Valuing the Effects of Air and Noise Pollution on Health Status in Turkey

Ozdamar, Oznur and Giovanis, Eleftherios

Akdeniz University, Centre for Economic Research on Mediterranean Countries (CERMC) Antalya, Kampus, Turkey, University of Bologna, Department of Economics, Italy, Royal Holloway University of London, Department of Economics, England

November 2014

Valuing the Effects of Air and Noise Pollution on Health Status in Turkey

Oznur Ozdamar[*†]

Eleftherios Giovanis[‡]

Abstract

This study explores the determinants of health status in Turkey. Moreover, this study explores the willingness to pay for reducing the air and noise pollution. The estimates are based on data from the annual Income and Living Conditions Survey (ILCS) in Turkey which took place in period 2006-2012. The effects of air and noise pollution on individuals' health status and whether an individual suffers from chronic illness are estimated and their monetary value is calculated. This is the first study which examines the effects of noise and air pollution in Turkey using a great variety of econometric models as ordered Logit and binary Logit models for cross sectional data. Moreover using a pseudo panel data created based on age and region cohorts various panel data econometric approaches are followed. Regarding the health status the first model is the adapted Probit fixed effects, the "Blow-Up and Cluster" (BUC) and Ferrer-*i*-Carbonell and Frijters (FCF) estimators to account for intercept heterogeneity. The second approach is the Random Effects Generalized Logit Model to account for slope heterogeneity. Finally, two and three stage least squares instrumental variables approaches are followed using wind direction and regional complaint rates on air and noise pollution as instruments. Income and education are the most important determinants of health status. Based on the favoured estimates individuals who reported problems with air and noise pollution are willing to pay for air and noise quality improvement more by 20.00-21.00 Turkish Liras (TL) and 22.80-25.00 TL respectively than the individuals than did not report any complaint. Finally, the MWTP values of air and noise pollution effects on wages, working hours lost, house rents and expenses and moving dwelling are calculated.

Keywords: Air pollution, Environmental valuation, Health Status, Noise, Pseudo-Panel

JEL Codes: I31, Q51, Q53, Q54

---

[*] Akdeniz University, Centre for Economic Research on Mediterranean Countries (CERMC) Antalya, Kampus, Turkey

[†] University of Bologna, Department of Economics, Italy, oznur.ozdamar@unibo.it

[‡] Royal Holloway University of London, Department of Economics, England

1. Introduction

Noise and air pollution and its influence on the environment, health and life quality of human beings has become a major topic in scientific research. Air pollution leads to worst health outcomes and increased death probability (Currie and Neidell, 2005). However, policies to reduce pollution are often hardly fought on the ground of their high financial costs. It is thus crucial to have reliable estimates of the public willingness to pay for a cleaner environment and to analyze the determinants of health status. Noise is another environmental pollutant that is increasing very rapidly as a result of improvement in commercial, industrial and social activities. It is referred to as an undesirable sound which results from the activities of man Increasing noise of airport and motorway traffic in the city centres have become a part of modern life (Okuguchi et al., 2002; Griefahn, 2002). Noise pollution affects the human health physically and psychologically. In the last century, population movement to the greater cities, disorder planned city development and increase of the motor vehicle in the traffic have been produced noise pollution and other environmental problems. The most important factor which affects the noise pollution is the mistakes taken place during the application of the city plans due to different political and social factors.

The purpose of this study is to examine the effects of self reported air and noise pollution and other determinants on self-reported health status and chronic illnesses. The analysis relies on detailed micro-level data, using NUT 1 data from the cross sectional Income and Living Conditions Survey (ILCS) in Turkey during period 2008-2012. Then, the marginal willingness to pay (MWTP) for an improvement on health status and illnesses through reduction on air and noise pollution is calculated.

Turkey covering approximately 780,000 square kilometres and with an 8,000 kilometre coastline extending along the Black Sea, the Sea of Marmara, the Aegean Sea and the Mediterranean Sea, has a unique position connecting Europe and Asia, geographically as well as ecologically. Turkey is the thirty-fourth largest country in the world with an area of 783,562 km^2 and it is situated at the meeting point of the three continents of the old world and stands as a crossroad between Asia and Europe which brings a unique pattern with rich biodiversity and large number of endemic species.

Turkey's economic emergence has brought with it fears of increased environmental degradation. As Turkey's economy experienced high levels of growth in the mid-1990s, the country's boom in industrial production resulted in higher levels of pollution and greater risks to the country's environment. More specifically, smog is a particularly issue in many Turkish cities, especially urban regions. Rising energy consumption and the increase in car ownership have increased air pollution, and as Turkey continues to develop its economy, the problem likely will be exacerbated unless preventive actions are undertaken. Recognizing these issues, the Turkish federal government has taken several measures to reduce pollution from energy sources. In order to meet European Union (EU) environmental standards, Turkey is requiring flue gas desulfurization (FGD) units on all newly commissioned coal power plants and is retrofitting FGD onto older units. However, the International Energy Agency (IEA) has criticized Turkey's efforts to reduce air pollution, saying that Turkey needs to maintain and possibly increase investments in public transport, especially in urban areas, as well as improve the implementation of existing regulations on air quality. Additionally, Turkey needs further efforts to improve the quality of oil products and additional investments in the environmental control system, as well as further promote fuel switching from high-sulphur lignite to natural gas (International Energy Agency, 2010).

According to World Bank (2012) which includes data on pollution in cities around the world, air pollution in Ankara and İstanbul exceeds the maximum acceptable limit set by the World Health Organization (WHO), particularly for Nitrogen dioxides and Sulphur Dioxide. Pollution along with over fishing threatens the industry. Anchovy production, which accounts for around two-thirds of the annual catch, fell by 28 percent in 2012, according to the Turkish Statistical Institute.

Two main techniques of environmental valuation have been used and are classified into revealed preference or contingent valuation method (CVM) and stated preference methods. CVM has been in use as a means of valuating a wide range of environmental goods and services for over 35 years, with over 2000 papers and studies using this method, most of which were from developed countries (Carson, 2000; Whittington, 2002).

The second approach, the stated preference method, includes traditional examples include hedonic price analysis and the travel cost approach. However, both methods have drawbacks. Hedonic price analysis requires the market of interest (typically the housing market) to be in equilibrium at even small geographical level (Frey et al., 2009). In stated preference analysis, the hypothetical nature of the surveys and the lack of financial implications may lead to superficial answers (Kahneman et al., 1999).

Another approach is the Life Satisfaction Approach (LSA). One advantage of this method is that it does not rely on asking people how they value environmental conditions or on equilibrium in the housing market does not require awareness of causal relationships- but simply assumes that pollution leads to change in life satisfaction and health status. However, LSA has weaknesses. There is growing evidence to support the suitability of individual's responses to self reported well-being and health questions for the purpose of estimating non-market values (Frey et al., 2010), but some potential limitations remain. Crucially, self-reported life satisfaction and health status must be regarded as a good proxy for an individual's utility. Furthermore, in order to yield reliable non-market valuation estimates, self-reported health status measures must reflect both stable inner states of respondents and current affects. In addition, self-reported health status must be comparable across groups of individuals under different circumstances. Similar to the hedonic property pricing method another limitation of LSA is that it is possible that people choose where they live. However, in this study LSA is not feasible because the data are only available on region, urban-rural and people's location is not known. More specifically, in order to map and assign the air pollution data on individuals is not possible using this geographical reference. Moreover, weather data are not possible to be considered. Nevertheless, this study serves as a proposal for future survey design in Turkey and other countries, considering high detailed geographical reference for possible future research and precise estimates which can help the policy makers to take measures and apply regulations for air quality improvement.

Moreover, the MWTP calculated in this study may not lead to superficial and strategic answers, because the respondents are only asked whether the individual is severely exposed or not to air and noise pollution, answering *yes* or *no* without asking whether are willing or how much are willing to pay. So there is no question such as how much are you willing to pay in environmental taxes or charges for improving environmental quality. Thus, controlling for various personal, household and demographic characteristics and income the MWTP can be calculated.

There are several key advantages of using these pseudo panel estimates. Firstly using adapted Probit OLS, FCF and BUC estimators it is possible to control for the regional, time invariant characteristics, estimating a latent class ordered probit model we model also for slope heterogeneity. To limit endogeneity issue we limit the population of interest to non-movers, since the decision to move may well be correlated to pollution and noise level. However, also instrumental variables using two stage and three stage least squares are applied as well as instrumental variable ordered probit model estimates are reported.

The paper is organized as follows. Section 2 presents a short literature review. Section 3 describes the theoretical and econometric framework. In section 4 the data and the research sample design are provided. In section 5 the results are reported, while in section 6 the concluding remarks are presented.

2. Literature Review

The association between mortality rate and particulate air pollution has long been studied. Dockery et al. (1993) related excess daily mortality from cancer and cardiopulmonary disease to several air pollutants, especially fine particulate matter $PM_{2.5.}$ Since then, many other epidemiological studies on the adverse effects of air pollutants have been carried out, ranging from variations in physiological functions and subclinical symptoms like heart rate variability and peaк expiratory flow rate to manifest clinical diseases as asthma, stroke, lung cancer, and leukaemia among others, premature births and deaths (Delfino et al., 1998; Naeher et al., 1999; Laden et al., 2000; Janssen et al., 2002; O'Neill et al., 2004; Preutthipan et al., 2004). More specifically, Delfino et al., (1998) report that the emergency rooms were 21.8 per cent higher than the average for a mean increase of 44 O_3 part per billion (ppb), while an increase in $PM_{2.5}$ from coal combustion sources accounted for a 1.1% increase in daily mortality (Laden *et al*., 2000).

Currie and Neidell (2005) using the California Birth Cohort files and the California Ambient Air Quality Data during period 1989-2000 propose an identification strategy using individual level data and exploiting within-zip code-month variation in pollution levels and creating measures of pollution at the zip code-week level and controlling for individual differences between mothers that may be associated with variation in birth outcomes. Their estimates imply that reductions in CO and PM_{10} over the time period they study saved over 1,000 infant lives in California alone.

Chay and Greenstone (2003a) examined the air quality improvements induced by the Clean Air Act Amendments (CAAAs) of 1970 to estimate the impact of particulates pollution on infant mortality during period 1971-1972. Their strategy has some attractive features, as the fact that federally-mandated regulatory pressure is orthogonal to county-level changes in infant mortality rates, except through its impact on air pollution. Therefore, nonattainment status may be a valid instrument. Also the authors use regulation-induced changes that occurred during an economic expansion period 1971-1972; thus, any potential biases due to economic shocks are likely to be mitigated. The federal air pollution regulations are associated with sharp reductions in both total suspended particulates (TSPs) pollution and infant mortality rates in the first year that the 1970 Clean Air Act Amendments were in force. The authors find that a one per cent decline in TSP results in a 0.5 per cent decline in the infant mortality rate. Chay and Greenstone (2003b) used substantial differences in air pollution reductions across sites to estimate the impact of TSPs on infant mortality.

The authors establish that most of the 1980-82 declining in TSPs was attributable to the differential impacts of the 1981-82 recession across counties. The authors find that a one percent reduction in TSPs results in a 0.35 percent decline in the infant mortality rate at the county level. Chay et al. (2003) examined the adult health impact of a one-year reduction in TSPs air pollution induced by the Clean Air Act of 1970. While the authors find that regulatory intensity is associated with large TSPs reductions, it has little systematic association with reductions in either adult or elderly mortality, implying that the regulation-induced reduction in TSPs is not associated with improvements in adult mortality. Cesur et al. (2013) examine its effect on infant mortality. More specifically, they examined the effects of gas infrastructure expansion on infant mortality in Turkey using data from the Turkish Statistical Institute and the Turkish Ministry of Health in period 2001-2006. Cesur et al. (2013) find that one-percentage point increase in the rate of subscriptions to natural gas services would cause the infant mortality rate to decline by 4 percent, which could result in 348 infant lives saved in 2011 alone.

CVM method has been used extensively to obtain values for avoided morbidity; example applications include valuation of respiratory and other symptoms of air pollution exposure (Loehman et al. 1979, Alberini et al. 1997, Alberini and Krupnick 1998, 2000), avoidance of asthma-related illness (Rowe and Chestnut 1985, Dickie and Ulery 2001), and avoidance of angina symptoms (Chestnut et al., 1988).

In Turkey, noise is recognized as a serious public health concerns. This has accounted for why very many studies have been carried out to determine the noise level of major cities in Turkey (Yilmaz and Ozer, 2005; Doygun et al., 2008; Ozyonar and Peker, 2008; Erdogan and Yazgan , 2009; Ozer et al., 2009; Sisman and Unver, 2011). However, the aim of these studies is to determine the levels of noise pollution rather than to give estimates of willingness to pay. Tanrıvermiş (1998) examined the Willingness to Pay (WTP) measures in Turkey using data for Cankaya district in Ankara as it this district represents the socio-economic characteristics of Ankara province. Using surveys from 8,564 households and 2,220 industrial firms. The Willingness to Pay (WTP) questions were related to consumer and producer preferences about environmental taxes and charges. Based on Tanrıvermiş' results neither consumer nor producers are willing to pay for additional taxes or charges for environmental quality improvement because of the inefficient usage of the government's revenues, even their WTP is 3-4 times higher than the current charges. Tekeşin and Shihomi (2014) examined the WTP for mortality risk reduction from four causes -lung cancer, other type of cancer, respiratory disease, traffic accident- are estimated using random parameter logit model with data from choice experiment for three regions in Turkey. The value of statistical life (VSL) estimated for Afsin-Elbistan, Kutahya-Tavsanli, Ankara and the pooled case are found as 0.56, 0.35, 0.46 and 0.49 million Purchasing Power Parity (PPP) adjusted 2012 US dollars (USD).

3. Methodology

3.1 Theoretical Framework

One of the first simple theoretical models examining the effects of air pollution on health has been proposed by Gerking and Stanley (1986). However, we extend the model by including also leisure. The utility function is:

$$U = U(X, L, H) \qquad (1)$$

, where X is a bundle of consumption goods, L is leisure and H is the Health status. Health is produced by the person via the following health production function:

$$H = H(M, E, A) \qquad (2)$$

The inputs to health production include a vector of medical treatment -care M , vector E includes environmental factors as air pollution and noise pollution, while A denotes the averting behaviour, where in the case examined is defined by the residential mobility and the moving status of the respondent. From (2) is derived that $H(H_M>0, H_E<0$ and $H_A>0)$, the term H_E is negative as air pollution has negative effects on health. In this study both general health status and whether the respondent suffers from a chronic illness are examined. For this reason the health production function (2) becomes:

$$H = H(M(I), I(E, A)) \qquad (3)$$

, where (3) shows that medical care M depends on diseases I, while air, noise pollution and avoidance behaviour determine these diseases. The person also faces a budget constraint:

$$w(H)[T - L] + N = P_X X + P_M M \qquad (4)$$

, where w is the wage, N is the non-labour income, T is the total time endowment, P_X and P_M denote the prices for X and M respectively. By combining the two constraints into a full-budget constraint, it is obvious that the cost of health production is the monetary price of health care inputs and the opportunity cost of the time used to produce health. The individual maximizes a utility function subject to a health production function and a full-budget constraint. Also wage is a function of health and labour productivity is increased with health at decreasing rate. The Lagrangian function is as follows:

$$\begin{aligned} &\max\ V = U[H(M,E;\delta),X,L] + \\ &\lambda[w(H)[T-L] + N - P_X X - P_M M] \end{aligned} \tag{5}$$

The first order conditions are:

$$\frac{\partial V}{\partial X} = \partial U / \partial X - \lambda P_X = 0 \tag{6a}$$

$$\frac{\partial V}{\partial L} = \partial U / \partial L - \lambda w = 0 \tag{6b}$$

$$\begin{aligned} &\partial V / \partial A = \partial U / \partial H\big((\partial H / \partial M)(\partial M / \partial I)(\partial I / \partial A) + (\partial H / \partial I)(\partial I / \partial A)\big) \\ &- \lambda\big(P_A + \partial w / \partial H\big((\partial H / \partial M)(\partial M / \partial I)(\partial I / \partial A) + (\partial H / \partial I)(\partial I / \partial A)\big)[T-L]\big) \end{aligned} \tag{6c}$$

$$\partial V / \partial M = (\partial U / \partial H)(\partial H / \partial M) - \lambda[P_M + (\partial U / \partial H)(\partial H / \partial M)[T-L]] \tag{6d}$$

Equations (6a)-(6b) show the trade-off between leisure and labour. Taking the total derivative of (3) it will be:

$$\frac{dH}{dE} = \left(\frac{\partial H}{\partial M}\frac{\partial M}{\partial I} + \frac{\partial H}{\partial I}\right)\left(\frac{\partial I}{\partial E} + \frac{\partial I}{\partial A}\frac{\partial A}{\partial E}\right) \tag{7}$$

Relation (7) shows that pollution depends on two components. The expression in the first parenthesis shows how health diseases are translated in poor health status. The first term *(∂H/∂M)(∂M/∂I)* shows the negative effects of pollution on health and the medical care treatment necessary for it. The second term *(∂H/∂I)* shows the health diseases caused by air pollution, which are untreated or the individuals ignore treatment. The expression in the second parenthesis shows the relationship between air pollution and health status or illness. The first term *(∂I/∂E)* indicates the effects of air pollution on health diseases, while the second term *(∂I/∂A)(∂A/∂E)* show the role of the avoidance behaviour to avert bad health or illness by limiting contact with noise and air pollution. This is captured by considering movers and non-movers sample. This basic model can serve as a guide for policy makers. Denoting the costs of regulation P_R necessary to reduce the negative impacts of pollution should be equal to:

$$\frac{\partial H}{\partial R} P_R = \frac{\partial w}{\partial H}\frac{dH}{dE} + \frac{\partial U}{\partial H}\frac{dH}{\lambda dE} + \frac{\partial M}{\partial E} P_M + \frac{\partial A}{\partial E} P_A \qquad (8)$$

, where the first term on the right hand side of relation (8) reflects the impact of pollution on wage, the second term show the direct disutility from pollution, the third term the medical treatment-care expenditures driven by pollution and the last term expresses the avoidance costs. The second term is estimated through the econometric modeling discussed in the next section. Furthermore, in this study the first term is used to estimate the effects of individuals with poor health on wage. The third term of relation (8) will be used in order to estimate the marginal willingness to pay for improving health illnesses through reduction of pollution. In this case the effect of poor heath on the probability of moving in the next 6 months is estimated.

3.2 Econometric Framework

3.2.1 Ordered Probit Cross- Sectional Data

The first part of this section describes the methodology applied for health status. Self-assessed health status can serve as an empirically valid and adequate approximation of individual welfare, in a way to evaluate directly the public goods. Additionally, by measuring the marginal disutility of a public bad or air pollution in that case, the trade-off ratio between income and the air pollution can be calculated. Therefore, the individual's reported health status levels can be treated as proxy utility data. However this seems to be a very strong assumption and one way of limiting this problem is to use panel data, so that the comparison is within individual over time, making it more likely that it is meaningful. As such cross sectional research is likely to be biased. The following model of health status for individual *i*, in region *j* at time *t* is estimated:

$$HS_{i,j,t} = \beta_0 + \beta_1 e_{j,t} + \beta_2 \log(y_{i,t}) + \beta' z_{i,j,t} + \mu_i + l_j + \theta_t + l_j T + \varepsilon_{i,j,t} \quad (9)$$

$HS_{i,j,t}$ is the health status. $e_{j,t}$ is the self reported environmental variable. More specifically, three self-reported variables are examined. The first variable is *noise pollution* coming from car traffic, trains, airplanes, factories, neighbours and bar-restaurants and discos. The second is the self reported *air pollution* variable which includes, fine dust, ozone, grime and fume. The self reported answers are binary yes and no. $log(y_{i,t})$ denotes the logarithm of household income and z is a vector of household and demographic factors, discussed in the next section. Set μ_i controls for individuals effects, l_j is controls for region, 12 regions particularly presented in the data part, and θ_t is a time-specific vector of indicators for the year, while l_jT is a set of area-specific time trends. Finally, $\varepsilon_{i,j,t}$ expresses the error term which we assume to be *iid*. Standard errors are clustered at the area-specific time trends.

The ordered probit is using a ordinal dependent variable, in the case examined is the self-reported health status coded as very good, good , fair, bad, very bad. Denoting the health status as y^* then the decision rule is:

$$y_i = 1 \; if \; y_i^* \leq u_1 \tag{10a}$$

$$y_i = 2 \; if \; u_1 < y_i^* \leq u_2 \tag{10b}$$

$$y_i = 3 \; if \; u_2 < y_i^* \leq u_3 \tag{10c}$$

$$y_i = 4 \; if \; u_3 < y_i^* \leq u_4 \tag{10d}$$

$$y_i = 5 \; if \; y_i^* > u_4 \tag{10e}$$

The threshold values (u_1, u_2, u_3, u_4) are unknown and the value of the index necessary to push an individual from very good to excellent is unknown. For example assuming a general form of ordered probit model as (11):

$$y_i^* = x_i\beta + \varepsilon_i \tag{11}$$

, where y_i^* is a function of observed and unobserved variables, then the probability $\Pr(y_i=1)$ is:

$$\begin{aligned} \Pr(y_i = 1) &= \Pr(y_i^* \leq u_1 = \Pr(x_i\beta + \varepsilon_i \leq u_1) = \Pr(\varepsilon_i \leq u_1 - x_i\beta) = \\ &= \Phi[u_1 - x_i\beta] = 1 - \Phi[x_i\beta - u_1] \end{aligned} \tag{12}$$

For a marginal change of *e*, the marginal willingness-to-pay (MWTP) can be derived from differentiating (9) and setting dHS=0. This is the income drop that would lead to the same reduction in health status than an increase in pollution.

3.2.2 Pseudo Panel Fixed Effects Models

In the case examined the Income and Living Conditions Survey (ILCS) of Turkey is based on repeated cross-sectional, where a random sample is taken from the population at consecutive points in time as it is described in data section. Several models, discussed in this section, that seemingly require the availability of panel data can also be identified with repeated cross-sections under appropriate conditions. One of the main drawbacks and limitations of using repeated cross-sectional data the same individuals are not followed over time, so that individual histories are not available for inclusion in a model for transforming a model to first-differences. On the other hand, repeated cross-sectional data suffer less from typical panel data problems like attrition and non-response. Furthermore, these problems are often substantially larger, both in number of individuals or households and in the time period that they span. Deaton (1985) suggests the use of cohorts to estimate a fixed effects model from repeated cross-sections. In this approach, individuals sharing some common characteristics (most notably year of birth) are grouped into cohorts, after which the averages within these cohorts are treated as observations in a pseudo panel. Moffitt (1993) and Collado (1997) extended this approach of to nonlinear and dynamic models. Following the procedures by Verbeek (2008) for linear models with fixed individual effects, to dynamic and discrete choice models and aggregating all observations to cohort level, the resulting model (9) can be written as:

$$\overline{H}_{c,j,t} = \overline{a}_{ct} + \beta_1 \overline{e}_{ct} + \beta_2 \log(\overline{y}_{ct}) + \beta' \overline{z}_{ct} + \mu_i + l_j + \theta_t + l_j T + \varepsilon_{c,j,t} \quad (13)$$

Based on the ILCS design the cohort is consisted from same gender, in the same age group and same location area. The resulting data set is a pseudo panel or synthetic panel with repeated observations over T periods and C cohorts. The main problem with estimating beta coefficients from (13) is that $\bar{a}_{ct}$ depends on t, is unobserved, and is likely to be correlated with the other covariates. Therefore, treating $\bar{a}_{ct}$ as part of the random error term is likely to lead to inconsistent estimators. In this case, $\bar{a}_{ct}$ is treated as fixed unknown parameters assuming that variation over time can be ignored and using fixed effects. Model (13) in a panel framework cannot be estimated using ordered logit and probit with fixed effects. In that case various econometric methods are applied in order to estimate equation (13). The first approach is the adapted Probit OLS proposed by van Praag and Ferrer-i-Carbonell (2004) where the dependent ordinal variable is converted in continuous variable assigning z-scores. Van Praag and Ferrer-i-Carbonell (2004; 2006) show both heuristically and in several applications that Probit OLS is virtually identical to the traditional ordered probit analysis. Generally, both OLS and Probit-OLS have been compared with the ordered models and no differences have been found among them (Van Praag and Ferrer-i-Carbonell 2006; Van Praag 2007; Luechinger 2009, 2010; Stevenson and Wolfers 2008). The calculation of the dependent ordinal variable can be stated as:

$$HS = E(Z \mid \mu_1 < Z < \mu_2) = [\phi(\mu_1) - \phi(\mu_2)]/[\Phi(\mu_2) - \Phi(\mu_1)] \quad (14)$$

, where Z is a standard normal random variable, φ is the standard normal probability density function, and Φ is the standard normal cumulative density function.

The second estimator is the FCF developed by developed by Ferrer-*i*-Carbonell and Frijters (2004). This method uses the conditional logit approach combined with an evolved coding of the dependent variable. Then the information of the second derivative of the log likelihood function, the so-called Hessian matrix, per individual is used in order to choose which coding is appropriate for the final conditional logit estimation. More specifically, the procedure consists of the three following steps Ferrer-*i*-Carbonell and Frijters (2004):

Firstly, the ordered scaled dependent variable y_{it} with K categories is split into $K\text{-}1$ new binary coded variables D_{ik} capturing all the possible threshold crossings. The new variable D_{itk} is:

$$D_{itk} = \begin{cases} 1 \ \ if \ \ y_{it} > \min_i \{y_{it}\} \\ 0 \ \ if \ \ y_{it} < \min_i \{y_{it}\} \end{cases}_{i} \tag{15}$$

Therefore for example from (15) the firstly new variable D_{i1} equals one if the original dependent y_{it} is at least one category greater than the minimum of y_{it} for each i, the next newly generated variable D_{i2} equals one if the original dependent variable is at least two categories greater than the minimum of the minimum of y_{it} for each i and so forth. In the second step the conditional log likelihood function is estimated for the first threshold crossing to derive the coefficients β that are used to calculate the Hessian matrix for each individual and for each D_{ik}. The final binary dependent variable is generated by choosing the specific D_{ik} that corresponds to the minimum trace per individual *i*. In the third step the newly generated binary dependent variable which reflects the optimal choice of D_{ik} for all *i* is fed into a conditional logit estimation to obtain the final coefficients.

However, the "Blow-Up and Cluster" (BUC) estimator (Baetschmann et al., 2011) is applied as well, because Baetschmann et al., (2011) provide reasons that, in general, FCF estimator is inconsistent as the way that by choosing the cutoff point based on the outcome, produces a form of endogeneity. In addition, FCF approach uses only individuals who move across the cut-off point resulting in a large loss of data. This large loss of data will lead to measurement errors as they may well become a large source of residual variation (Ferrer-*i*-Carbonell and Frijters, 2004). This is also not appropriate for our analysis because the purpose of this study is to examine and control for various factors affecting health status. Therefore, the BUC estimator is also applied in this study (see Baetschmann et al., 2011 for technical details and working example). More specifically, FCF estimator performs well is the number of observations is large and the number of categories on the ordered scale is small (usually three categories). Nevertheless, in the case examined the self reported health status is consisted from five categories. The BUC method performs similarly well and even outperforms the FCF estimator if the number of categories on the ordered scale is large. However, linear fixed effects model in some cases can deliver essentially the same results as the more elaborate binary recoding schemes, as the results section presents.

The final method applied is to collapse the ordered dependent variable in to a binary and then to apply the conditional fixed effects logit proposed by Chamberlain (1980) followed by Jones and Schurer (2007) and lately by Schmitt (2013). More specifically, the conditional fixed effects logistic regression is used as in the case of

BUC estimator, where the dependent variable has to be collapsed into binary format. The binary variable is:

$$\begin{aligned} I_{ct} &= 0 \; if \;\; HS_{ct} < \overline{HS}_c \\ I_{ct} &= 1 \; if \;\; HS_{ct} \geq \overline{HS}_c \end{aligned} \tag{16}$$

, where

$$\overline{HS}_c = \frac{1}{T}\frac{1}{C}\sum_{t=1}^{T}\sum_{j=1}^{C} HS_c \tag{17}$$

The generated dummy variable $I_{i,t}$ equals one if person i has stated a value of health status at time t which is lower than the individual mean value over the whole period. Therefore, two things should be clarified. As the original health status is coded as excellent for lower values and very poor for high values the same order is kept in this case to be consistent with all the previous and the next econometric models which are followed. Thus, 1 means that a person stated a higher (worse) value of health status than the individual mean. On the contrary, the dummy variable takes 0 if person i has stated a value of health status lower (better) than the individual mean.

Having panel data allows us to identify the model from changes in the pollution level within cohorts rather than between cohorts. This reduces the possible endogeneity bias in the estimates since unobservable characteristics of the region that may be correlated with pollution and health status are eliminated in a fixed effect model. Thus the model is identified from changes in the pollution level within cohorts i.e. between interviews rather than between cohorts. To limit endogeneity issue coming from residential mobility the population of interest is limited to non-movers. Focussing on non-movers also allow us to capture unobservable characteristics of the region that may be correlated with pollution and health status that are fixed over time. Non-mover status is to be preferred, since this indicates whether the individual has moved in comparison with its location at the last wave. The variation in pollution level between interviews is possibly exogenous and driven by differences in the time of the year that the interviews take place, as well as variation in the level of pollution between years due to variations in economic activity.

3.2.3 Two Stage and Three Stages Least Squares and Instrumental Ordered Probit Models

In this section the two stage and three stage least squares approaches are followed. There are two main reasons why an instrument variable approach might be necessary. Firstly, the endogeneity might be an issue coming from reverse causality between self reported air and noise pollution and health status or by omitted variables. Even though, the estimates examine various samples, such as non movers in order to limit endogeneity which also comes from residential mobility, or by using fixed effects to account for omitted variables an instrumental variable approach is followed. Secondly, the endogeneity might arise because of subjective rating thus regional air and noise pollution complaint rate is used as a candidate instrument variable. Moreover, wind direction is used as an additional instrument. It is well known that air and noise pollution are correlated with wind direction; however wind direction might have indirect effects on health status through air and noise pollution.

In parallel with tow stage least squares, three stage least squares are applied too. In the case examined here two equations are estimated separately; one for noise and one for air pollution. Furthermore, regressions including both self reported pollutants are taking place as well; however because both pollutants are correlated it might be difficult to disentangle their effects. Therefore, as a number of equations are to be estimated simultaneously and a problem with endogeneity might be existed, for the reasons mentioned above, a three-stage least square approach will be used. Three-stage least square is a combination of seemingly unrelated regression developed by Zellner (1962) and two-stage regression with instrument variables (Zellner and Theil, 1962). In a multiple equation system, like in the case examined in this study, where the same data set is used, the independent variables differ between the equations, the errors may be correlated between the equations. Three-stage least squares may, therefore, be more efficient than two-stage least squares (Madansky, 1964, Belsley, 1988, and Greene, 2008). In the case where self reported air and noise pollution are endogenous, ordinary least square regression or seemingly unrelated regression may produce spurious results. The instrument variable approach may avoid this bias if the instrument variables are valid (Murray, 2006). The instrument for individual subjective ratings on air and noise pollution problems are constructed by taking the average complaint rates on NUT 1 level finding evidence of a downward bias. In other words, using self-reporting environmental complaint problems imply that the marginal willingness to pay for improvements is underestimated.

Wind direction can be a candidate instrument as it can be correlated with noise and air pollution, while its effects have an indirect impact on health. Wind direction has different effects on rural and urban areas. In urban areas, ambient sound is produced from human sources, such as road traffic creating an urban hum. In rural areas sound can be generated by stationary farms equipment may be considered a noise nuisance if the sound levels are higher than the ambient or surrounding background sound level. High-frequency sounds are potentially more detectable and potentially more annoying than low-frequency sounds. Normally, air temperatures decrease with increasing height above ground. However, under temperature inversions, air temperatures increase with increasing height above ground. These conditions generally occur at night when the wind is calm, the sky is dark and starlit, and daytime heat energy stored in the earth is re-directed back to the atmosphere, leaving behind cold air at the ground. This causes sound waves to bend downward off this upper layer of warm air, so sound waves can be heard at long distances (Aecom, 2011; Ovenden et al. 2011; Fraser and Eng, 2012). It should be noticed that other weather variables, such as wind speed, temperature and humidity are not taken as instruments, because can have direct effect on health status and are examined as additional controls in robustness checks.

3.2.4 Random Effects Latent Class Generalized Ordered Logit Model

Using the conventional fixed or random effects models described in the previous sections, correct for intercept heterogeneity. One step further, is to model for slope heterogeneity. Therefore this approach is asking not only whether “money buys health”, but also “for whom it buys the most health”. The model endogenously divides the observations-in a probabilistic sense- into separate classes, which differ by the parameters-slope and intercept- of the relation between income and health status (Clark et al. 2005). This model assumes that an agent *i* evaluates her health status at time *t*. Let β_{it} denotes her answer, which belonging to ordered set of labels $M = \{m_1, m_2 .. m_M\}$, where *M* denotes the labels for *m=1,2…M*. The ordered logit

(OL) model is usually justified on the basis of an underlying latent variable, *HS*, in our case, which is a linear in unknown parameters, function of a vector of observed characteristics *z*, and its relationship to certain boundary parameters, μ. We can therefore write for simplicity the model:

$$HS_{ct}^{*} = a_{ct} + \beta_{ct}\log(y_{ct}) + \varepsilon_{ct} \tag{18}$$

The Generalized Ordered Logit can be written as

$$P(HS_c > M = g(X\beta_m) = \frac{\exp(a_m + X_c\beta_m)}{1 + \{\exp(a_m + X_c\beta_m)\}},\ m = 1,2,......M - 1 \tag{19}$$

, where M is the number of categories of the ordinal dependent variable. Formally, a latent variable k^* is defined, which determines latent class membership. This is assumed to be a function of a vector of observed characteristics *x*; with unknown weights β and a random disturbance term ε as:

$$k^* = x'\beta + \varepsilon \tag{20}$$

From (19), it can be determined that the probabilities that *HS* will take on each of the values 1, ...,*J* are equal to:

$$\begin{aligned} &P(HS_c = 1) = 1 - g(X_c\beta_m) \\ &P(HS_c = m) = g(X_c\beta_{m-1}) - g(X_c\beta_m),\ \ m = 2,....M - 1 \\ &P(HS_c = M) = g(X_c\beta_{m-1}) \end{aligned} \tag{21}$$

In this context the estimated parameters of relation (18) are individual and potentially time-varying parameters. Therefore, in this general model heterogeneity is twofold; firstly because the "marginal utility" of income and the baseline-intercept-level of health status are individual-specific, and secondly because individuals may use different labels to express the same level of health status. The second heterogeneity may reflect variations in attitudes towards pleasure, happiness, health and pain.

3.2.5 Binary Logit Model Cross-Sectional and Pseudo-Panel Data

Typically, three main binary choice models have been employed in literature the Linear Probability Model (LPM) and the nonlinear models Probit and Logit. The two main problems with the LPM were: nonsense predictions are possible -there is nothing to bind the value of Y to the (0,1) range- and linearity does not make much sense conceptually. To address these problems we use nonlinear binary response model. For both cross and pseudo panel data Logit model is used. Because Probit Model does not allow fixed effects for panel data analysis we use only Logit model. In this case model (9) remains the same with the difference that we have a binary dependent variable indicating whether the respondent suffers from any chronic disease. The illness is not specific; however the question includes respiratory diseases, such as asthma, emphysema, bronchitis and other diseases as diabetes, hypertension, renal failure and rheumatic diseases.

4. Data

Income and Living Conditions is a cross-sectional survey which started since 2006 and the last survey took place in 2012 and the respondents are aged 15 and older. All settlements within the borders of the Republic of Turkey have been included. These settlements have been stratified into 2 levels in view of the urban – rural area definition made by the State Planning Organisation, where settlements with a population of 20,001 and over are defined as urban, while settlements with a population of 20,000 and less are defined as rural. For the purposes of the study which used a two-staged sampling design; entire Turkey has been divided into blocks which covered 100 households each. At the first stage, blocks were selected as the first stage sampling unit, while at the second stage households were selected from among the previously selected blocks as the final sampling unit. The annual sampling size is 13,414 households in respect of the estimation, objectives and targeted variables of the study. The survey also includes regions, which are coded according to the Nomenclature of Territorial Units for Statistics (NUTS) as NUTS level 1 classification and are: TR1-Istanbul, TR2-West Marmara, TR3-Aegean, TR4- East Marmara, TR5-West Anatolia, TR6- Mediterranean, TR7-Central Anatolia, TR8-West Black Sea, TR9-East Black Sea, TRA-North-east Anatolia, TRB-Central east Anatolia, TRC- Southeast Anatolia (Turkish Statistical Institute, 2013).

Based on the literature the demographic and household variables of interest are household income[4], gender, age, household type, job status, industry code of the job occupation, house tenure, marital status, education level, type of the fuel mostly used in the dwelling for heating, piped water system in the dwelling, indoor toilet, house size and NUTS 1 regions. The principal health outcome is self-assessed health (SAH) defined by a response to the question "What is your general health status; very good/good/fair/bad/very bad?". The second dependent variable used is a binary variable yes or no answering on whether the individuals suffer from chronic (long-

[4] The analysis was also conducted using individual level income; however this is affected by labour force participation which we do not explicitly model here.

standing) illness or condition. In robustness checks separate regressions for, quadratic term specification on income, urban and rural areas, age groups and sex are estimated.

In table 1 the summary statistics for four different samples are reported. The average household income is around 21,300 Turkish Liras for the total sample, while the average is slightly higher for movers. The self reported responses for air and noise pollution complaints are similar among all samples where the 25 and 17 per cent claim that there are problems about air and noise pollution respectively, while the 75 and 82 per cent declares no problems.

The 25 per cent of the sample reports that it suffers from a chronic illness, while the rest 85 per cent declares no. The statistics show that almost all the households in the sample have available piped water in the dwelling at 96 per cent. Regarding the self reported health status table 1 show that 11.88 and 52.73 per cent report very good and good health respectively, the 20.74 reports fair health status, while 12.81 and 2.04 per cent report respectively bad and very bad health status. Non movers sample report a slightly higher proportion of bad health at 13.17 per cent, while the movers for environmental or other reasons, presented in panels C and D, report slightly higher proportions of very good and good health, as well as, lower proportions of bad and very bad health.

In table 2 the correlation matrix between household income, self reported air and noise pollution problems, the dummy whether an individual suffers from a chronic disease and the self reported ordered health status variable is presented. From table 2 the correlation between household income and health status is negative indicating that the higher income is associated with better health status, given that health status is very good for 1 and very bad for 5. Similarly, the association between income and suffering from a chronic disease is negative. Noise and air pollution are associated positively with poor health status and the probability that an individual will report that he/she suffers from chronic disease. Chronic disease self-report is positively correlated with poor health status, while income is positively associated with air and noise pollution, probably indicating that individuals with higher income are located in more polluted areas as urban areas.

In addition, the correlation between temperature and health status is -0.0151, while between temperature and chronic illness is -0.0116. Similarly the correlation of wind speed with health status and chronic illness is 0.0037 and 0.0034 respectively, while the respective values for humidity are 0.0072 and 0.0025. These results are reported as an additional regression using weather data for non movers sample takes place.

5. Empirical Results

In this section the estimation results are presented and discussed. Equation (13) is estimated separately for each pollutant in order to disentangle their effects. In table 3 the pooled adapted Probit-OLS results are reported, while in table 4 the fixed effects adapted Probit-OLS estimates are presented. It should be noticed that a negative sign is associated with better health outcome levels, as the self reported health status variable is defined as 1 for very good health and 5 for very bad health status. The sign of the coefficients are the same in both estimates; however the magnitude is different, indicating the bias of the pooled OLS estimates. The self reported air and noise complaint present the expected positive signs, while income's coefficient sign is negative respectively. Therefore a rise in air pollution increases the probability of health status deterioration occurrence. In tables 3 and 4 the estimates are provided for fours samples; the total sample; the non-movers sample; the movers for environmental reasons movers and the movers for other reasons sample.

Age has a negative impact on health status as it was expected. This implies that a higher occurrence of health problems is more possible in old age indicating that health status becomes more important with age. People generally encounter deterioration in health with old age; however this does not imply that the decline in health with age is experienced at the same rate by individuals neither implies that it is homogenous for all people. Moreover, not all the people are willing to pay the same amount for an improvement on health status. Nevertheless, the results regarding slope heterogeneity are reported in a later part of this section.

Income has a negative sign indicating that the higher income is associated with higher-better levels of health outcome. Richer, better-educated people live longer than poorer, who are usually less-educated people. In addition to providing means for purchasing health care, higher incomes can provide better nutrition, housing, schooling, and recreation. Independent of actual income levels, the distribution of income within countries and states has been linked to rates of mortality. Although controversial, one explanation is that underinvestment in public goods and welfare and the experience of inequality are both greater in more stratified societies and that these, in turn, affect health (Deaton, 2001; 2002).

The role of educational qualifications of health status is key determinants of health and living standards. Moreover, in adult life an individual’s living standards and health are determined partly by their life-course experience up to that point and partly by the social roles — in terms of marital status, employment and parenthood status, household type- and less by other household characteristics as fuel type used, pipe water infrastructure, while house tenure has no significant effects. Therefore, those who are single report lower levels of health status followed by separated and divorced individuals. Those who are widowed present the lowest health outcome levels amongst the other categories of marital status. Regarding education level, the reference category is the illiterate individuals. It becomes clear that higher education levels are associated with higher levels of health outcome. For example individuals who have completed the primary school are report a better health outcome by 0.301, while those who have completed high school and higher education are healthier by 0.449 and 0.518 respectively. Similarly, job status is an important determinant of health status. The reference category is the full-time employees. Thus, a positive sign for the part-time employees, unemployed and retired individuals indicates a lower level of health status for these categories than for people who are full-time employed. Especially, the retired and widowed people present the lowest levels of health status, reflecting their old age which implies additional health problems. More specifically, more than 40 per cent of the widowed individuals are older than 55 years old. In tables 3-4 the results for occupation codes are reported. More specifically, there is no difference on health status between individuals who are professionals and the reference category which is managers. However, skilled workers employed in agricultural and forestry industry present lower levels of health outcomes followed by clerical support workers. The house size contributes positively on health. Regarding household type the results are mixed. Another possible factor could be used in this case is the household size, or number of children. However, the former factor allows us to examined more detailed the effects and structure of a household, rather than taking only the size. More specifically, from tables 3-4 it becomes clear that a couple with no dependent children and younger than 65 year old are healthier than a household which is consisted only by a single person. Similarly a household, which is consisted by two adults with one or two dependent children, present higher levels of health status than single individuals. These findings are also captured by the marital status. On the other hand, a household, which is consisted by two adults with no dependent children, but at least one of them is older than 65 years old, are less healthy than single persons, which reflects the old age of those persons, as in the case of widowed and retired people. The literature provides evidence that family support and size can be protective and beneficial to people with a chronic illness (Aldwin and Greenberger, 1987; Doornbos, 2001). Therefore, household type and support can be a proxy for home health care indicating that home health care substitutes for medical care obtained on the market and improves people's health leaving on families with big size than people who do not.

Many economists have attributed these correlations to the effects of education, arguing that more educated people are better able to understand and use health information, and are better placed to benefit from the healthcare system. Moreover, economists found negative correlation between socio-economic status characteristics and health status, such as smoking and obesity. However, the latter is not analysed in this study as such information is not available in ILCS. Similarly, epidemiologists argue that the economists' explanations at best can explain only a small part of the gradient; they argue that socioeconomic status is a fundamental cause of health. They frequently endorse measures to improve health through manipulating socioeconomic status by improving education but also by redistributing income (Deaton, 2001; 2002; Fiscella and Franks, 1997; 2000). In addition, low-SES persons also experience greater residential crowding and noise. Crowding within the home appears to be more problematic for health than is area density. Noise exposure has been linked to poorer long-term memory and reading deficits and to higher levels of overnight urinary catecholomines among children and to hypertension among adults (Evans and Lepore, 1992; Evans, 1997; Evans and Saegert, 2000).

Generally, the results overall show that education is perhaps the most basic socio-economic status (SES) component since it shapes future occupational opportunities and earning potential. It also provides knowledge and life skills that allow better-educated persons to gain more ready access to information and resources to promote health. The general findings so far are consistent with other studies (Benzeval et al. 2000; Prus 2001; Robert and Li 2001; Deaton, 2001; 2002; Beckett and Elliott 2002; Bostean, 2010).

The rest of the factors have small or insignificant effects on health. More specifically, house tenure is insignificant, with the exception the movers for other reasons sample where the tenants have lower health level than the owners. This reflects two things; the owners are either individuals with higher income or are supported by the household. The rest of the determinants examined is the indoor flushing toilet and piped water in the dwelling and the type of fuel used for healing. This is the first study which explores these factors, which based on the estimate are important determinants of health status. Tables 3-4 show that whether there is indoor flushing toilet for sole use of the household or shared has no different impact on health; however, the individuals who answered that there is no indoor flushing toilet and no piped water in the dwelling have lower health status levels. Finally, the type of fuel used for heating in the dwelling is important for the health status. More specifically, either using wood or coal has no difference on health; however using natural gas, fuel-oil and electricity has more positive effects on individuals' health status than coal or wood. In addition, when dried cow dung is used as fuel for heating has significant negative effects on heath status.

Based on tables 3-4 the MWTP for air and noise pollution is calculated. However, the MWTP values for fixed effects model in table 4 are presented. Respondents who reported that there is problem with air pollution are willing to pay more for air quality improvement than the respondents who answered no problems by 19.67 TL for total sample, 18.58 TL for the non-movers sample, 32.54 TL for the movers for environmental reasons movers and 22.82 TL concerning the movers for other reasons sample. The respective values for noise pollution reduction is 21.29 TL for total sample, 21.38 TL for the non-movers sample, 29.54 TL for the movers for environmental reasons movers and 20.77 TL based on columns (5)-(8) of table 4. Therefore, individuals who moved because of environmental or other reasons evaluate more the air pollution than noise, while the MWTP values for non movers sample are similar with those derived using the total sample. This can be explained by the fact that 76 per cent of the survey is non movers.

The next tables 5-13 present different econometric models for the health status and the analysis is restricted to non movers in order to limit possibly endogeneity. In table 5 the pooled ordered Logit and IV Ordered Probit models are reported. Regarding the pooled ordered Logit model the sign of the coefficients is the same with the fixed effects estimated coefficients; however the MWTP values are lower in the case, which may indicate the biases using pooled estimates. On the other hand, the pooled ordered Probit IV approach presents similar MWTP values with those in table 4.

In tables 6-7 the estimates using panel ordered Logit, FCF, BUC and Chamberlain estimators are reported. The results confirm the findings described previously for the table 4 and the adapted Probit fixed effects estimates. The coefficients have the same sign, while the magnitude is higher as these methods use the Logit approach where the coefficients are roughly 4 times higher than the coefficients derived from the linear regression. Moreover, the MWTP in tables 6-7 are very similar with those in table 4 discussed previously.

In tables 8-9 the results for the two and three stage least squares respectively are reported. The sign and the impact of the various determinants on health is similar with the previous results confirming the estimates and the importance of each factor on health. However, the MWTP values in tables 9-10 are higher. More specifically, regarding the two stage least squares estimates the MWTP values for air and noise pollution are 23.00 TL and 27.67 TL, while in the case of the adapted Probit fixed effects in table 4 and column (9) the respective MWTP values are 17.63 TL and 18.17 TL. This indicates that the estimates of the fixed effects model in table 4 are biased downward and the MWTP is underestimated. Similarly, the MWTP values derived from the three stage least squares and presented in table 10 are higher and equal at 20.13 TL and 24.24 TL, when instruments are used. In addition, when the self reported air and noise pollution problems are considered as exogenous are still higher than the fixed effects model and the individuals are willing to pay more by 19.21 TL and 12.66 TL than the individuals who do not report any complain or problem with air and noise pollution. However, the MWTP values, using three stage least squares, are slightly lower than those calculated based on the two stage least squares. Nevertheless, as it has been discussed in the methodology section, the former approach can be more robust for two reasons. Firstly, it is not precise to calculate MWTP and to disentangle the effects of air and noise pollution when both self reported complains about environment are used in the regression. Secondly, there is a strong possibility that the error term between the two equations, one for each pollution question, is correlated therefore the three stage least squares method is more appropriate in this case. Generally, in rural areas the air and noise pollution has significant effects too. Although rural areas are generally quiet, farmers live in a competitive world, and modern farms sometimes have to use noisy stationary equipment. Some neighbours might not like the noise that produce (Aecom, 2011; Ovenden et al. 2011). Also one major source of noise is traffic which comes especially from freeways. As noise is dependent on wind speed and wind direction in order to reduce noise exposure, one possible action that is often considered is the construction of a noise barrier next to the freeway.

In table 10 the dynamic Generalized Methods of Moments (GMM) system estimates are reported as an additional robustness check. The MWTP values are similar; however when both air and noise pollution problems are included in the regressions GMM results are very similar with those found using three stage least squares indicating that dynamic GMM modeling is more appropriate than static adapted Probit fixed effects or other estimators examined in this study. Moreover, GMM is useful as the parameter of the lagged dependent variable indicates the extent to which an individual changes his or her adaptation level and adapts to living conditions represented by the stimulus level in the preceding period. More, specifically, the coefficient of the one lagged health status in table 3 ranges between 0.1468-0.1471. Therefore, the adaptation level at present is a weighted average where living conditions in the previous period are weighted at approximately 14 per cent, while the previous adaptation level is weighted at 86 per cent. Therefore, the individual's expectations about health status at the present level are shaped significantly by the living conditions in the previous period.

In table 11 the random effects latent class ordered Logit regressions. Using conventional fixed or random effects corrects for intercept heterogeneity. However, latent class models allow the parameters of the unobserved (latent) individual utility function to differ across individuals i.e. slope heterogeneity (Tinbergen, 1991; Clark et al., 2005). Based on the results of table 11 it becomes clear that both air and noise pollution have significant negative effects on health status in all classes. The latent class models allow for slope heterogeneity; therefore it is possible to examine for differences of air and noise pollution and income effects on health. Thus different MWTP are assigned in each class. The classes are: class 2 (good health), class 3 (fair health), class 4 (bad health), class 5 (very bad health) and the reference category is class 1 (very good health). Therefore, as it was expected the less healthy individuals pay more, than the individuals in class 1 for air and noise pollution reduction, ranging between 6.63-13.44 TL and 10.12-15.88. However, it should be noticed that the MWTP in each case is calculated based on income in every class. Thus, the individuals belonging in the lower health status classes 4-5 are willing to pay less than the rest of the classes because their income is lower even if the MWTP is higher as a percentage of their income.

Age is not homogenous in health status groups as it becomes more important factor for those with fair and bad self reported health status. The education level remains the stronger SES determinant of health for all classes. However, the education level has significantly higher positive effects on health for the least healthy individuals in classes 4-5. The job and marital status remain very important factors for the health status in all classes. Nevertheless, being part-time employed, unemployed, and retired the health status is less than individuals who are full-time employed and the effects are increased with the individuals' health status deterioration. Based on the results of table 11 widowed and divorced respondents are more likely to report a lower health status than the married people, but it is insignificant for class 5.

Similarly, living as a single implies a lower level in health status than people who are married.

Household type is an important determinant for health in all classes. Especially, in poor health status classes the structure and size of household has significant positive effects on health, where adults with one or more dependent children present higher levels of health outcome than single persons. Finally, the fuel type for heating has similar effects with those discussed previously, while the non availability of piped water in the dwelling is only significant in classes 4-5, reflecting that the individuals in those classes have low income.

In table 12 some additional robustness checks for gender, age groups, rural-urban areas and quadratic specification on income are reported. In panel A and urban areas the respondents who reported problems with air and noise pollution are willing to pay more by 21.59 TL and 25.88 TL respectively than the respondents who did not report complaint about air and noise pollution. The respective MWTP values for the rural areas are 14.56 TL and 17.34 TL. In panel B the results show that men are willing to pay more for the air quality improvement than women, while women are willing to pay more for noise pollution reduction. In panels C and D the results show that the young aged people in the age group 15-24 are willing to pay more for air and noise quality improvement, than the rest age groups, followed by the age group 45-54 and 65 and older. However, as previously, MWTP is calculated based on the different average income in each age group, where people 65 years old or older are willing to pay more as a percentage of their income than the age group 45-54. Nevertheless, the results show two things: Firstly, the young people care more about the environment, which is reflected by their higher education level. Secondly, the older age groups are willing to pay more because individuals in those age groups are older and less healthy. Finally, in panel D income in both linear and quadratic terms is significant and an inverted U-shaped curve is presented. This indicates that income up to some point has negative effects on health. In other words, as the income is increase up to some point health is not improved. However, after a specific point health starts to be improved. The necessary point in the case examined ranges between 14,764-14,328 TL.

In table 13 the estimates from the adapted Probit Fixed Effects model controlling additional for weather variables are reported. The estimated coefficients present the expected signs and are significant. The effects of wind speed and humidity on health status are negative, while average temperature has positive impact on health. On the one hand, wind speed cleans or moves the air pollutants away, while on the other hand wind speed implies lower temperature levels, as well as, it transfers faster and in higher frequencies noise and sound waves. Humidity, through fog and rain has negative impact on health status which might come from the fact that chemical compounds and air pollutants are contained in humidity. Furthermore, high temperature is associated with higher levels of pollution and noise; however data on maximum temperature were not available. Nevertheless the average temperature contributes positively on health status, which implies better environmental and weather conditions for individuals, including sun days and mild climate.

The next step is to present the results for chronic illnesses. More specifically, the results regarding the effects of income and air-noise pollution on chronic illness probability occurrence are reported in table 14. In panel A the estimates using a pooled binary Logit model are reported, while in panel B the fixed effects Logit results are presented for the four samples mentioned previously. The MWTP values in panel A range between 16.00-18.00 TL, while the MWTP for noise pollution reduction is 13.74 in the movers for other reasons sample in column (4). However, in panel B the MWTP values are significantly higher, almost doubled, than in panel A, showing the biases derived by pooled estimates. Moreover, the estimates using an instrumental binary Probit model with random effects, using the regional complaint rates and wind direction as instruments, took place where the MWTP values are similar with those derived from fixed effects Logit data. The coefficients for the rest of the health status determinants are not reported as the concluding remarks are similar with those derived previously for the health status. However, what it is important is the MWTP values; where in case of the individuals who suffer from specific chronic diseases are significantly higher.

Finally, in tables 15-16 additional estimates are reported in order to calculate the first, third and fourth term of equation (8) which are necessary to calculate the total cost of regulation. The estimates in panels A and B can be used as costs for avoidance behaviour and to calculate the last term of equation (8) which is $(\partial A/\partial E)(P_A)$. More specifically, the estimates in panel A of table 15 show the effect of poor health status and chronic diseases on working hours lost. Individuals with poor health status on average work less by 1.3 and 1.5 hours than people with good health status for the total and non movers sample. In addition, higher household income is associated with lower hours of work. Similarly, the individuals who suffer from chronic illness are working less by 1.3 hours than people who do not suffer. However, this does not imply that working hours lost is associated with avoidance behaviour. Nevertheless, one assumption is that individuals with poor health status might avoid attending work in order to avoid high outdoor pollution level. At the same time the estimates in panel A can be used in order calculate the third term $(\partial M/\partial E)(P_M)$, where the assumption of visiting a practitioner or hospital can be examined. In that case the P_M can be considered as zero because the hospital services in Turkey are free, if the exclusion of private services is assumed, which is not the main scope of the study but these calculation are suggested for future research. However, the assumption of 3 hours replacing P_M is taken here as an example, which included the transportation time and list queuing time for visiting a practitioner. Therefore, the third term is equal 3.9 and 4.5 less working hours for individuals with poor health status relatively to those with good health status. In panel B the estimates of the effects of poor health status and chronic illness effects on the probability of moving the next 6 months are presented. More specifically, the dependent variable is whether the individual will move during the next 6 months which is available from the survey. In that case using these estimates in panel B and the estimated effects of air and noise pollution from table 4 the term representing avoidance behaviour $(\partial A/\partial E)(P_A)$ is equal at 0.0071 and 0.0075 for air and noise pollution respectively and non movers. The respective values for chronic diseases are 0.0054 and 0.0048. However, in this case P_A is considered as zero. In table 16 the effects of air and noise pollution on house rents and housing maintenance expenses are present. The results show that air and noise pollution are negatively associated with housing rent, while a positive relationship between pollution and housing maintenance expenses is observed in panel B of table 16. These findings are consistent with other studies (Harrison and Rubinfeld, 1978; Murdoch, and Thayer, 1988; Chau et al., 2003; Chay and Greenstone, 2005). Therefore, there is a trade –off on moving from one location to another. Firstly, is the household will move the expenses related to housing caused by pollution will be reduced. On the other hand, the house rent will be increased as a cleaner area is associated with more expensive houses. Therefore, P_A can be calculated using the difference of the two above-mentioned parameters. Using the estimates from tables 16 and 4 and regarding air pollution, non movers sample and health status, the difference is 0.0502 gained from housing expenses minus 0.0361 from the increase in house rent. However, the estimates should consider more precise the housing expenses and rent depending on the location. Moreover, the regression control for the same characteristics as the previous estimates, including additional factors, such as the number of rooms, the age of the house and other detailed dwelling specific characteristics. However, this is out of the scope of this study; thus the results are not presented.

Finally, the first term of equation (8) $(\partial w/\partial H)(dH/dE)$ using the estimates from table 15 and panel C, as well as the estimates from table 4 and column (9) , can be calculated. The term $(\partial w/\partial H)(dH/dE)$ it is equal at 0.0125 and 0.0139 for air and noise pollution respectively and non movers with poor health status. Similarly, for the individuals who suffer from chronic diseases the cost is 0.0092 and 0.0102 for air and noise respectively. Using the three stage least squares estimates from table 9 and column (2) -which are 0.1237 and 0.1489 for air and noise pollution respectively- $(\partial w/\partial H)(dH/dE)$ is equal at 0.0147 and 0.0177 for air and noise pollution respectively, while the respective values for individual who suffer from chronic illness are 0.0108 and 0.0131.

This study is based on a cost-benefit analysis suing MWTP; however, the estimates show the individuals who self-reported air and noise pollution problem by how much more are willing to pay than the individuals with no complaints rather than how much exactly are willing to pay. Therefore, the exact levels of air emissions and noise pollution should be considered. Overall, the results suggest that one of the main policies in Turkey should be education reconstruction, health promotion and income distribution focusing on SES disparities elimination and reducing income inequalities on health. Furthermore, a broad approach to the multiple determinants of SES disparities in health should be reduced or not eliminated. Therefore a new approach is needed in policy circles that would reconsider the benefit side of cost-benefit analysis. Traditionally, these calibrations emphasize economic efficiency or possibly social justice, but they often leave out the health-promoting, and potentially cost-saving, prospects of policies that improve education or equalize resources. Finally, the results confirm the proposal by International Energy Agency (2010), which suggests that Turkey should promote fuel switching from high-sulphur lignite and coal to natural gas.

However, there are some drawbacks in this study. Firstly, the econometric methods applied as well as the relationship between health, pollution and other socioeconomic and demographic factors, seemingly require the availability of panel data. Therefore, one major limitation of using repeated cross-sectional data is that the same individuals are not followed over time. Nevertheless, repeated cross-sectional data suffer less from typical panel data problems like attrition and non-response. Furthermore, these problems are often substantially larger, both in number of individuals or households.

Moreover, there is additional information on whether the individuals or household have changed address or moved location during the last five years limiting the endogeneity problem and examining different samples based on their moving status and reason. Finally, another drawback is that an individual may have "unobservable" characteristics that are genetic or inherited at birth which may influence a range of outcomes. If these effects are not taken into account, then the observed association between income and other characteristics and health might not reflect the true relationship. However, it is generally very difficult to find appropriate measures to act as proxies for such characteristics including this survey.

6. Conclusions

This study has used a set of repeated cross sectional and pseudo panel micro-data on self-reported health status, chronic illness and air-noise pollution from the Income and Living Conditions Survey in Turkey. Various econometric approaches have been applied for robustness checks. The results showed that the MWTP for the individual who report a problem on air and noise pollution is higher by 22-25 TL than the individuals who did not report. In addition, most of the determinants examined in this study have significant effects on health status, with education to be the most important one followed by job status, marital status, house size and household type. House tenure shows no significant effects on health, while this study examines additional determinants than other studies, such as piped water, indoor flushing toilet and type of fuel for heating effects on health. Moreover, various cases have been examined in, as the urban versus rural areas, gender and age groups. Finally, the costs effects of air and noise pollution on wage, working hours lost because of illness, avoidance behaviour, considering the effects on house rents and maintenance expenses, through pollution are examined.

Acknowledgements

This research has been funded under the Scientific and Technological Research Council of Turkey (TUBITAK) Scientist Support Directorate (BİDEB) - Postdoctoral Research Grants Funding Scheme 2219.

We would like to thank University of Bologna, Department of Economics being the host institution. Special thanks to Professor Daniele Fabbri, Professor Chiara Monfardini and the head of the Department of Economics Luca Lambertini for their support making possible the accomplishment of the project.

This work was based on data from the Income and Living Conditions Survey (ILCS) cross-sectional during period 2006-2012 provided by the Turkish Statistical Institute (TURKSTAT). Special thanks to Oğuzhan Türkoğlu in the Dissemination and Communication Department Dissemination Group in TURKSTAT for providing us the survey data. The data are the copyright of TURKSTAT. The use of the data in this work does not imply the endorsement of TURKSTAT in relation to the interpretation or analysis of the data.

References

Aecom, 2011. Wind Farm Noise Statutory Nuisance Complaint Methodology. Report Prepared for Defra: Contract No. NANR 277

Alberini, A., Cropper, M., Fu, T., Krupnick, A., Liu, J., Shaw, D., Harrington, W. 1997. Valuing health effects of air pollution in developing countries: The case of Taiwan, J. Environmental Economics and Management 34, 107-126.

Alberini, A., Krupnick, A., 1998. Air Quality and Episodes of Acute Respiratory Illness in Taiwan Cities: Evidence from Survey Data. Journal of Urban Economics 44, 68-92.

Alberini, A., Krupnick, A., 2000. Cost-of-Illness and willingness to pay estimates of the benefits of improved air quality: evidence from Taiwan, Land Economics, 76, 37-53.

Baetschmann, G., Staub, K.E., Winkelmann, R. 2011. Consistent Estimation of the Fixed Effects Ordered Logit Model. Discussion Paper 5443, IZA.

Beckett, M., Elliott, M. N., 2002. Does the Association Between Marital Status and Health Vary by Sex, Race, and Ethnicity? Rand, Labor and Population Program. Working Paper Series 02-08.

Belsley, D.A. 1988. Two- or Three-stage least squares? Computer Science in Economics and Management 1, 21-30.

Benzeval, M., Taylor, J., Judge, K., 2000. Evidence on the relationship between low income and poor health: Is the Government doing enough? Fiscal Studies 21, 375-399.

Bostean, G., 2010. An Examination of the Relationship between Family and U.S. Latinos' Physical Health. Field Actions Science Reports. Special Issue 2. Migration and Health 1-7.

Carson, R.T., 2000. Contingent valuation: a user's guide. Environmental Science and Technology 34(8), 1413–1418.

Cesur, R., Tekin, E., Ulker, A. 2013. Air Pollution and Infant Mortality: Evidence from the Expansion of Natural Gas Infrastructure. IZA Discussion Paper No. 7179, Bonn, Germany.

Chamberlain, G. 1980. Analysis of covariance with qualitative data. Review of Economics and Statistics 47(1), 225-238.

Chau, K.W., Yiu, C.Y., Wong, S.K., Lai, L.W.C. 2003. Hedonic price modelling of environmental attributes: a review of the literature and a Hong Kong case study, in *Understanding and Implementing Sustainable Development*. Lai, L.W.C. and Lorne, F.T. *(*eds.) Nova Science, 87-110.

Chay K.Y., Greenstone M, 2003a. Air Quality, Infant Mortality, and the Clean Air Act of 1970", NBER Working Paper No. 10053, Cambridge, MA.

Chay K.Y., Greenstone M, 2003b. The Impact of Air Pollution on Infant Mortality: Evidence from Geographic Variation in Pollution Shocks Induced by a Recession", Quarterly Journal of Economics 118(3) 1121-1167.

Chay K.Y., Dobkin, C., Greenstone M, 2003, The Clean Air Act of 1970 and Adult. Journal of Risk and Uncertainty 27(3) 279-300.

Chay, K.Y., Greenstone, M. 2005. Does air quality matter? Evidence from the housing market, Journal of Political Economy, 113(2), 376-424

Chestnut, Lauraine G., L. Robin Keller, William E. Lambert, and Robert D. Rowe, 1996. Measuring Heart Patients' Willingness to Pay for Changes in Angina Symptoms, Medical Decision Making 16, 65-77.

Clark, E.A., Etile F, Postel-Viany F, Senik C, Van der Straeten K. 2005. Heterogeneity in Reported Well-Being: Evidence from Twelve European Countries. The Economic Journal 115, 118-132.
Collado, M.D. 1997, Estimating Dynamic Models from Time Series of Independent Cross-Sections, Journal of Econometrics 82, 37-62.
Currie, J. and Neidell, M., 2005. Air Pollution and Infant Health: What Can We Learn from California's Recent Experience? The Quarterly Journal of Economics, 120 (3), 1003-1030.
Deaton, A. 1985, Panel Data from Time Series of Cross Sections, Journal of Econometrics, 30, 109-126.
Deaton, A. 2001. Inequalities in Income and Inequalities in Health. In Welch, F. (ed.) The causes and consequences of increasing inequality. Chicago: Chicago University Press.
Deaton, A.S. 2002. Policy Implications of the Gradient of Health and Wealth, Health Affairs 21, 13-30.
Delfino R J, Murphy-Moulton A M, Becklake M R, 1998, Emergency room visits for respiratory illnesses among the elderly in Montreal: association with low level ozone exposure. Environmental Research Section A 76, 67 – 77.
Dickie, M. and V.L. Ulery 2001. Valuing Health in the Household: Are Kids Worth More than Parents?. Presented at the Association of Environmental and Resource Economists workshop, Assessing and Managing Environmental and Public Health Risks. Bar Harbor, Maine, June 13-15. http://www.aere.org/.
Clark, E.A., Etile F, Postel-Viany F, Senik C, Van der Straeten K. 2005. Heterogeneity in Reported Well-Being: Evidence from Twelve European Countries. The Economic Journal. 115, 118-132.
Dockery D, Pope C A, Xiping X, Spengler J, Ware J, Fay M, Ferris B, Speizer F, 1993. An Association between Air Pollution and Mortality in Six U.S. Cities. New England Journal of Medicine 329(24) 1753–1759.
Doygun, H., Gurun, D. K. 2008. Analysing and mapping spatial and temporal dynamics of urban traffic noise pollution: a case study in Kahramanmaras, Turkey Environmental Monitoring and Assessment 142, 65-72.
Erdogan, E., Yazgan, M. 2009. Landscaping in reducing traffic noise problem in cities: Ankara case, African Journal of Agricultural Research, 4(10), 1015-1022.
Evans, G.W., Lepore, S.J. 1992. Conceptual and Analytic Issues in Crowding Research, Journal of Environmental Psychology. 12(2) 163–173.
Evans, A.W. 1997. Environmental Stress and Health, in Handbook of Health Psychology, ed. Baum, A. , Revenson, T., Singer . J.E., Mahwah, N.J.: Erlbaum.
Evans, G.W and Saegert, S. 2000. Residential Crowding in the Context of Inner City Poverty, in Theoretical Perspectives in Environmental-Behavior Research, ed. S. Wapner, S., Demick, J., Yamamoto, T., Minami, H. New York: Kluwer Academic/Plenum Publishers, 247–267.
Ferrer-i-Carbonell, A., Frijters, P., 2004. How Important is Methodology for the estimates of the determinants of Happiness?, Economic Journal. 114, 641-659.
Fiscella, K,. Franks, P. 1997. Poverty or income inequality as predictor of mortality: longitudinal cohort study. British Medical Journal, 314(7096), 1724–1727.
Fiscella, K,. Franks, P. 2000. Individual income, income inequality, health, and mortality: what are the relationships?. Health Services Research journal , 35(1 P 2): 307–318.
Fraser, H., Eng., P. 2012. Understanding and Reducing Noise Nuisance From Stationary Farm Equipment. Order N. 12-029 AGDEX 700

Frey, S.B., Luechinger, S., Stutzer, A., 2009. The Life Satisfaction Approach to Environmental Valuation. IZA Discussion Paper Series No. 4478.
Frey, B., Luechinger, S., Stutzer, A., 2010. The life satisfaction approach to environmental valuation. Annual Review of Resource Economics 2, 139-160.
Gerking S, Stanley RL. 1986. An Economic Analysis of Air Pollution and Health: The Case of St. Louis. The Review of Economics and Statistics. 68(1):115-121.
Greene, W. 2011 Econometric Analysis, Seventh Edition. Upper Saddle River, New Jersey: Prentice Hall.
Griefahn, B. 2002 Sleep disturbances related to environmental noise, Noise Health 4, 57-60.
Harrison, D., Rubinfeld, D.L. 1978. Hedonic Housing Prices and the Demand for Clean Air. Journal of Environmental Economics and Management, 5, 81-102.
International Energy Agency. 2010. Energy Policies of IEA Countries, Turkey 2009 Review.
Janssen N A H, Schwartz J, Zanobetti A, Suh H H, 2002, Air conditioning and source-specific particles as modifiers of the effect of PM10 on hospital admissions for heart and lung disease. Environmental Health Perspectives 110, 43 – 49.
Jones, A.M. and Schurer, S. 2007. How Does Heterogeneity Shape the Socioeconomic Gradient in Health Satisfaction?. Ruhr Economic Papers No. 8
Kahneman, D., Ritov, I., Schkade, D., 1999. Economic preferences or attitude expressions? An analysis of dollar responses to public issues. Journal of Risk and Uncertainty. 19, 220-242.
Laden F, Neas L M, Dockery D W, Schwartz J, 2000, Association of fine particulate matter from different sources with daily mortality in six US cities. Environmental Health Perspectives 108 941 – 947.
Loehman, Edna T., S. V. Berg, A. A. Arroyo, R. A. Hedinger, J. M. Schwartz, M. E. Shaw, R. W. Fahien, V. H. De, R. P. Fishe, D. E. Rio, W. F. Rossley, and A. E. S. Green, (1979). Distributional analysis of regional benefits and costs of air quality control, Journal Environmental Economics and Management 6, 222-243.
Luechinger, S., 2009. Valuing Air Quality Using the Life Satisfaction Approach. The Economic Journal. 119(536), 482-515.
Luechinger, S., 2010. Life Satisfaction and Transboundary Air Pollution. Economics Letters. 107(1), 4-6.
Madansky, A. 1964. On the efficiency of three-stage least-squares estimation, Econometrica, Vol.31(1-2), 51-56.
Moffitt, R. (1993), Identification and Estimation of Dynamic Models with a Time Series of Repeated Cross-Sections, Journal of Econometrics, 59, 99-123.
Murdoch, J.C. and Thayer, M.A. (1988) Hedonic price estimation of variable urban air quality. Journal of Environmental Economics and Management, 15(2), pp.143-146
Murray, M.P. 2006. Avoiding Invalid Instruments and coping with weak Instruments. Journal of Economic Perspective, Vol.20(4), 111-132.
Naeher L P, Holford T R, Beckett W S, Belanger K, Triche E W, Bracken M B, et al, 1999, Healthy Women's PEF Variations with Ambient Summer Concentrations of PM_{10}, $PM_{2.5}$, SO_4^{-2}, H^+, and O_3. American Journal of Respiratory Critical Care Medicine 160 117–125.
Okuguchi, T., Osanai, T., Fujiwara, N., Kato, T., Metoki, N., Konta Y., Okumura, K. 2002. Effect of losartan on nocturnal blood pressure in patients with stroke: comparison with angiogenesis converting enzyme inhibitor, American Journal of Hypertension, 15, 998-1002.

O'Neill M S, Loomis D, Borja-Aburto V H, 2004, Ozone, area social conditions, and mortality in Mexico City. Environmental Research 94 234–242.
Ovenden, N., Shaffer, S., Fernando, H. 2011. How the weather affects the scale of urban noise pollution. Popular version of paper 2pNS3. Presented Tuesday Afternoon, May 24, 2011, 161st Acoustical Society of America Meeting, Seattle, Wash.
Ozer, S., Yilmaz, H., Yesil, M., Yesil, P. 2009. Evaluation of noise pollution caused by vehicles in the city of Tokat, Turkey, Scientific Research and Essays, 4(10): 1205-1212.
Ozyonar, F., Peker, I. 2008. Investigation of the environmental noise pollution in Sivas City Centre. Ecology, 18(69): 75-80.
Preutthipan A, Udomsubpayakul U, Chaisupamongkollarp T, Pentamwa P, 2004, Effect of PM10 pollution in Bangkok on Children with and without asthma. Pediatric Pulmonology 37 187 – 192.
Prus, G.S., 2001. The Relationship between Age, Socio-Economic Status, and Health among Adult Canadians. Social and Economics Dimensions of An Ageing Population. SEDAP Research Paper No. 57.
Robert, A.S., Li, W.L., 2001. Age Variation in the Relationship Between Community Socioeconomic Status and Adult Health. Research on Aging. 23(2), 233-258.
Rowe, R.D. and L.G. Chestnut. Oxidants and Asthmatics in Los Angeles: A Benefits Analysis. Report to the Office of Policy Analysis, US Environmental Protection Agency. Energy and Resource Consultants, Inc., Boulder, CO. March 1985.
Sisman, E. E., Unver, E. 2011. Evaluation of traffic noise pollution in Corlu, Turkey, Scientific Research and Essays, 6(14). 3027-3033.
Schmitt, M., 2013. Subjective Well-Being and Air Quality in Germany. SOEP — The German Socio-Economic Panel Study at DIW Berlin. SOEP papers on Multidisciplinary Panel Data Research, 541.
Stevenson, B., Wolfers, J., 2008. Economic growth and subjective well-being: Reassessing the Easterlin paradox. Brookings Papers on Economic Activity.
Tanrıvermiş, H., (1998). Willingness to Pay (WTP) and Willingness to Accept (WTA) Measures in Turkey: May WTP and WTA Be Indicators to Share the Environmental Damage Burdens: A Case Study", Journal of Economic Cooperation Among Islamic Countries. 19(3), 67-93.
Tekeşin, C. and Shihomi, A. 2014. Measuring the Value of Mortality Risk Reductions in Turkey International Journal of Environmental Research and Public Health, 11(7), 6890-6922.
Tinbergen, J., 1991. On the measurement of welfare. Journal of Econometrics. 50, 7–15.
Turkish Statistical Institute 2013. Income and Living Conditions Survey Micro Data Set (Cross Sectional), 2006-2012. Ankara.
Yilmaz, H., Ozer, S. 2005. Evaluation and analysis of environmental noise pollution in the city of Erzurum, Turkey, International Journal of Environmental Pollution, 23(4): 438-448.
Van Praag, B., Ferrer-i-Carbonell, A., 2004. Happiness quantified: A satisfaction calculus approach. Oxford: Oxford University Press.
Van Praag, B., Ferrer-i-Carbonell, A., 2006. An almost integration-free approach to ordered response models. Tinbergen Institute Discussion Paper TI 2006-047/3.
Van Praag, B., 2007. Perspectives from the Happiness Literature and the Role of New Instruments for Policy Analysis. IZA Discussion Paper No. 2568.

Verbeek, M. 2008. Pseudo panels and repeated cross-sections in Mátyás, L., and Sevestre, P. eds., The Econometrics of Panel Data: Fundamentals and Recent Developments in Theory and Practice,
Whittington, D., 2002. Improving the performance of contingent valuation studies in developing countries. Environmental Resources Economy 22, 323–367.
World Bank (2012). World Development Indicators 2012. The World Bank.
Zellner, A. (1962). An efficient method of estimating seemingly unrelated regression equations and tests for aggregation bias. Journal of American Statistical Association, Vol.(57), 348-368.
Zellner, A. and Theil, H. (1962). Three-stage least square: Simultaneous Estimation of simultaneous Equations. Econometrica, Vol.30(1), January, 54-78.

Table 1. Summary Statistics

Variables	Mean	Standard Deviation	Minimum	Maximum
Panel A: Total Sample				
Panel A1: Continuous variables				
Household income	21,322.12	19,695.18	95.77	642,017.8
Panel A2: Categorical Variables				
Air Pollution Problems (Yes)	25.06	Noise Pollution Problems (Yes)	17.79	
Air Pollution Problems (No)	74.94	Noise Pollution Problems (No)	82.21	
Chronic Diseases (Yes)	25.97	Chronic Diseases (No)	74.03	
Indoor flushing toilet (Yes, for sole use of the household)	84.32	Piped water system in the dwelling (Yes)	96.48	
Indoor flushing toilet (Yes, Shared)	11.71	Piped water system in the dwelling (No)	3.52	
Indoor flushing toilet (No)	3.97	Health Status (Fair)	20.74	
Health Status (Very Good)	11.88	Health Status (Bad)	12.81	
Health Status (Good)	52.73	Health Status (Vary Bad)	2.04	
Panel B: Non-Movers Sample				
Panel B1: Continuous variables				
Household income	21,165.37	19,517.76	95.77	642,017.8
Panel B2: Categorical Variables				
Air Pollution Problems (Yes)	24.83	Noise Pollution Problems (Yes)	17.51	
Air Pollution Problems (No)	75.17	Noise Pollution Problems (No)	82.49	
Chronic Diseases (Yes)	26.53	Chronic Diseases (No)	73.47	
Indoor flushing toilet (Yes, for sole use of the household)	83.75	Piped water system in the dwelling (Yes)	96.32	
Indoor flushing toilet (Yes, Shared)	11.82	Piped water system in the dwelling (No)	3.68	
Indoor flushing toilet (No)	4.44	Health Status (Fair)	21.00	
Health Status (Very Good)	11.82	Health Status (Bad)	13.17	
Health Status (Good)	51.90	Health Status (Vary Bad)	2.11	
Panel C: Movers (For Environmental Reasons) Sample				
Panel C1: Continuous variables				
Household income	21,661.24	17,705.57	1,581.401	161,110.1
Panel C2: Categorical Variables				
Air Pollution Problems (Yes)	28.81	Noise Pollution Problems (Yes)	19.25	
Air Pollution Problems (No)	71.19	Noise Pollution Problems (No)	80.75	
Chronic Diseases (Yes)	24.19	Chronic Diseases (No)	75.81	
Indoor flushing toilet (Yes, for sole use of the household)	85.98	Piped water system in the dwelling (Yes)	96.43	
Indoor flushing toilet (Yes, Shared)	12.30	Piped water system in the dwelling (No)	3.57	
Indoor flushing toilet (No)	1.72	Health Status (Fair)	20.97	
Health Status (Very Good)	12.62	Health Status (Bad)	11.22	
Health Status (Good)	53.73	Health Status (Vary Bad)	1.47	
Panel D: Movers (For Other Reasons) Sample				
Panel D1: Continuous variables				
Household income	21,820.58	20,301.42	134.005	546,629.1
Panel D2: Categorical Variables				
Air Pollution Problems (Yes)	25.71	Noise Pollution Problems (Yes)	18.66	
Air Pollution Problems (No)	74.29	Noise Pollution Problems (No)	81.34	
Chronic Diseases (Yes)	24.20	Chronic Diseases (No)	75.80	
Indoor flushing toilet (Yes, for sole use of the household)	86.14	Piped water system in the dwelling (Yes)	97.00	
Indoor flushing toilet (Yes, Shared)	11.34	Piped water system in the dwelling (No)	3.00	
Indoor flushing toilet (No)	2.52	Health Status (Fair)	19.87	
Health Status (Very Good)	12.07	Health Status (Bad)	11.68	
Health Status (Good)	54.53	Health Status (Vary Bad)	1.85	

Table 2. Correlation Matrix

	Health Status	**Chronic Illness**	**Household Income**	**Air Pollution**
Chronic Illness	0.6514*** (0.000)			
Household Income	-0.1427*** (0.000)	-0.0755*** (0.000)		
Air Pollution	0.0108*** (0.000)	0.0085*** (0.0013)	0.0345*** (0.000)	
Noise Pollution	0.0083*** (0.0003)	0.0065*** (0.000)	0.0068*** (0.0008)	0.3231*** (0.000)

*** indicates significance at 1% level.

Table 3. Adapted Probit OLS Pooled

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Household Income	-0.1164***	-0.1171***	-0.0721*	-0.1147***	-0.1157***	-0.1167***	-0.0729*	-0.1127***	-0.1173***
	(0.0045)	(0.0053)	(0.0390)	(0.0093)	(0.0045)	(0.0053)	(0.0395)	(0.0093)	(0.0053)
Air Pollution	0.1072***	0.1009***	0.2131***	0.1237***					0.0984***
	(0.0054)	(0.0064)	(0.0686)	(0.0108)					(0.0066)
Noise Pollution					0.1120***	0.1155***	0.1709***	0.0995***	0.1094***
					(0.0062)	(0.0073)	(0.0836)	(0.0123)	(0.0276)
Age	0.0204***	0.0207***	0.0179***	0.0204***	0.0207***	0.0208***	0.0177***	0.0205***	0.0207***
	(0.0004)	(0.0003)	(0.0035)	(0.0005)	(0.0003)	(0.0003)	(0.0034)	(0.0005)	(0.0003)
Marital Status (Reference Married)									
Marital Status (Single)	0.0466***	0.0456***	0.1355	0.0492***	0.0455***	0.0445***	0.1346	0.0487***	0.0452***
	(0.0075)	(0.0087)	(0.1023)	(0.0150)	(0.0075)	(0.0087)	(0.1033)	(0.0150)	(0.0087)
Marital Status (Widowed)	0.2117***	0.2104***	-0.1880	0.2259***	0.2092***	0.2076***	-0.1379	0.2249***	0.2093***
	(0.0239)	(0.0270)	(0.3211)	(0.0521)	(0.0239)	(0.0271)	(0.3242)	(0.0523)	(0.0270)
Marital Status (Divorced)	0.1970***	0.2030***	0.2244	0.1857***	0.1945***	0.1995***	0.2669	0.1851***	0.2018***
	(0.0196)	(0.0234)	(0.2134)	(0.0365)	(0.0196)	(0.0234)	(0.2171)	(0.0365)	(0.0234)
Marital Status (Separated)	0.1597***	0.1907***	0.1122	0.0818	0.1568***	0.1878***	0.1160	0.0768	0.1878***
	(0.0351)	(0.0405)	(0.3281)	(0.0718)	(0.0351)	(0.0403)	(0.3384)	(0.0720)	(0.0403)
Education Level (Reference Illiterate)									
Primary school	-0.1959***	-0.3127***	-0.3826***	-0.2671***	-0.2064***	-0.3143***	-0.3893***	-0.2699***	-0.3137***
	(0.0145)	(0.0129)	(0.1460)	(0.0253)	(0.0145)	(0.0129)	(0.1458)	(0.0253)	(0.0129)
High school	-0.4153***	-0.4224***	-0.4476**	-0.3812***	-0.4171***	-0.4240***	-0.4435**	-0.3833***	-0.4245***
	(0.0138)	(0.0157)	(0.1829)	(0.0297)	(0.0138)	(0.0157)	(0.1822)	(0.0297)	(0.0157)
Higher education level	-0.4703***	-0.4807***	-0.7207***	-0.4209***	-0.4712***	-0.4819***	-0.7132***	-0.4215***	-0.4836***
	(0.0149)	(0.0171)	(0.1873)	(0.0313)	(0.0149)	(0.0171)	(0.1875)	(0.0313)	(0.0171)
Job Status (Reference Empl. Full Time)									
Job Status (Employee Part Time)	0.1429***	0.1499***	0.0630	0.1499***	0.1435***	0.1500***	0.0541	0.1266***	0.1487***
	(0.0093)	(0.0107)	(0.0977)	(0.0107)	(0.0093)	(0.0107)	(0.0975)	(0.0189)	(0.0107)
Job Status (Self-Employed Part Time)	0.1470***	0.1472***	0.2652	0.1241***	0.1469***	0.1440***	0.1783	0.1364***	0.1444***
	(0.0163)	(0.0180)	(0.3671)	(0.0190)	(0.0163)	(0.0180)	(0.2308)	(0.0379)	(0.0108)
Unemployed	0.1189**	0.1195**	0.1380	0.2018*	0.1174**	0.1209**	0.1783	0.2054**	0.1127**
	(0.0503)	(0.0518)	(0.2418)	(0.1085)	(0.0503)	(0.0516)	(0.2465)	(0.1023)	(0.0507)
Retired	0.9451*	0.8593**	0.7520*	-0.5417***	0.9448*	0.8690**	0.7587*	-0.5823***	0.8393**
	(0.4881)	(0.3659)	(0.3848)	(0.1705)	(0.4880)	(0.3653)	(0.3862)	(0.1577)	(0.3647)
Occupation code (Reference Managers)									
Occupation code (Professionals)	0.0060	-0.0089	0.1587	0.0442*	0.0066	-0.0084	0.1527	0.0458**	-0.0098
	(0.0120)	(0.0141)	(0.1505)	(0.0230)	(0.0120)	(0.0141)	(0.1477)	(0.0230)	(0.0141)
Occupation code (Clerical Support	0.0512***	0.0474***	-0.0500	0.0675***	0.0513***	0.0474***	-0.0370	0.0661***	0.0457***
Workers)	(0.0127)	(0.0148)	(0.1378)	(0.0248)	(0.0127)	(0.0149)	(0.1365)	(0.0248)	(0.0148)
Occupation code (Skilled agricultural,	0.0658***	0.0561***	0.0682	0.0997***	0.0631***	0.0544***	0.0559	0.0942***	0.0606***
forestry)	(0.0111)	(0.0128)	(0.1486)	(0.0231)	(0.0111)	(0.0128)	(0.1461)	(0.0230)	(0.0128)

Table 3 (cont.) Adapted Probit OLS Pooled

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
House Size	-0.0005***	-0.0005***	-0.0032**	-0.0007***	-0.0005***	-0.0005***	-0.0035**	-0.0007***	-0.0004***
	(0.0001)	(0.00022)	(0.0015)	(0.0002)	(0.0001)	(0.00022)	(0.0015)	(0.0002)	(0.00013)
Household Type (Reference Single Person)									
Household Type (2 ad., no dep, children < 65)	-0.0224	-0.0445*	0.0728	-0.0670*	-0.0214	-0.0457*	0.1111	-0.0678*	-0.0440*
	(0.0231)	(0.0265)	(0.2584)	(0.0362)	(0.0228)	(0.0265)	(0.2590)	(0.0363)	(0.0265)
Household Type (2 ad., no dep. children, at least one adult 65 years or more)	0.0866***	0.1145***	0.2670	0.0106	0.0864***	0.1147***	0.3221	0.0112	0.1130***
	(0.0261)	(0.0313)	(0.3216)	(0.0509)	(0.0262)	(0.0313)	(0.3161)	(0.0511)	(0.0313)
Household Type (2 ad. with one dep. child)	-0.0019	-0.0310*	-0.0820	-0.0624*	-0.0044	-0.0334**	-0.0479	-0.0606*	-0.0307*
	(0.0192)	(0.0163)	(0.2589)	(0.0361)	(0.0213)	(0.0166)	(0.2589)	(0.0362)	(0.0162)
Household Type (2 ad. with two dep. children)	-0.0244**	-0.0299**	-0.0609	-0.0781**	-0.0245**	-0.0312**	-0.0184	-0.0734**	-0.0287**
	(0.0112)	(0.0143)	(0.2514)	(0.0362)	(0.0112)	(0.0146)	(0.2528)	(0.0363)	(0.0141)
House Tenure (Reference Owner)									
House Tenure (Tenant)	-0.0052	-0.0013	0.0200	0.0238**	-0.0026	-0.0037	0.0270	0.0232*	-0.0058
	(0.0062)	(0.0054)	(0.0804)	(0.0118)	(0.0062)	(0.0074)	(0.0807)	(0.0118)	(0.0074)
House Tenure (Lodging)	-0.0347	-0.0315	0.1271	-0.0367	-0.0329	-0.0336	0.1330	-0.0336	-0.0310
	(0.0291)	(0.0217)	(0.2322)	(0.0301)	(0.0290)	(0.0216)	(0.2403)	(0.0301)	(0.0216)
Flushing Toilet (Reference Yes for sole use of the household)									
Indoor Flushing Toilet (Yes) shared	-0.0189	-0.0186	-0.0941	-0.0145	-0.0189	-0.0188	-0.1105	-0.0124	-0.0179
	(0.0138)	(0.0295)	(0.1136)	(0.0335)	(0.0138)	(0.0295)	(0.1136)	(0.0336)	(0.0151)
Indoor Flushing Toilet (No)	0.0329*	0.0291***	0.1632	0.0403**	0.0325*	0.0298***	0.2405	0.0408**	0.0276***
	(0.0185)	(0.0099)	(0.2703)	(0.0180)	(0.0185)	(0.0098)	(0.2710)	(0.0180)	(0.0098)
Type of Fuel (Reference Wood)									
Type of Fuel (Coal)	-0.0085	-0.0048	-0.0233	-0.0194	-0.0049	-0.0017	-0.0267	-0.0148	-0.0061
	(0.0068)	(0.0078)	(0.0911)	(0.0143)	(0.0068)	(0.0078)	(0.0910)	(0.0143)	(0.0078)
Type of Fuel (Natural Gas)	-0.0227*	-0.0343**	0.0053	0.0024	-0.0246**	-0.0371**	-0.0215	0.0032	-0.0392***
	(0.0120)	(0.0142)	(0.0152)	(0.0234)	(0.0120)	(0.0142)	(0.0154)	(0.0235)	(0.0141)
Type of Fuel (Fuel-Oil)	-0.0665**	-0.0646*	-0.0931	-0.0739	-0.0616**	-0.0648*	-0.2108	-0.0730	-0.0667*
	(0.0303)	(0.0354)	(0.2665)	(0.0594)	(0.0303)	(0.0354)	(0.2961)	(0.0594)	(0.0353)
Type of Fuel (Electricity)	-0.0607***	-0.0662***	-0.0517*	-0.0487	-0.0574***	-0.0665***	-0.0541*	-0.0449	-0.0734***
	(0.0174)	(0.0207)	(0.0278)	(0.0328)	(0.0194)	(0.0207)	(0.0279)	(0.0330)	(0.0207)
Type of Fuel (Dried cow dung)	0.0428***	0.0410***	-0.1936	0.0583**	0.0522***	0.0417***	-0.1841	0.0587**	0.0428***
	(0.0124)	(0.0140)	(0.1888)	(0.0274)	(0.0124)	(0.0140)	(0.1888)	(0.0275)	(0.0140)
Piped Water (No)	0.0283*	0.0286*	0.1758	0.0021	0.0284*	0.0285*	0.1900	0.0081	0.0288*
	(0.0150)	(0.0170)	(0.2030)	(0.0324)	(0.0150)	(0.0170)	(0.2033)	(0.0325)	(0.0170)
Number of Observations	112,338	84,640	752	26,946	112,338	84,640	752	26,946	84,640
R Square	0.2113	0.2143	0.2921	0.2034	0.2109	0.2142	0.2868	0.2034	0.2155
MWTP	20.06	18.48	35.28	23.99	21.11	21.42	31.04	19.65	(18.15;20.18)

Standard errors between brackets, ***, ** and * indicate significance at 1%, 5% and 10% level. Columns (1) and (5) refer to total sample, (2) and (6) to non-mover sample, (3) and (7) to movers for environmental reasons, (4) and (8) to movers for other reasons, while (9) refer to non movers sample when both air and noise pollution are included into the regressions.

Table 4. Adapted Probit Fixed Effects

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Household Income	-0.1292***	-0.1330***	-0.0891*	-0.1200***	-0.1277***	-0.1317***	-0.0832*	-0.1185***	-0.1329***
	(0.0065)	(0.0075)	(0.0463)	(0.0134)	(0.0065)	(0.0075)	(0.0431)	(0.0134)	(0.0075)
Air Pollution	0.1166***	0.1142***	0.1455**	0.1231***					0.1082***
	(0.0076)	(0.0089)	(0.0689)	(0.0151)					(0.0093)
Noise Pollution					0.1248***	0.1300***	0.1407**	0.1106***	0.1115***
					(0.087)	(0.0102)	(0.0682)	(0.0172)	(0.0107)
Age	0.0200***	0.0204***	0.0165***	0.0191***	0.0201***	0.0205***	0.0169***	0.0192***	0.0204***
	(0.0004)	(0.0004)	(0.0055)	(0.0008)	(0.0004)	(0.0005)	(0.0055)	(0.0008)	(0.0005)
Marital Status (Reference Married)									
Marital Status (Single)	0.0293**	0.0176	0.0505	0.0671**	0.0275**	0.0153	0.0722	0.0672**	0.0406***
	(0.0134)	(0.0158)	(0.2301)	(0.0260)	(0.0135)	(0.0158)	(0.2303)	(0.0270)	(0.0158)
Marital Status (Widowed)	0.2366***	0.2299***	0.0290	0.2625***	0.2340***	0.2264***	0.0281	0.2630***	0.2277***
	(0.0320)	(0.0363)	(0.3310)	(0.0698)	(0.0321)	(0.0364)	(0.3312)	(0.0701)	(0.0363)
Marital Status (Divorced)	0.1813***	0.1769***	0.0577	0.2058***	0.1795***	0.1728***	0.0742	0.2085***	0.1750***
	(0.0270)	(0.0320)	(0.2949)	(0.0518)	(0.0270)	(0.0320)	(0.2952)	(0.0517)	(0.0319)
Marital Status (Separated)	0.1324***	0.1479***	0.3327	0.0996	0.1284***	0.1441***	0.3775	0.0931	0.1435***
	(0.0471)	(0.0552)	(0.5351)	(0.0923)	(0.0471)	(0.0551)	(0.5286)	(0.0926)	(0.0551)
Education Level (Reference Illiterate)									
Primary school	-0.2637***	-0.2631***	-0.3193*	-0.2611***	-0.2646***	-0.2638***	-0.3178*	-0.2623***	-0.2637***
	(0.0161)	(0.0183)	(0.1781)	(0.0348)	(0.0161)	(0.0183)	(0.1729)	(0.0348)	(0.0183)
High school	-0.3711***	-0.3708***	-0.4148**	-0.3658***	-0.3719***	-0.3725***	-0.4183**	-0.3633***	-0.3733***
	(0.0198)	(0.0227)	(0.1942)	(0.0416)	(0.0198)	(0.0227)	(0.1942)	(0.0417)	(0.0227)
Higher education level	-0.4177***	-0.4126***	-0.5235**	-0.4192***	-0.4160***	-0.4118***	-0.5169**	-0.4150***	-0.4151***
	(0.0213)	(0.0246)	(0.2337)	(0.0442)	(0.0213)	(0.0246)	(0.2310)	(0.0442)	(0.0246)
Job Status (Reference Empl. Full Time)									
Job Status (Employee Part Time)	0.1429***	0.1562***	0.1849	0.1163***	0.1429***	0.1563***	0.1737	0.1179***	0.1547***
	(0.0093)	(0.0153)	(0.1439)	(0.0275)	(0.0093)	(0.0153)	(0.1440)	(0.0277)	(0.0153)
Job Status (Self-Employed Part Time)	0.1459***	0.1072***	0.5474	0.1221***	0.14435***	0.1045***	0.5234	0.1232***	0.1038***
	(0.0133)	(0.0284)	(0.5837)	(0.0196)	(0.0133)	(0.0285)	(0.5740)	(0.0197)	(0.0284)
Unemployed	0.1070***	0.1083**	0.8064*	0.2211*	0.1048***	0.1077**	0.8252*	0.2202*	0.1089**
	(0.0256)	(0.0505)	(0.4454)	(0.1171)	(0.0255)	(0.0505)	(0.4743)	(0.1169)	(0.0428)
Retired	0.9031*	0.9659**	0.8178*	-0.5952***	0.9075*	0.9621**	0.8196*	-0.5641***	0.9451*
	(0.4765)	(0.4837)	(0.4180)	(0.2236)	(0.4767)	(0.4935)	(0.4182)	(0.1846)	(0.4883)
Occupation code (Reference Managers)									
Occupation code (Professionals)	-0.0185	-0.0414**	-0.0635	0.0435	-0.0194	-0.0429**	-0.0744	0.0448	-0.0435**
	(0.0165)	(0.0196)	(0.2244)	(0.0316)	(0.0165)	(0.0196)	(0.216)	(0.0316)	(0.0195)
Occupation code (Clerical Support	0.0353*	0.0236	-0.0259	0.0289	0.0355*	0.0242	-0.0243	0.0271	0.0217
Workers)	(0.0180)	(0.0211)	(0.1902)	(0.0349)	(0.0180)	(0.0211)	(0.1913)	(0.0349)	(0.0211)
Occupation code (Skilled agricultural,	0.0424***	0.0368**	0.0802	0.0580*	0.0408***	0.0345**	0.0672	0.0555*	0.0412**
forestry)	(0.0150)	(0.0173)	(0.1920)	(0.0306)	(0.0150)	(0.0173)	(0.1916)	(0.0306)	(0.0173)

Table 4 (cont.) Adapted Probit Fixed Effects

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
House Size	-0.0006***	-0.0005**	-0.0028*	-0.0009***	-0.0006***	-0.00049**	-0.0029**	-0.0009***	-0.00045**
	(0.002)	(0.00024)	(0.0016)	(0.0003)	(0.002)	(0.0002)	(0.0017)	(0.0003)	(0.00019)
Household Type (Reference Single Person)									
Household Type (2 ad., no dep, children < 65)	-0.0191	-0.0281*	0.0935	-0.1173**	-0.0186	-0.0284*	0.0849	-0.1191**	-0.0276*
	(0.0268)	(0.0147)	(0.2866)	(0.0470)	(0.0268)	(0.0147)	(0.2850)	(0.0471)	(0.0144)
Household Type (2 ad., no dep. children, at least one adult 65 years or more)	0.0735**	0.1062***	0.3065	0.0208	0.0743**	0.1072***	0.3722	0.0228	0.1048***
	(0.0330)	(0.0390)	(0.3305)	(0.0655)	(0.0330)	(0.0391)	(0.3174)	(0.0655)	(0.0390)
Household Type (2 ad. with one dep. child)	-0.0168	-0.0321*	-0.0533	-0.1094**	-0.0163	-0.0320*	-0.0338	-0.1076**	-0.0324*
	(0.0267)	(0.0166)	(0.3022)	(0.0469)	(0.0267)	(0.0166)	(0.2997)	(0.0355)	(0.0166)
Household Type (2 ad. with two dep. children)	-0.0237*	-0.0280**	-0.0339	-0.1200**	-0.0254*	-0.0282**	-0.0192	-0.1155**	-0.0285**
	(0.0123)	(0.0137)	(0.3048)	(0.0472)	(0.0128)	(0.0137)	(0.2692)	(0.0472)	(0.0138)
House Tenure (Reference Owner)									
House Tenure (Tenant)	-0.0085	0.0209**	-0.0510	0.0232	-0.0116	0.0234**	0.0588	0.0186	0.0213**
	(0.0076)	(0.0102)	(0.1064)	(0.0165)	(0.0086)	(0.0102)	(0.1076)	(0.0165)	(0.0102)
House Tenure (Lodging)	-0.0271	-0.0366	0.2373	-0.0075	-0.0278	-0.0387	0.2522	-0.0040	-0.0347
	(0.0242)	(0.0292)	(0.2967)	(0.0433)	(0.0242)	(0.0292)	(0.3087)	(0.0433)	(0.0291)
Flushing Toilet (Reference Yes for sole use of the household)									
Indoor Flushing Toilet (Yes) shared	-0.0187	-0.0301	-0.1401	-0.0199	-0.0196	-0.0307	-0.1573	-0.0196	-0.0298
	(0.0211)	(0.0292)	(0.1567)	(0.0244)	(0.0212)	(0.0292)	(0.1574)	(0.0245)	(0.0290)
Indoor Flushing Toilet (No)	0.0199*	0.0217	0.0186	0.0363	0.0197*	0.0215	0.0178	0.0360	0.0202
	(0.0120)	(0.0138)	(0.3391)	(0.0524)	(0.0119)	(0.0138)	(0.3346)	(0.0520)	(0.0132)
Type of Fuel (Reference Wood)									
Type of Fuel (Coal)	0.0021	0.0080	0.0022	-0.0171	0.0048	0.0104	0.0112	-0.0134	0.0058
	(0.0096)	(0.0110)	(0.1192)	(0.0202)	(0.0096)	(0.0110)	(0.1185)	(0.0202)	(0.0110)
Type of Fuel (Natural Gas)	-0.0234*	-0.0332**	0.2433	0.0144	-0.0239*	-0.0335**	0.2144	0.0160	-0.0328**
	(0.0129)	(0.0159)	(0.2114)	(0.0328)	(0.0129)	(0.0159)	(0.2154)	(0.0329)	(0.0159)
Type of Fuel (Fuel-Oil)	-0.0309	-0.0280	-0.4797	-0.0034	-0.0268	-0.0303	-0.5456	-0.0020	-0.0273
	(0.0421)	(0.1114)	(0.3365)	(0.0834)	(0.0421)	(0.1114)	(0.3510)	(0.0834)	(0.1193)
Type of Fuel (Electricity)	-0.0380*	-0.0553*	-0.0791*	-0.0319	-0.0382*	-0.0491*	-0.0776*	-0.0277	-0.0564**
	(0.0218)	(0.0269)	(0.0461)	(0.0440)	(0.0218)	(0.0269)	(0.0445)	(0.0443)	(0.0269)
Type of Fuel (Dried cow dung)	0.0714***	0.0631***	0.0444	0.1013***	0.0706***	0.0638***	0.0568	0.1111***	0.0651***
	(0.0180)	(0.0205)	(0.2557)	(0.0390)	(0.0180)	(0.0205)	(0.2522)	(0.0390)	(0.0205)
Piped Water (No)	0.0283*	0.0315*	0.4872*	0.0091	0.0282*	0.0316*	0.4903*	0.0124	0.0323*
	(0.0146)	(0.0163)	(0.2820)	(0.0480)	(0.0146)	(0.0163)	(0.2777)	(0.0481)	(0.0163)
Number of Observations	112,338	84,640	752	26,946	112,338	84,640	752	26,946	84,640
R Square	0.2093	0.2119	0.1854	0.2003	0.2088	0.2119	0.1822	0.1983	0.2131
MWTP	19.67	18.58	32.54	22.82	21.29	21.38	29.54	20.77	(17.63;18.17)

Standard errors between brackets, ***, ** and * indicate significance at 1%, 5% and 10% level. Columns (1) and (5) refer to total sample, (2) and (6) to non-mover sample, (3) and (7) to movers for environmental reasons, (4) and (8) to movers for other reasons, while (9) refer to non movers sample when both air and noise pollution are included into the regressions

Table 5. Ordered Logit and Instrumental Ordered Probit Pooled Models for Non-Movers

Variables	Pooled Ordered Logit	Pooled IV-Ordered Probit	Variables	Pooled Ordered Probit	Pooled IV-Ordered Probit
Household Income	-0.2952***	-0.1329***	Household Type (2 ad., no dep, children < 65)	-0.1387**	-0.1944***
	(0.0136)	(0.0132)		(0.0657)	(0.0633)
Air Pollution	0.2144***	0.2343***	Household Type (2 ad., no dep. children, at least one adult 65 years or more)	0.2247***	0.0792
	(0.0172)	(0.0215)		(0.0752)	(0.0713)
Noise Pollution	0.2408***	0.2288***	Household Type (2 ad. with one dep. child)	-0.1416**	-0.1546**
	(0.0208)	(0.0224)		(0.0673)	(0.0634)
Age	0.0548***	0.0303***	Household Type (2 ad. with two dep. children)	-0.1378**	- 0.1744***
	(0.0085)	(0.0007)		(0.0667)	(0.0632)
Marital Status (Single)	0.1984***	0.0946***	House Tenure (Tenant)	0.0207	0.0061
	(0.0245)	(0.0240)		(0.0193)	(0.0208)
Marital Status (Widowed)	0.5234***	0.2792***	House Tenure (Lodging)	-0.0834	-0.0753
	(0.0636)	(0.0564)		(0.0602)	(0.0572)
Marital Status (Divorced)	0.5597***	0.2896***	Indoor Flushing Toilet (Yes) shared	-0.0170	-0.0310
	(0.0579)	(0.0551)		(0.0366)	(0.0330)
Marital Status (Separated)	0.6191***	0.2060*	Indoor Flushing Toilet (No)	0.0740***	0.0400
	(0.1031)	(0.1083)		(0.0243)	(0.0352)
Primary school	-0.6757***	-0.4191***	Type of Fuel (Coal)	-0.0110	-0.0362*
	(0.0285)	(0.0276)		(0.0199)	(0.0191)
High school	-0.9948***	-0.6188***	Type of Fuel (Natural Gas)	-0.0825**	-0.0771**
	(0.0383)	(0.0372)		(0.0387)	(0.0368)
Higher education level	-1.169***	-0.6949***	Type of Fuel (Fuel-Oil)	-0.0857	0.1623
	(0.0433)	(0.0413)		(0.0952)	(0.1310)
Job Status (Employee Part Time)	0.3408***	0.1485***	Type of Fuel (Electricity)	-0.1819***	-0.0604**
	(0.0242)	(0.0394)		(0.0554)	(0.0281)
Job Status (Self-Employed Part Time)	0.3379***	0.2135***	Type of Fuel (Dried cow dung)	0.1385***	0.0859***
	(0.0434)	(0.0281)		(0.0352)	(0.0320)
Unemployed	0.3645*	0.2885*	Piped Water (No)	0.0607*	0.0501*
	(0.1883)	(0.1644)		(0.0361)	(0.0258)
Retired	1.858***	0.4286*	Number of Observations	84,640	30,083
	(0.0720)	(0.2241)			
Occupation code (Professionals)	-0.0400	0.0017	Pseudo R Square	0.1056	
	(0.0412)	(0.0421)			
Occupation code (Clerical Support Workers)	0.1236***	0.0655	Wald Chi Square		8,604.72
	(0.0428)	(0.0432)			[0.000]
Occupation code (Skilled agricultural, forestry and fishery workers)	0.1587***	0.0945***	MWTP	(16.96; 19.72)	(19.23; 20.21)
	(0.0327)	(0.0355)			
House Size	-0.0012***	-0.00065**			
	(0.00034)	(0.00030)			

Standard errors between brackets, p-value between square brackets, ***, ** and * indicate significance at 1%, 5% and 10% level.

Table 6. Panel Ordered Logit and FCF Estimates for Non-Movers

Variables	Panel Ordered Logit	FCF	Variables	Panel Ordered Logit	FCF
Household Income	-0.2924***	-0.2919***	Household Type (2 ad., no dep, children < 65)	-0.1350**	-0.0362
	(0.0137)	(0.0217)		(0.0673)	(0.0479)
Air Pollution	0.2121***	0.2522***	Household Type (2 ad., no dep. children, at least one adult >65	0.2194***	0.0983
	(0.0178)	(0.0260)		(0.0759)	(0.1167)
Noise Pollution	0.2382***	0.2841***	Household Type (2 ad. with one dep. child)	-0.1359**	-0.0124
	(0.0204)	(0.0304)		(0.0676)	(0.0979)
Age	0.0549***	0.0506***	Household Type (2 ad. with two dep. children)	-0.1335**	-0.0567
	(0.0082)	(0.0014)		(0.0673)	(0.0974)
Marital Status (Single)	0.1990***	0.1519***	House Tenure (Tenant)	0.0242	0.0584
	(0.0250)	(0.0488)		(0.0707)	(0.0408)
Marital Status (Widowed)	0.5251***	0.6895***	House Tenure (Lodging)	-0.0903	-0.0811
	(0.0637)	(0.1136)		(0.0619)	(0.0822)
Marital Status (Divorced)	0.5565***	0.4283***	Indoor Flushing Toilet (Yes) shared	-0.0143	-0.0076
	(0.0576)	(0.0923)		(0.0376)	(0.0650)
Marital Status (Separated)	0.6039***	0.5083***	Indoor Flushing Toilet (No)	0.0722***	0.0880**
	(0.1033)	(0.0615)		(0.0245)	(0.0390)
Primary school	-0.6769***	-0.5300***	Type of Fuel (Coal)	0.0161	0.0289
	(0.0282)	(0.0504)		(0.0199)	(0.0314)
High school	-0.9943***	-0.9679***	Type of Fuel (Natural Gas)	-0.0972**	-0.0026
	(0.0385)	(0.0711)		(0.0395)	(0.0597)
Higher education level	-1.165***	-0.4151***	Type of Fuel (Fuel-Oil)	-0.1365	-0.1410
	(0.0437)	(0.0246)		(0.1032)	(0.1323)
Job Status (Employee Part Time)	0.3457***	0.2979***	Type of Fuel (Electricity)	-0.1926***	-0.1585*
	(0.0253)	(0.0421)		(0.0569)	(0.0811)
Job Status (Self-Employed Part Time)	0.3645***	0.2196***	Type of Fuel (Dried cow dung)	0.1269***	0.1718***
	(0.0438)	(0.0724)		(0.0342)	(0.0506)
Unemployed	0.3694*	0.7051*	Piped Water (No)	0.0636*	0.1001*
	(0.1884)	(0.3610)		(0.0382)	(0.0518)
Retired	1.8682***	1.142*	Number of Observations	84,640	11,125
	(0.0710)	(0.611)			
Occupation code (Professionals)	-0.0368	-0.0790	LR Chi Square		6,221.34
	(0.0428)	(0.0621)			[0.000]
Occupation code (Clerical Support Workers)	0.1259***	0.0876	Wald Chi Square	7,528.34	
	(0.0429)	(0.0631)		[0.000]	
Occupation code (Skilled agricultural, forestry and fishery workers)	0.1518***	0.1407**	MWTP	(17.30;20.11)	(17.87;20.85)
	(0.0338)	(0.0694)			
House Size	-0.0013***	-0.0020***			
	(0.00035)	(0.0005)			

Standard errors between brackets, p-value between square brackets, ***, ** and * indicate significance at 1%, 5% and 10% level.

Table 7. BUC and Chamberlain Conditional Logit Fixed Effects Estimates for Non-Movers

Variables	BUC	Chamberlain	Variables	BUC	Chamberlain
Household Income	-0.3444***	-0.3279***	Household Type (2 ad., no dep, children < 65)	-0.0417*	-0.0411*
	(0.0211)	(0.0247)		(0.0238)	(0.0236)
Air Pollution	0.2360***	0.2647***	Household Type (2 ad., no dep. children, at least one adult 65 years or more)	0.2041	0.2695
	(0.0267)	(0.0396)		(0.2076)	(0.2190)
Noise Pollution	0.2960***	0.2981***	Household Type (2 ad. with one dep. child)	-0.0462**	-0.0475**
	(0.0302)	(0.0341)		(0.0215)	(0.0224)
Age	0.0541***	0.0564***	Household Type (2 ad. with two dep. children)	-0.0453**	-0.0446**
	(0.0013)	(0.0015)		(0.0221)	(0.0203)
Marital Status (Single)	0.1418***	0.2005***	House Tenure (Tenant)	0.0549**	0.0492**
	(0.0496)	(0.0658)		(0.0255)	(0.0236)
Marital Status (Widowed)	0.6434***	0.7739***	House Tenure (Lodging)	-0.0825	-0.0253
	(0.0991)	(0.1192)		(0.0866)	(0.1027)
Marital Status (Divorced)	0.5017***	0.5487***	Indoor Flushing Toilet (Yes) shared	-0.0575	-0.0595
	(0.0884)	(0.1077)		(0.0621)	(0.0429)
Marital Status (Separated)	0.5114***	0.6858***	Indoor Flushing Toilet (No)	0.0659*	0.0528
	(0.1546)	(0.1778)		(0.0375)	(0.0716)
Primary school	-0.5379***	-0.5204***	Type of Fuel (Coal)	0.0400	0.0121
	(0.0477)	(0.0528)		(0.0298)	(0.0343)
High school	-0.8715***	-0.8542***	Type of Fuel (Natural Gas)	-0.0676**	-0.0697**
	(0.0622)	(0.0712)		(0.0357)	(0.0372)
Higher education level	-1.042***	-1.087***	Type of Fuel (Fuel-Oil)	-0.1606	-0.1604
	(0.0688)	(0.0817)		(0.1579)	(0.1728)
Job Status (Employee Part Time)	0.3540***	0.3748***	Type of Fuel (Electricity)	-0.1623**	-0.1054**
	(0.0399)	(0.0459)		(0.0793)	(0.0429)
Job Status (Self-Employed Part Time)	0.2081***	0.2097**	Type of Fuel (Dried cow dung)	0.1978***	0.0907***
	(0.0751)	(0.0878)		(0.0545)	(0.0318)
Unemployed	0.4228**	0.4290**	Piped Water (No)	0.1301**	0.1238*
	(0.2059)	(0.2024)		(0.0636)	(0.0699)
Retired	1.210*	1.122*	Number of Observations	82,796	41,711
	(0.6164)	(0.5811)			
Occupation code (Professionals)	-0.1130*	-0.1410*	LR Chi Square	6,396.05	6,756.20
	(0.0606)	(0.0788)		[0.000]	[0.000]
Occupation code (Clerical Support Workers)	0.0837	0.1184	MWTP	(17.79;20.46)	(18.21;20.78)
	(0.0626)	(0.0756)			
Occupation code (Skilled agricultural,	0.1140**	0.1093**			
forestry and fishery workers)	(0.0480)	(0.0543)			
House Size	-0.0013**	-0.0009**			
	(0.0005)	(0.0004)			

Standard errors between brackets, p-values between square brackets, ***, ** and * indicate significance at 1%, 5% and 10% level.

Table 8. Two Stages Least Squares Estimates for Non-Movers

Variables	2SLS	Variables	2SLS
Household Income	-0.1291***	Household Type (2 ad., no dep, children < 65)	-0.0971**
	(0.0080)		(0.0468)
Air Pollution	0.1304**	Household Type (2 ad., no dep. children, at least one adult 65 years or more)	0.0809*
	(0.0594)		(0.0417)
Noise Pollution	0.1569**	Household Type (2 ad. with one dep. child)	-0.0982**
	(0.0723)		(0.0447)
Age	0.0203***	Household Type (2 ad. with two dep. children)	-0.0927**
	(0.0005)		(0.0402)
Marital Status (Single)	0.0202	House Tenure (Tenant)	0.0167
	(0.0189)		(0.0152)
Marital Status (Widowed)	0.2242***	House Tenure (Lodging)	-0.0032
	(0.0377)		(0.0332)
Marital Status (Divorced)	0.1712***	Indoor Flushing Toilet (Yes) shared	-0.0075
	(0.0341)		(0.0169)
Marital Status (Separated)	0.1257*	Indoor Flushing Toilet (No)	0.0138
	(0.0647)		(0.0236)
Primary school	-0.2673***	Type of Fuel (Coal)	-0.0198
	(0.0174)		(0.0144)
High school	-0.3949***	Type of Fuel (Natural Gas)	-0.0289
	(0.0242)		(0.0275)
Higher education level	-0.4340***	Type of Fuel (Fuel-Oil)	-0.0887
	(0.0273)		(0.0613)
Job Status (Employee Part Time)	0.1380***	Type of Fuel (Electricity)	-0.1296***
	(0.0164)		(0.0377)
Job Status (Self-Employed Part Time)	0.0869***	Type of Fuel (Dried cow dung)	0.1092***
	(0.0302)		(0.0331)
Unemployed	0.1904*	Piped Water (No)	0.0484*
	(0.1064)		(0.0249)
Retired	0.6814**	Number of Observations	60,224
	(0.3455)		
Occupation code (Professionals)	-0.0538**	R Square	0.1501
	(0.0234)		
Occupation code (Clerical Support Workers)	0.0245*	Sargan statistic over-identification test Chi Square statistic	1.768
	(0.0134)		[0.1837]
Occupation code (Skilled agricultural, forestry and fishery workers)	0.0850***	Cragg-Donald Weak identification test Wald F-statistic	94.136
	(0.0251)		[0.000]
House Size	-0.0003***	MWTP	(23.00;27.67)
	(0.0001)		

Standard errors between brackets, p-value between square brackets, ***, ** and * indicate significance at 1%, 5% and 10% level.

Table 9. Three Stages Least Squares Estimates for Non-Movers

Variables	Exogenous	Endogenous
Household Income	-0.1171***	-0.1170***
	(0.0046)	(0.0046)
Air Pollution	0.1181**	0.1237**
	(0.0538)	(0.0537)
Noise Pollution	0.1392**	0.1489**
	(0.0674)	(0.0677)
MWTP	(19.21;22.66)	(20.13;24.24)

Standard errors between brackets, *** and ** indicates significance at 1% and 5% level

Table 10. GMM System Estimates for Non-Movers

Variables	(1)	(2)	(3)
Household Income	-0.1470***	-0.1471***	-0.1468***
	(0.0048)	(0.0048)	(0.0048)
Household Income	-0.1268***	-0.1255***	-0.1296***
	(0.0013)	(0.0084)	(0.0092)
Air Pollution	0.1081***		0.1229***
	(0.0099)		(0.0109)
Noise Pollution		0.1449***	0.1367***
		(0.0385)	(0.0457)
Number of Observation		47,965	
Wald chi square	8,869.59	8,687.05	7,515.24
	[0.000]	[0.000]	[0.000]
Arellano-Bond test for AR(2)	-0.93	-1.08	-0.32
	[0.350]	[0.278]	[0.752]
Sargan test of over-identification restrictions	15.52	19.98	9.73
	[0.689]	[0.396]	[0.940]
Sargan test of weak instruments	4.19	6.94	1.09
	[0.522]	[0.225]	[0.955]
MWTP	(18.42)	(24.95)	(20.49;22.79)

Standard errors between brackets, p-value between square brackets, ***, indicate significance at 1%, level.

Table 11. Random Effects Generalized Logit Model for Non-Movers

Variables	Class 2	Class 3	Class 4	Class 5
Household Income	-0.2372***	-0.3084***	-0.3682***	-0.4593***
	(0.0212)	(0.0169)	(0.0253)	(0.0949)
Air Pollution	0.1893***	0.2007***	0.2510***	0.3138***
	(0.0275)	(0.0351)	(0.0218)	(0.1019)
Noise Pollution	0.1877***	0.2745***	0.2797***	0.4965***
	(0.0319)	(0.0248)	(0.0401)	(0.1512)
Age	0.0487***	0.0575***	0.0506***	0.0468***
	(0.0013)	(0.0009)	(0.0015)	(0.0060)
Marital Status (Reference Married)				
Marital Status (Single)	0.1764***	0.3556***	0.1536**	-0.0826
	(0.0336)	(0.0361)	(0.0623)	(0.2511)
Marital Status (Widowed)	0.8960***	0.7636***	0.3101***	0.2097*
	(0.1948)	(0.0801)	(0.1021)	(0.1096)
Marital Status (Divorced)	0.3770***	0.6927***	0.6867***	0.4945
	(0.1033)	(0.0701)	(0.1008)	(0.3411)
Marital Status (Separated)	0.5174***	0.7793***	0.6328***	0.2676
	(0.1936)	(0.1184)	(0.1774)	(0.7706)
Education Level (Reference Illiterate)				
Primary school	-0.5550***	-0.5989***	-0.5678***	-0.3985***
	(0.0680)	(0.0322)	(0.0386)	(0.1419)
High school	-0.8222***	-0.9649***	-1.078***	-1.215***
	(0.0756)	(0.0473)	(0.0787)	(0.0331)
Higher education level	-0.9945***	-1.214***	-1.422***	-2.459***
	(0.0805)	(0.0569)	(0.1101)	(0.0548)
Job Status (Reference Empl. Full Time)				
Job Status (Employee Part Time)	0.1232***	0.3906***	0.4562***	0.6149***
	(0.0440)	(0.0293)	(0.0389)	(0.1373)
Job Status (Self-Employed Part Time)	0.2669***	0.4237***	0.4437***	0.8263***
	(0.0801)	(0.0519)	(0.0715)	(0.2557)
Unemployed	0.2551	0.5632*	1.006***	0.8121*
	(0.2084)	(0.3191)	(0.3282)	(0.4411)
Retired	0.5329	1.242	1.983***	2.904**
	(0.6381)	(0.8381)	(0.0728)	(1.141)
Occupation code (Reference Managers)				
Occupation code (Professionals)	-0.0060	-0.0698	-0.0137	0.5962
	(0.0572)	(0.0613)	(0.1361)	(0.5529)
Occupation code (Clerical Support	0.0787	0.1502***	0.1432	0.1616
Workers)	(0.0595)	(0.0570)	(0.1120)	(0.4384)
Occupation code (Skilled agricultural,	0.1773***	0.1135***	0.0983	-0.3617
forestry)	(0.0527)	(0.0404)	(0.0688)	(0.2585)

Table 11 (cont.) Random Effects Generalized Logit Model

Variables	Class 2	Class 3	Class 4	Class 5
House Size	-0.0018***	-0.0008*	-0.0015**	-0.0046*
	(0.0005)	(0.00045)	(0.0007)	(0.0024)
Household Type (Reference Single Person)				
Household Type (2 ad., no dep, children < 65)	-0.1609	-0.0510	-0.2161*	-0.7462**
	(0.1030)	(0.0875)	(0.1189)	(0.0362)
Household Type (2 ad., no dep. children, at least one adult 65 years or more)	0.4936***	0.1520**	0.2163*	-0.7054**
	(0.1577)	(0.0774)	(0.1241)	(03386)
Household Type (2 ad. with one dep. child)	-0.2401**	-0.0612*	-0.1701	-0.9498***
	(0.1023)	(0.0311)	(0.1218)	(0.3534)
Household Type (2 ad. with two dep. children)	-0.1930*	-0.1122*	-0.2618**	-0.6276*
	(0.1016)	(0.0663)	(0.1213)	(0.3419)
House Tenure (Reference Owner)				
House Tenure (Tenant)	-0.0339	-0.0130	-0.1370	0.7457
	(0.0305)	(0.0262)	(0.1717)	(0.5424)
House Tenure (Lodging)	0.0541	-0.0351	-0.0477	0.1849
	(0.0829)	(0.0807)	(0.0456)	(0.1801)
Flushing Toilet (Reference Yes for sole use of the household)				
Indoor Flushing Toilet (Yes) shared	-0.0637	-0.0138	-0.0510	-0.1073
	(0.0396)	(0.0446)	(0.0415)	(0.1598)
Indoor Flushing Toilet (No)	0.0065	0.0734**	0.0603	-0.3027
	(0.0610)	(0.0270)	(0.0636)	(0.2517)
Type of Fuel (Reference Wood)				
Type of Fuel (Coal)	-0.0348	-0.0435*	-0.0021	0.0242
	(0.0326)	(0.0236)	(0.0349)	(0.1346)
Type of Fuel (Natural Gas)	-0.1136*	-0.1316**	-0.1487	-0.5030
	(0.0579)	(0.0512)	(0.0959)	(0.4136)
Type of Fuel (Fuel-Oil)	-0.3201**	0.0538	-0.8696**	-0.6311
	(0.1332)	(0.1337)	(0.4234)	(0.5056)
Type of Fuel (Electricity)	-0.3646***	-0.3361***	-0.2097	-0.2118
	(0.0776)	(0.0712)	(0.1345)	(0.3059)
Type of Fuel (Dried cow dung)	0.2092***	0.1238***	0.1140**	0.2316
	(0.0535)	(0.0398)	(0.0553)	(0.2217)
Piped Water (No)	0.0157	0.0485	0.0956*	0.2260**
	(0.0630)	(0.0258)	(0.0577)	(0.1128)
Number of Observations	84,640			
LR Chi Square	22,828.55			
	[0.000]			
MWTP	(13.44; 13.20)	(13.49; 15.88)	(12.48; 12.28)	(6.63;10.12)

Standard errors between brackets, p-values between square bracket, ***, ** and * indicates significance at 1%, 5% and 10% level.

Table 12. Robustness Checks for Non-Movers

Panel A:Urban-Rural Areas				
	Urban		**Rural**	
Household Income	-0.1184***	-0.1178***	-0.1483***	-0.1481***
	(0.0125)	(0.0125)	(0.0140)	(0.0142)
Air Pollution	0.1038***		0.1549***	
	(0.0120)		(0.0236)	
Noise Pollution		0.1178***		0.1802***
		(0.0133)		(0.0400)
MWTP	21.59	25.88	14.56	17.34
Panel B: Gender				
	Male		**Female**	
Household Income	-0.1265***	-0.1258***	-0.1264***	-0.1255***
	(0.0093)	(0.0093)	(0.0185)	(0.0185)
Air Pollution	0.1095***		0.1194***	
	(0.0106)		(0.0272)	
Noise Pollution		0.1334***		0.1136***
		(0.0121)		(0.0283)
MWTP	19.16	23.51	20.05	19.39
Panel C: Age Groups				
	15-24	**25-34**	**35-44**	**45-54**
Household Income	-0.0677***	-0.1067***	-0.1475***	-0.1306***
	(0.0338)	(0.0224)	(0.0206)	(0.0259)
Air Pollution	0.0842**	0.0721***	0.1011***	0.1196***
	(0.0422)	(0.0244)	(0.0236)	(0.0348)
Noise Pollution	0.0972*	0.0813***	0.0856***	0.1271***
	(0.0523)	(0.0270)	(0.0269)	(0.0401)
MWTP	(26.13; 30.17)	(14.49;16.34)	(15.04; 12.73)	(22.32;23.72)
Panel D: Age Groups and Quadratic Income				
	55-64	**65 and older**	**Quadratic Income**	
Household Income Linear Term	-0.1203***	-0.1222***	-0.4567***	-0.4610***
	(0.0447)	(0.0397)	(0.0886)	(0.0889)
Household Income Quadratic Term			0.0238***	0.0241***
			(0.0045)	(0.0045)
Air Pollution	0.0950**	0.1134***	0.1122***	
	(0.0421)	(0.0401)	(0.0089)	
Noise Pollution	0.1104**	0.1524**		0.1303***
	(0.0504)	(0.0680)		(0.0102)
MWTP	(15.94; 18.52)	(19.57;24.96)		

Standard errors between brackets, ***, ** and * indicates significance at 1%, 5% and 10% level.

Table 13. Adapted Probit Fixed Effects Controlling for Weather for Non-Movers

Variables	
Household Income	-0.1306***
	(0.0077)
Air Pollution	0.1088***
	(0.0092)
Noise Pollution	0.1273***
	(0.0099)
Average Temperature	-0.0061***
	(0.0016)
Wind Speed	0.00033**
	(0.00015)
Humidity	0.0019***
	(0.0006)

Standard errors between brackets, *** and ** indicates significance at 1% and 5% level

Table 14. Pooled and Panel Conditional Fixed Effects Logit Models for Chronic Illnesses

Model	(1)	(2)	(3)	(4)
Variables	**Panel A: Pooled Logit**			
Household Income	-0.1552***	-0.1517***	-0.0964***	-0.1749***
	(0.0155)	(0.0177)	(0.0240)	(0.0329)
Air Pollution	0.2445***	0.2343***	0.1310*	0.2797***
	(0.0199)	(0.0230)	(0.0722)	(0.0404)
Noise Pollution	0.2448***	0.2693***	0.1507	0.1667***
	(0.0226)	(0.0263)	(0.1062)	(0.0457)
Number of Observations	112,338	84,640	747	26,937
LR Chi Square	18,192.63	13,987.61	206.32	4,147.24
	[0.000]	[0.000]	[0.000]	[0.000]
Pseudo R Square	0.1506	0.1523	0.2474	0.1479
MWTP	(17.58;18.00)	(16.05;17.63)	(17.03;17.24)	(18.72;13.74)
	Panel B: Panel Fixed Effects Logit			
Household Income	-0.1548***	-0.1755***	-0.5263	-0.1102**
	(0.0219)	(0.0251)	(0.5739)	(0.0471)
Air Pollution	0.2582***	0.2476***	1.077	0.2955***
	(0.0273)	(0.0316)	(0.7123)	(0.0560)
Noise Pollution	0.2504***	0.2770***	-0.5442	0.1653***
	(0.0308	(0.0357)	(0.7776)	(0.0629)
Number of Observations	50,141	38,182	368	11,778
LR Chi Square	6,742.80	5,167.78	145.17	1,619.47
	[0.000]	[0.000]	[0.000]	[0.000]
Pseudo R Square	0.1774	0.1795	0.5201	0.1825
MWTP	(37.07;33.51)	(29.65;32.59)	(36.49;28.67)	(56.81;32.16)

Standard errors between brackets, p-values between square brackets, *** and ** indicates significance at 1% and 5% level
In column (1) the results refer to total sample, column (2) to non-movers, column (3) to movers for environmental reasons and column (4) to movers for other reasons.

Table 15. Estimates of Poor Health Effects on Work Hours Lost, Moving Status and Wages

Model	Total Sample	Non-Movers	Total Sample	Non-Movers
Panel A: Fixed Effects DV Log of Working Hours Lost				
Household Income	-0.2877**	-0.2651***	-0.1929**	-0.1891***
	(0.1141)	(0.1010)	(0.0779)	(0.0903)
Health Status (Poor)	1.3435**	1.5516**		
	(0.6408)	(0.7141)		
Chronic Illnesses (Yes)			1.3768**	1.2939**
			(0.5377)	(0.5917)
Panel B: Fixed Effects Logit Moving Status DV Moving in the next 6 months				
Household Income	-0.0285**	-0.0324***	-0.0640***	-0.0696***
	(0.0114)	(0.0113)	(0.0162)	(0.0161)
Health Status (Poor)	0.0643***	0.0659***		
	(0.0158)	(0.0223)		
Chronic Illnesses (Yes)			0.0499***	0.0407***
			(0.0162)	(0.0148)
Panel C: Fixed Effects for Wage DV Log of Wage				
Health Status (Poor)	-0.1174***	-0.1189***		
	(0.0087)	(0.0089)		
Chronic Illnesses (Yes)			-0.0872***	-0.0859***
			(0.0090)	(0.0104)

Standard errors between brackets, p-values between square brackets, *** and ** indicate significance at 1% and 5% level

Table 16. Estimates of Noise and Air Pollution on House Rents and Housing Maintenance Expenses

Model	(1)	(2)	(3)	(4)
Panel A: Fixed Effects Model DV Log of House Rents				
Household Income	0.1697***	0.1628***	0.4087***	0.1855**
	(0.0104)	(0.0130)	(0.0857)	(0.0170)
Air Pollution	-0.0237***	-0.0370***	-0.0814*	-0.0055
	(0.0103)	(0.0129)	(0.0464)	(0.0179)
Noise Pollution	-0.0453***	-0.0512***	-0.0919*	-0.0353*
	(0.0113)	(0.0145)	(0.0542)	(0.0186)
Panel B: Fixed Effects Model DV Log of Housing Maintenance Expenses				
Household Income	0.2729***	0.2763***	0.2890***	0.2606***
	(0.0039)	(0.0045)	(0.0561)	(0.0080)
Air Pollution	0.0430***	0.0489***	0.0508	0.0239***
	(0.0041)	(0.0047)	(0.0712)	(0.0084)
Noise Pollution	0.0274***	0.0264***	0.0783	0.0345***
	(0.0046)	(0.0054)	(0.0630)	(0.0092)
	(.0219; - .001814)	(.0322; - .0012)	(.02503; - .00122)	(.0350; - .00050)

Standard errors between brackets, p-values between square brackets, *** and * indicates significance at 1% and 10% level
In column (1) the results refer to total sample, column (2) to non-movers, column (3) to movers for environmental reasons and column (4) to movers for other reasons.