current labour status. Besides, Stern (1989), Sickles and Taubman (1986) indicate that boredom or absence of activity resulting from non-participation may diminish the quality of health. Moreover, jobs with unpleasant working conditions also could have negative effect on health (Cai & Kalb, 2006).

Rationalization endogeneity issue exists if the self-reported health is used as an explanatory variable in the labour force model. Unfortunately, only the self-reported health is included in most of the surveys. Hence, self-assessed health as an explanatory variable is usually used to explore the relation between health and labour force participation. Nevertheless, some researchers think that people who do not work may use their poor health as an excuse for their non-participation, which is called justification or rationalization (Stern, 1989; Dwyer & Mitchell, 1999; Kreider, 1999; Anderson & Burkhauser, 1984, 1985; Bound, 1991). As a result of rationalization, health variable as an explanatory variable in labour force participation model becomes endogenous making the effects overestimated.

While most of the researches in the considered literature took a binary disability status as health variable (Stern, 1989; Lechner & Vazquez, 2003; Kidd et al., 2000), this study and studies by Cai (2010) and Cai and Kalb (2006)

and Holt (2010) take the health variable in a multi-level form. On the other hand, some studies used health variable in both binary and multi-level form but in a different scale (Stern, 1989). Applying simultaneous equation models, Stern (1989), Cai and Kalb (2006) could not detect strong evidence that the rationalization endogeneity occurs. Further work by Cai (2010), using the Australian Survey data (HILDA), examined the impact of self-assessed health on labour force participation for men and women of working age. Their results support the findings in the literature that health has positive effect on labour force participation. As for the reverse effect, the rationalization endogeneity hypothesis is rejected for men but not rejected for women. Previous studies also show evidence that the relationship between health and participation differs among different age-gender groups (Cai & Kalb, 2006). Previous studies also suggest that, evidence of endogeneity appears to be different in different estimation methods. For example, two-stage and Full Information Maximum Likelihood (FIML) estimation methods may lead to different results in terms of the test of exogeneity hypothesis (Cai & Kalb, 2006).

To deal with the endogeneity issue related to self-assessed health variables, researchers have applied different methods. While some researchers used more accurate health measures (Anderson & Burkhauser, 1984; Parsons, 1982), some others used instrumental variable estimation method. The problem in accounting for endogeneity is the availability of good instruments. There are some comments on the lack of good instruments in addressing the problem in the literature (Strauss & Thomas, 1998).

3. Statistical Model and Estimation Strategy

In this study, health equation and labour force participation equations are estimated simultaneously to account for the endogeneity of health. The model is explained in this section by following Stern (1989), Cai and Kalb (2004, 2006). Health determination is specified in the first equation. This equation determines the true health, not self-reported health.

$$H^{**} = \alpha_1 L^* + X_H \beta_H + \varepsilon_1 \quad (1)$$

Where $H^{**}$is the latent true health which depends on the latent value of labour force participation and set of exogenous variables x_H; ε_1 is a disturbance term. Since the true health is endogenous to labour force participation, latent value of labour force participation enters the equation (1).

Second equation describes the labour force participation,

$$L^* = \alpha_2 H^{**} + X_L \theta_L + \varepsilon_2 \quad (2)$$

Where the latent value of labour force participation L^* depends on by true health H^{**}, and a set of exogenous variables $X_{L;}$ ε_2 is the disturbance term. X_L and X_H may include same variables.

Since the true health is not observed, third equation is described to connect true health with observed self-reported health,

$$H^* = H^{**} + \gamma L^* + \varepsilon_3 \quad (3)$$

Where H^* is the latent measure of self-reported health status, self-reported health depends on latent value of labour force participation which implies the rationalization endogeneity of self-reported health (Cai, 2006, 2010). If the γ has positive sign, people in the labour market tend to exaggerate their health, and people not in the labour market tend to downgrade their health. $\varepsilon_1, \varepsilon_2, \varepsilon_3$ are assumed to be jointly and normally distributed.

Substituting equation (1) into equation (3), gives

$$H^* = \varphi_1 L^* + X_H \beta_H + \varepsilon_H \quad (4)$$

Where $\varphi_1 = \alpha_1 + \gamma$, $\varepsilon_H = \varepsilon_1 + \varepsilon_3$. In the model only φ_1 can be identified; α_1 and γ cannot be estimated separately. In other words, true indignity and justification endogeneity cannot be separated while the total endogeneity can be estimated.

Derived from the equation (3) that $H^{**} = H^* - \gamma L^* - \varepsilon_3$. Replacing this into (2) yields

$$L^* = \varphi_2 H^{**} + X_L \beta_L + \varepsilon_L, \quad (5)$$

Where $\varphi_2 = \alpha_2/(1 + \alpha_2\gamma)$, $\beta_L = \theta_L/(1 + \alpha_2\gamma)$, and $\varepsilon_L = (\varepsilon_2 - \alpha_2\varepsilon_3/(1 + \alpha_2\gamma)$. ε_L and ε_H are correlated through ε_3 , even if ε_1 and ε_2 are independent. But, ε_1 and ε_2 are highly correlated since there may be some unobservable factors affecting both labour force status and health.

As a health variable, multi- level (5 level) self-reported health status is used as given in the Survey. As a labour force status there are two states: participation and non-participation. Labour force participation includes employed and unemployed.

Observed values of the endogenous variables are:

$$H=\begin{cases} 4\,(=very\ good) if\ m_3 < H^* < m_4 = +\infty \\ 3\,(=good)\ if\ m_2 < H^* < m_3 \\ 2\,(=fair) if\ m_1 < H^* < m_2 \\ 1\,(=bad) if\ m_0 < H^* < m_1 \\ 0\,(=very\ bad)\ if\ -\infty =< m_{-1} < H^* \leq m_0 \end{cases} \quad (6)$$

Where (m_o, m_1, m_2, m_3) are unobserved cut-off points, and

$$\begin{cases} 1\,(=in\ labour\ force) \quad if\ L^* > 0 \\ 0\,(=not\ in\ labour\ force)\ if\ L^* \leq 0 \end{cases} \quad (7)$$

Equations (4), (5), (6) and (7) constitute a simultaneous equation system. φ_1, φ_2, β_H and $\beta_L$are coefficient parameters to estimate in equations (4) and (5) and m_o to m_3 in equations (6) and (7).

As observed in the literature, two different methods can be applied to estimate the simultaneous equation system: the two-stage method and the FIML method. We employed the two-stage estimation method in this paper. Two-stage estimation provides consistent but inefficient estimates since the possible correlation between the two error terms in the structural equations is ignored (Cai & Kalb, 2006). The FIML method produces efficient and consistent parameter estimates because it takes the possible correlation between the error terms into consideration. With the two-stage estimation, exogeneity can be only partially tested, because the coefficient on the labour force participation variable is estimated and the correlation coefficient is not taken into account. In spite of these deficiencies the two-stage method is employed in this paper since the FIML method is difficult to apply with standard econometric packages.

To employ two-stage estimation method, reduced forms of equations (4) and (5) are estimated. Reduced forms of considered equations (equations 4 and 5) are,

$$H^* = X\pi_H + \varepsilon_H^* \quad (8)$$

$$L^* = X\pi_L + \varepsilon_L^* \quad (9)$$

Where X is the set of all exogenous variables in X_H and X_l; π_H and π_L are reduced form coefficient parameters and ε_H^* and ε_H^* are error components in reduced forms.

In the first stage, equations (8) and (9) is estimated by applying ordered probit and probit in order. The consistent estimated of π_H and π_L, denoted as $\hat{\pi}_H$ and $\hat{\pi}_L$, can be used to obtain predicted values of latent health and labour force status

$$\widehat{H}^* = X\hat{\pi}_H \quad (10)$$

$$\widehat{L}^* = X\hat{\pi}_L \quad (11)$$

The second stage is to replace L^* and H^* in equations (4) and (5) by $\widehat{H}^*$ and $\widehat{L}^*$ and estimate the ordered and probit again. The standard errors of the second stage parameters need to be adjusted to reflect the fact that $\hat{\pi}_H$ and $\hat{\pi}_H$ are estimated from the first stage. As in the instrumental variable method, whole exogenous variables are considered as instruments for estimation of labour force and health equations individually in the simultaneous system.

4. Data and Variables

This study uses 2013 Income and Living Conditions Turkey Survey, which was conducted by Turkish Statistical Institute (TUIK). Details of this Survey can be reached at the web site of the Turkish Statistical Institution.

Income and Living Conditions Survey contains information on individuals' labour force participation, health status and various demographic characteristics. Standard five-level health status measured by likert-scale (scaled from "very bad" to "very good") question was collected in the personal interviews. Participants of the study were also asked whether they had a long-standing illness or health condition that restricted their daily life and had

lasted six months or more.

Since the relationship between health and labour force participation happens to be different in different age groups the model is separated into four age-gender groups for estimation: younger men (less than 50 years old), younger women (less than 50 years old), older men (aged 50 or over), older (women aged 50 or over). Those who are still students and over retirement age are excluded from the sample. Fifty years of age break is used to see the difference between the young and old age groups in terms of their labour force participation. In the literature, 50 years of age is defined as the beginning of the old working age (Dixon, 2003). Working age population is grouped in three age categories: younger adults (15-29), prime-aged adults (30-49) and older adults (50-64). In this study, younger and prime-aged adults are combined as younger adults. The employment patterns of older workers differ from those of younger workers. Estimating the model separately for younger and older working age groups gives an opportunity to understand the effects of health on labour force participation for older working age individuals. Table 1 shows the relationship between the labour force participation and self-reported health situation by age-gender groups. As it can be seen in Table 1, there is positive relationship between labour force participation and health status. Percentages of men who do not participate in labour market diminish with better health. If individuals have better health, they are more likely to participate in the labour market. Around 83 per cent of men expressing very bad health do not participate in the labour force. In contrast, only 25 per cent of males expressing very good health do not participate in the labour force. While positive link between health and labour force participation exists for both young and old men, for all health levels, old men are more likely not to be in labour force than the young men. Same pattern can be observed for women. On the contrary to developed countries, for all five health levels, women who participate in labour force are less than the ones not in the labour force. Hence, women have lower participation rate in comparison to men for all health levels. Since the number of women in the labour force with very good health (for all age groups) is very low, it would be better to compare the labour status of women with good health with very bad health. For instance, while about 86 per cent of younger women expressing very bad health do not participate in the labour force, 65 per cent of younger women with good health do not participate in the labour force. For four health levels except very bad health level, older women more likely do not participate compared to younger women.

Table 1 also shows that there is a negative relationship between health and age. While around 6 per cent of males aged 15-49 express bad and very bad health, 16 per cent of males aged 50-65 report bad and very bad health. For males, about 7% aged 15-40 report bad and very bad health, while 25% aged 50-60 do so.

The definitions of all variables are provided in Table 2. As it can be seen in the Table 2, while different group of independent variables is included in the labour force and health equation to satisfy the identification condition for simultaneous equation models (Green, 1997; Cameron & Trivedi, 2010; Maddala, 1992), some same standard variables are also included in each equation.

Standard variables from the literature are used in the health equation as explanatory variables. Age variable is included since health gets worse (Kenkel, 1995) with age. Marital status is also included since there is a close relationship between them (Beckett & Elliott, 2002; Wilson & Oswald, 2005). Related literature often suggests positive correlation between health and being married. Variables capturing educational attainment are also included, assuming that education improves health since awareness of health-related knowledge rises with education (Grossman, 1999). Hence, we construct a set of dummy variables, which shows educational attainment.

Some additional objective health indicators are also included in the health equation. Only two indicators were available in the Household Income and Living Condition Survey. One indicator is the presence of long-term health conditions and the other one is the lack of physical activity.

There have been studies that imply the effect of unemployment and employment on health (Pharr, Moonie, & Bungum, 2011; Wilson & Walker, 1993; Jin, Shah, & Svoboda, 1997; Mathers & Schofield, 1998). Therefore, past employment variable (years in employment) is also decided to be included in the model.

Table 1. Labour force status[a] by self-assessed health status

	Very good (4)	Good (3)	Fair (2)	Bad (1)	Very bad (0)
Men					
% In labour force	75.4	81.6	78.1	54.8	17.5
% Not in the labour force	24.6	18.4	21.9	45.2	82.5
Observations	3147	12597	3213	1459	206
Men aged 15-49					
% In labour force	76	85.2	90.1	65	19.2
% Not in the labour force	24	14.8	9.9	35	80.8
Observations	2942	10471	1924	832	125
Men aged 50-64					
% In labour force	67.8	64.1	60.2	58.7	14.8
% Not in the labour force	32.2	35.9	39.8	41.3	85.2
Observations	205	2126	1289	627	81
Women					
% In labour force	31.9	33.9	31.7	25.2	17.5
% Not in the labour force	68.1	66.1	69.3	74.8	82.5
Observations	2629	11826	3989	1891	183
Women aged 15-49					
% In labour force	32.3	34.8	33.9	27.5	14.4
% Not in the labour force	67.7	65.2	66.1	72.5	85.6
Observations	2554	10605	2650	1081	111
Women aged 50-60					
% In labour force	18.7	26.8	27.3	22.1	22.2
% Not in the labour force	81.3	73.2	72.7	77.9	77.8
Observations	75	1221	1339	810	72

Note. [a] In labour force includes employed and unemployed persons.

Creating stressful or unpleasant working environment, employment may make individuals' health worse. On the contrary, employment may have positive effect on individuals' health by making them happier and more self-confident. Unemployment variable is not included in the model since the proportion of life in unemployment (years of unemployment) was not available in the Survey. To control the effects of jobs' quality on health, occupational variables are included in the health equation.

Labour force participation equation includes a few variables, which are not present in health equilibrium. It has been known that presence of children interacted with marital status may affect labour force participation. But the direction of effect is not clear. Another standard variable "*Urban*" is also included in the labour force equation.

Descriptive statistics of data are presented in Table 3. For older men, participation rate is lower than that of younger men. On the other hand, the distance between old and young women is very small. The mean value of self-reported health is higher for young people than for old people for both genders. As expected, old people with dependent children are less than young people for both genders. Young men and women have higher education than older men and women. Men are more probably to have a higher degree than women and women are more probably to drop out of school than elder men. Young men and women are more probably in white-collar job than older men and women while older women are more probably to be in blue-collar job than older men. Older women are more probably to have long-term health problems and lack of physical activity than older men.

Table 2. Variable description

Endogenous variables	
Labour force	1 if in the labour force
Health	Self assessed health status, 0= very bad, 1=bad, 2=fair, 3=good, 4=very good
Variables common in both equations	
Demographic	
Age	Age deviation from a base age[a]
Age squared	Age deviation squared[a]; only included for the younger females and males.
Married	1 if married or de facto

Education	
University	1 If has a associate, undergraduater or graduate degree
Completed 12 years	1 if has completed 12 years of education
Completed less than year 12	1 if the highest education completed is lower than 12
Non-degree	1 if has no education degree completed
Past Employment	Years in employment
Variables only appear in the labour force participation	
Child dependent	1 if has dependent child
Child independent	1 if has independent child
Married*child_dependent	Interaction between married and dependent child[b]
Married*child_independent	Interaction between married and independent child
Urban	1 if lives in urban area
Variables only appear in health equation	
Occupational	
White collar jobs_1	1 if the last or current job as a manager, administrator or professional
White collar jobs_2	1 if the last or current job as a clerical, sales or service worker
Blue collar jobs	1 if the last or current job as a skilled agricultural, fishery workers, crafts and related trades workers, plant and machine operators and assemblers and elementary occupations
Health related	
Health condition	1 if suffers from any chronic (long-standing) illness or condition[b]
Lack of physical activity	1 if lack of physical activity on-going for at least 6 months

Note. [a]Age variable is calculated by taking difference between the real age and 15 for young people and taking the difference between the real age and 50 for older people.

[b] Child dependent variable is used for younger peoples since, few older people have dependent child.

Table 3. Descriptive statistics

	Men 15-49		Women 15-49	
Variable	Mean	Std Dev.	Mean	Std Dev.
Endogenous variables				
Labour force	0.83	0.38	0.34	0.47
Health	2.93	0.75	2.85	0.77
Demographic				
Age	31.25	10.19	31.20	10.04
Married	0.38	0.49	0.29	0.45
Child dependent	0.81	0.39	0.83	0.38
Child independent	0.19	0.39	0.17	0.38
Married*child_dependent	0.27	0.44	0.22	0.42
Married*child_independent	0.11	0.32	0.06	0.24
Urban	0.68	0.47	0.68	0.47
Education				
University	0.13	0.34	0.10	0.30
Completed 12 years	0.23	0.42	0.17	0.37
Completed less than year 12	0.56	0.49	0.54	0.50
No-degree	0.06	0.24	0.20	0.40
Occupational				
White collar jobs_1	0.17	0.37	0.14	0.35
White collar jobs_2	0.24	0.41	0.24	0.43
Blue collar jobs	0.59	0.49	0.61	0.49
Past Employment	8.09	5.06	2.83	4.80
Health related				
Health condition	0.16	0.36	0.20	0.40
Lack of physical activity	0.15	0.35	0.17	0.38
No. of observations	13972		9932	

Table 3. Continued

	Men 50-64		Women 50-60	
Variable	Mean	Std Dev.	Mean	Std Dev.
Endogenous variables				
Labour force	0.59	0.49	0.26	0.44
Health	2.40	0.86	2.12	0.85
Demographic				
Age	56.21	4.19	54.54	3.09
Married	0.01	0.12	0.02	0.14
Child dependent	0.45	0.50	0.38	0.49
Child independent	0.55	0.50	0.62	0.49
Married*child_dependent	0.01	0.05	0.003	0.06
Married*child_independent	0.01	0.11	0.02	0.13
Urban	0.61	0.49	0.61	0.49
Education				
University	0.11	0.31	0.04	0.21
Completed 12 years	0.12	0.33	0.07	0.25
Completed less than year 12	0.65	0.47	0.47	0.50
No-degree	0.12	0.32	0.42	0.49
Occupational				
White collar jobs_1	0.17	0.38	0.09	0.29
White collar jobs_2	0.19	0.39	0.13	0.34
Blue collar jobs	0.63	0.48	0.78	0.41
Past Employment	6.08	5.75	2.11	4.43
Health related				
Health condition	0.46	0.50	0.60	0.48
Lack of physical activity	0.34	0.47	0.47	0.49
No. of observations	4303		2460	

5. Results of Estimation

Estimation results of two stage methods for the age-gender groups are given in Table 4. Even though it has been focused on the relationship between health and labour force status in this study, we also discussed the results of exogenous variables. As presented in Table 4, while some results for other explanatory variables are expected, some are not. Because of missing value issue of some variables, the samples in Table 4 are less than those in Table 1.

For all age-gender groups, estimation results indicate positive and significant effect of health on labour force participation as literature suggests. In other words, if the health gets better, the probability of participation in labour force participation increases. Marginal effect of health on labour force participation cannot be calculated. This is because the model is not linear. Instead, the conditional probabilities of labour market participation by observed health status are predicted and reported in Table 5 holding all variables at their mean values. Results in Table 5 imply that the conditional probabilities increase with observed health status for three age groups except the group for older women. The predicted effect of health is larger for older men than for younger men as indicated in the literature. The predicted effect is larger for older women only conditional of bad, fair and good level of health than for younger women. Bad health condition is likely to reduce productivity for younger and older people but this impact is clearly more significant for older men and young women. The probability of labour force participation is 32% among those with very bad health condition, which is higher than those with bad health condition.

As for the effect of labour force participation on health: for younger man and older women, labour force participation appears to have significantly positive effect on health status. The estimated effect is negative and significant for older women. On the other hand, the estimated impact is positive and insignificant for younger women and older men. The positive and significant impact may point to rationalization endogeneity of health for younger males. The estimated negative and significant impact for older women may suggests that undesirable physical conditions and stress in work environment might eliminate the other positive impacts of labour force participation. The negative sign of the labour force participation variable for older men and women is not

surprising because old people are under less pressure in a society than young people to attribute non-participation to ill-health (Cai & Kalb, 2004, 2006). Insignificant results might be because of the nature of two-stage method. There is lack of variation in the predicted value for the labour force participation variable. Hence, this model causes an insignificant coefficient.

Turning to the labour force participation model, positive sign of age coefficient confirms the findings in the literature for older people. The likelihood of labour force participation decreases with age for old people but increases with age for young people. The age-squared variable is included for young people and it is significant for both young females and young man. For the educational variables, people with no complete school education are excluded as a group. For younger women, all the coefficients of educational categories are significant and have expected signs. The sign of the educational variables are opposite to expectation for younger men and older women but they are all significant. The sign on the variable *university* for older men is positive and significant. Other than university level education, all the other educational variables have opposite sign for older men and women.

It appears that married males are less probably to be in the labour force than single men. However, married women are more probably to be in the labour force in comparison to single women. Actually the variable "spouse in the labour force" would have been in the equation but spouse's labour status data could not be reached from the survey.

Past employment is another important explanatory variable associated with present participation. The sign of this variable is not so clear in the theory. The estimated sign on this variable is positive for all groups indicating that if employment period is longer, person has more experience and demand higher earning. Hence, the person is more likely to be labour force.

Presence of "*dependent child"* variable has the expected sign for younger men and women. Young men with dependent child are more likely to participate in the labour force while women with dependent child are less likely to participate in the labour force. Older men and women are less likely to participate in the labour force when they have independent child. Married men with dependent child are less likely to be in the labour force than single men. Interaction term "*married*child_dependent"* variable has positive sign but is not significant. For all groups, people living in urban areas are less likely to participate than their counterparts living in rural areas.

The reason for estimating health model is just to control for the endogeneity issue. Hence, the estimation results of the health equation are briefly discussed.

For all age-gender groups, specific health condition variables are all significant and have signs as expected in the literature. The age variable is significant and has negative sign for all age-gender groups implying health deterioration with age.

For all age-gender groups, education coefficients have the expected signs. Coefficients are also significant for young groups and older men while the *university degree* variable is not significant for older women.

The marital status variables have the positive sign for young groups and have negative signs for older age groups. The marital status variable is only insignificant for younger women. The coefficient of past employment is positive and significant only for old age people. This may suggest that the person was healthy in the past but present health situation might not be good.

Lastly, all occupation variables have signs as literature suggested. Compared with the first level white collar jobs, second level white collar and blue collar jobs included in the health model are not good for health.

For the exogeneity of self-reported health, the coefficient of the labour force participation variable in the health equation (φ_1) and the correlation between ε_H and $\varepsilon_l(\rho)$ are required to be zero. Two-stage method is not able to estimate the correlation coefficient. Hence, the presence of exogeneity can be derived from the significance of the labour force participation coefficient in the health model.

Looking at the Table 4, coefficient on the labour force participation variable is significant for younger men and older women. In other words, only for younger men and older women the exogeneity hypothesis is rejected.

As indicated before, Stern (1989), Cai and Kalb (2004, 2006) and Cai (2010) used a multi-level measure of health. Applying the two-stage method they could not find the presence of endogeneity. These authors only find the presence of endogeneity in their studies using FIML method. Therefore my results can be comparable with Cai and Kalb (2004, 2006). In terms of the health effect on labour force participation, same findings are observed. When it comes to the health endogeneity issue, this study has different findings from Cai and Kalb. Using the

two-stage method, labour force participation variable was significant in the health model for younger men and older women, indicating exogeneity can be rejected only for these two groups.

Table 4. Two stage coefficient estimates[a]

	Men 15-49		Women 15-49	
Variable	Coefficient	Standard error	Coefficient	Standard error
Labour force participation equation				
Health	0.3469***	0.0215	0.0831***	0.0180
Age	0.1383***	0.0100	0.0323***	0.0080
Age squared	-0.0049***	0.0002	-0.00135***	0.0002
University	-0.2729***	0.1082	0.8636***	0.0602
Completed 12 years	-0.4105***	0.0964	0.1338 ***	0.0500
Completed less than year 12	-0.2297***	0.0888	0.1279	0.0399
Married	-0.3441***	0.0896	0.5744***	0.0681
Past employment	0.0372***	0.0045	0.0521***	0.0021
Child dependent	0.2081***	0.0679	-0.1999***	0.0423
Child independent				
Married*child_independent				
Married*child_dependent	-0.51136***	0.1016	0.0113	0.0862
Urban	-0.1047**	0.0429	-0.4166***	0.0326
Constant	1.5042***	0.1391	-0.1788***	0.0799
Health Equation				
Labour force	0.1956**	0.0906	0.0320	0.0558
Age	-0.0691***	0.0145	-0.0299***	0.0066
Age squared	0.0014***	0.0005	0.0001	0.0002
University	0.5506***	0.0608	0.5764***	0.0672
Completed 12 years	0.4011***	0.0584	0.4392***	0.0493
Completed less than year 12	0.2545***	0.0488	0.3114***	0.0368
Married	0.1437**	0.0629	0.0467	0.0509
Past employment	0.0008	0.0043	0.0016	0.0040
White collar jobs_2	-0.0249	0.0377	-0.0099	0.0461
Blue collar jobs	-0.0768**	0.0358	-0.043503	0.0558
Health condition	-1.0449***	0.0415	-1.1262***	0.0397
Lack of physical activity	-1.1301***	0.0698	-1.0820***	0.0397
Cut1 m_1	-4.1155***	0.1586	-4.5899***	0.1083
Cut2 m_2	-2.7009***	0.1507	-2.9304***	0.0884
Cut3 m_3	-1.5038**	0.1486	-1.5815**	0.0841
Cut4 m_4	0.9103**	0.1481	0.8756	0.0822
Log-likelihood of two-stage LF equation	-2575		-5858	
Log-likelihood of two-stage health equation	-11149		-7906	
No. of observations	13972		9932	

Table 4. Continued

	Men 50-64		Women 50-60	
Variable	Coefficient	Standard error	Coefficient	Standard error
Labour force participation equation				
Health	0.2022 ***	0.0228	0.1817***	0.0343
Age	-0.1139***	0.0059	-0.0560***	0.0097
Age squared				
University	0.1741*	0.0976	-0.2419	0.1305
Completed 12 years	-0.1729*	0.0948	-0.2819**	0.1316
Completed less than year 12	-0.1451**	0.0725	0.0008	0.0660
Married	-0.0160	0.7227	-0.4436	1.6016
Past employment	0.0638***	0.0030	0.0387***	0.0027

Child dependent				
Child independent	-0.2336 ***	0.0446	-0.1558**	0.0597
Married*child_independent	-0.2456	0.7541	0.5869	1.6195
Married*child_dependent				
Urban	-0.5567***	0.0463	-0.5502***	0.0663
Constant	-0.4990 ***	0.1229	-0.4301***	0.1128
Health Equation				
Labour force	-0.0108	0.0668	-0.2558***	0.0949
Age	-0.0209**	0.0094	-0.0377***	0.0099
Age squared				
University	0.6265***	0.0916	0.2463	0.1793
Completed 12 years	0.6984***	0.0793	0.2560**	0.1320
Completed less than year 12	0.4061***	0.0584	0.2191***	0.0525
Married	-0.3390 **	0.2267	-0.3273*	0.1662
Past employment	0.0119***	0.0054	0.0145***	0.0053
White collar jobs_2	-0.0872	0.0666	-0.1337	0.1475
Blue collar jobs	-0.1380**	0.0645	-0.4057***	0.1511
Health condition	-1.0808***	0.0486	-1.0277***	0.0672
Lack of physical activity	-1.0809 ***	0.0489	-1.0055***	0.0598
Cut1 m_1	-3.260286***	0.1474343	-3.7087***	0.2120
Cut2 m_2	-1.773731**	0.1404573	-2.0028***	0.1841
Cut3 m_3	-0.3942005	0.1382805	-0.5673	0.1777
Cut4 m_4	1.962642***	0.1405394	1.7140**	0.1803
Log-likelihood of two-stage LF equation	-2355		-1315	
Log-likelihood of two-stage health equation	-3936		-2394	
No. of observations	4303		2460	

Note. ***Significant at 1%, **5%, *10%.

a, standard errors are bootstrapped with 1000 replications.

Table 5. Predicted conditional probability of LFP

Health Status	**Predicted probability of LFP**
Men 15-49	
Very bad	0.3332
Bad	0.8139
Fair	0.9609
Good	0.9776
Very good	0.9783
Women 15-49	
Very bad	0.4369
Bad	0.4891
Fair	0.5562
Good	0.5909
Very good	0.6109
Men 50-64	
Very bad	0.1783
Bad	0.4299
Fair	0.6254
Good	0.6498
Very good	0.6862
Women 50-60	
Very bad	0.3238
Bad	0.2360
Fair	0.3413
Good	0.4118
Very good	0.2866

6. Conclusion

This study investigated the relationship between health and labour force participation by utilizing data from the Turkish Household Income and Living Condition Survey. Considering possible endogeneity of the self-reported health variable, health equation and labour force participating equation are estimated simultaneously applying a two-stage estimation method. Since the relationship between health and labour force participation happens to be different in different age groups the estimation is carried out respectively for four age-gender groups.

Study results suggest that self-assessed health status positively and significantly affects the labour force participation for all age-gender groups similar to other studies in the literature (Stern, 1989; Cai & Kalb, 2004, 2006, 2010; Chirikos, 1993; Holt, 2010). Also, the conditional probabilities of labour market participation by observed health status are predicted and reported in Table 5 holding all variables at their mean values. Results in Table 5 imply that the conditional probabilities of participation increase with observed health status for three age groups except the group for older women. The predicted effect of health is larger for older men than for younger men as indicated in the literature. Bad health condition is likely to reduce productivity for younger and older people but this impact is clearly more significant for older men and younger women.

As for the rationalization endogeneity of health on labour force participation, the labour force participation variable is significant for younger men and older women but not significant for younger women and older men, in the health equation. For younger men, positive sign of labour force participation variable may suggest the rationalization endogeneity of health to labour force participation (Stern, 1989; Dwyer & Mitchell, 1999; Kreider, 1999; Bound, 1991; Cai & Kalb, 2004, 2006). This finding is different from Cai and Kalb's (2004, 2006) and Stern's (1989) findings. They found that the labour force participation variable is significant for younger men in the health equation but the negative sign is opposite to the rationalization hypothesis in the literature. In this study, results indicate that younger men who do not participate in the labour force may be more likely to overstate their health problems to justify their non-participation. This may be due to high unemployment rates among younger working age population in Turkey. Some people who have done everything they can do to find a job and still remain unemployed give up seeking a job and considered as non-participant in labour force statistically. These people are called discouraged workers. The proportion of youth who are not in education, employment or training is high at 24.6% in 2013 compared with the OECD average of 14.3% in Turkey (OECD, 2014). They might feel more pressure in the society compared to older people. As a result, they may report poor health to justify their non-participation. This may not be the case in developed countries since their unemployment rates are lower compared to developing countries.

The negative sign of the labour force participation coefficient in health equation for older men and women does not suggest endogeneity caused by rationalization. The effects of other factors like bad working environment or work stress may dominate the positive effects of labour force participation. This result might suggest that older people are usually under less pressure in the society than younger people to participate in the labour force. As a result, older people might not attribute their non-participation to their poor-health. Cai and Kalb (2004, 2006) found similar findings in Australia.

Finally, using a two-stage estimation method, based on the significance of the coefficient on the labour force participation variable in health equation, the exogeneity hypothesis is rejected for younger men and older women. This means that health is treated as endogeneous variable in the labour force participation for younger men and older women. In the case of Turkey, the two-stage method produces a significant coefficient for labour force participation variable. This study also brings forth a question of whether similar findings would be found for the other developing countries.

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