Health Impairments, Work Limitations & Earnings

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Abstract: Our analysis is based on the 2008 Athens Area Study and exploits detailed information regarding health impairments and labor market outcomes for Greek males. Distinguishing between healthy and heath-impaired employees who have or do not have work limitations, the unobserved productivity effect of health is separated from discrimination. We then estimate a regression model that includes terms to correct the employment selection and endogenous stratification on self-reported health condition. A penalty for productivity limitation exists. Evidence of wage discrimination is also found. Both findings are statistically significant and highlight the necessity of instituting active policies against unequal treatment.

JEL Classification: I1, J2, J3
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1. Introduction

People with health impairments are at risk of social exclusion because of the physical, financial, and attitudinal barriers that they face in the labor market. Findings from the United States and Great Britain indicate that the unemployment probabilities of those with health problems are higher than those of individuals without health problems, while those who are employed earn less (Johnson and Lambrinos, 1985; Baldwin and Johnson, 1994, 2000; Kreider, 1999; Kidd *et al.,* 2000; DeLeire, 2001; Acemoglu and Angrist, 2001; Campolieti, 2002; Kruse and Schur, 2003; Jones *et. al*., 2006). Ill health, however, is a restriction or inability rather than a demographic characteristic, and there is not a single, consistently used definition or method for classifying it. Hence, pledge generalizations are not the case[1].

The economic analysis of workers living with ill health within the labor market has been neglected in Greece. An illuminative exemption is the 2002 study undertaken by the General Secretarial of National Statistical Service of Greece, but this study lacks wage data. The main findings suggest that 16.2% of the total populations are health impaired, and among them, 83% are economically inactive as compared to the 58% of the total population. Half of them, 53.6%, claim employment problems due to their health status, and 40.2% feel that they are socially excluded. These figures are especially striking when considered in the context of recent legislative and other reforms aimed at securing improvements in the labor market position of health-impaired and disabled individuals. In 2005, Greece adopted the European Antidiscrimination Directive (EC/78/2000), perceived as a hallmark in the quest of individuals with ill health for equal access to labor market opportunities. The national Antidiscrimination Legislation (3304/2005) helps to protect people with health problems against discrimination in the workplace. Protection is provided against discrimination in recruitment, employment, dismissal and the like for a reason related to ill health. A failure to comply with these requirements is itself an act of unlawful discrimination unless it can be justified by a reason that is both material to the circumstances of the case and substantial[2].

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[1] A Eurostat (2002) study shows that health status is not evenly distributed; with each step up the socioeconomic ladder, groups are less vulnerable to disease, ill health and premature death. Genetics, the physical environment and early childhood experiences all influence overall population health in addition to the socioeconomic environment. Perceptions can also differ for each culture, thus making comparisons more or less irrelevant.

[2] Defenses include the extent of the employer's financial and other resources, the costs of making the adjustments and the extent to which other activities would be disrupted.

The aim of the current research is to examine for the first time in Greece to what extent differences in earnings for health-impaired male workers can be attributed to productivity differences and/or discrimination. Work productivity is an important determinant of labor force behavior. Unlike minority groups that are afforded protection under the law, persons with health impairments are likely to have health problems that limit their capacity for some types of work and their earnings (Baldwin and Johnson, 1994). In the current research, as in DeLeire (2001) and Jones *et al*. (2006), to distinguish between productivity differences and discrimination against health impaired people, the Athens Area Study 2008 sample separates individuals into three groups: the healthy, the health-impaired who report that their health status limits their work capacity in a sense that affects the type and amount of work that they can do; and the health-impaired who report that their productivity at work is unaffected by their health condition.

Following Jones *et al.*'s (2006) reasoning, assuming that health-impaired employees with no work limitations do not have lower productivity relative to healthy workers as a result of their health status, we can interpret the assigned wage difference as an estimate of discrimination. However, if the degree of discrimination is assumed to be the same between health-impaired employees having work limitations and health-impaired employees having no work limitations, the wage penalty of the work-limited group less the measure of discrimination for the non-work-limited group may be considered as an estimate of the lower productivity of the group having work limitations relative to the healthy group that is not captured by the measured characteristics included in the empirical model. Thus, to advocate for the existence of discrimination against health-impaired workers, intermediate steps should be followed.

Some studies, including Nagi (1979) and Stern (1989), have concluded that self-reports of health conditions are unbiased. However, whether an individual has a health problem and whether it is work limiting are both subjective, and there may be social and economic incentives to misreport health status (Bound, 1991). This major complicating factor, which has received growing attention, is the endogeneity of self-assessed health measures. Much of the literature suggests that we should be especially skeptical about non-workers' responses to questions about health status since certain incentives may lead them to systematically over-report the extent to which a health condition limits their work capacity. Health-related work limitations may be one of the few socially acceptable reasons for men younger than normal retirement age to be out of the labor force. Furthermore, the subjective nature of self-reported health also means that the responses may not strictly be comparable across individuals, and measurement errors are possible, which may also render health measures endogenous.

In the current research, by using detailed information on objective health conditions available in our sample, we are able to consider the potential bias associated with self-reported health status when estimating the impact of health impairments on the labor market for the entire working age population. This is an application of the well-known switching regression model proposed by Lee *et al.* (1980), Maddala (1983), and Amemiya (1985) and discussed heavily in the applied literature. In the current modeling, we also have to deal with sample selection bias associated with individuals' employment/unemployment status by utilizing Heckman's (1974) selection model. Without controlling for sample selection, any differences in the employment probabilities may actually be confounded by variations between characteristics that affect individuals' labor supply decisions.

The present research makes an important conceptual contribution to our understanding of health-impaired people in the Greek labor market. In identifying the statistical effect of health status on income, we aim to provide a richer empirical backdrop for further analysis of wage gaps and antidiscrimination policy. The rest of the paper is divided into five sections. The next section describes the data sources. Section 3 presents the descriptive statistics. Section 4 describes the model and estimation procedures. Section 5 presents the estimations, followed by a discussion and conclusions.

2. Data Set

The data were gathered from March to December 2008 in Athens, the capital of Greece, as part of the Athens Area Study (AAS) conducted by the University of Piraeus, University of Central Greece and Panteion University of Social and Political Sciences. The 2008 AAS is one component of the Multi-City Study of the Scientific Center for the Study of Discrimination (SCSD). The current AAS consists of telephone-based surveys that were administered to approximately 8,700 households. Males in each household were randomly selected to provide information on a variety of demographic characteristics. The interviews were restricted to employed and unemployed [3] respondents aged 18 to 65 years. Wage is measured as a continuous variable. The AAS constructed an hourly wage measure by dividing the last month's wages, called NLHN, by self-reported working hours per month. Surveyors asked, "What is your best estimate of your wage last month before taxes and other deductions?" The earnings variable is the natural logarithm of hourly earnings.

In the current study, we use self-reported information on specific health conditions. There are three types of individuals in our sample. The healthy (non-impaired) people are represented by N, the health-impaired people having work limitations are represented by D^{WL}, and the health-impaired people having no work limitations are represented by D^{NWL}. Respondents were asked about the presence of work limitations in the following question: "Do you have a long run, over 12 months, health condition that limits the kind or amount of work you can perform?" Individuals were also asked: "Do you have a long run, over 12 months, health condition that does not limit the kind or amount of work you can perform?" The type of variable used to control for health status is of crucial importance since the results for some of the economic variables of interest, as well as the estimates of the effect of health status, will depend on the nature of the health variable used in the analysis. Individuals may have an impairment that they do not perceive to be work limiting and, as such, a work-limiting health status measure may underestimate the number of people with ill health and the employment and wage rate for the health-impaired[4] population as a whole (Burkhauser et. al., 2002; Dave et al., 2008).

The sample includes additional information regarding a broad list of functional activities (FA) and other limitations in daily activities (DA) and instrumental activities (IA) as explanatory variables because of their potential productivity-related limitations. The main advantage of such questions is that they give direct information on work ability and are extensively used in labor market analysis (Kruse and Schur, 2003; Hollenbeck and Kimel, 2008). Moreover, the focus on chronic illnesses is important in the context of employment given the link between work and leisure. Additional

[3] We define unemployed as a person who is available to work and seeking work but currently without work.

[4] Notice that, in addition to the severity of the impairment, whether a health problem is work limiting will depend on a range of factors ,including an individual's own employment opportunities, the accessibility of workplace technological advances, changes in the nature of employment and labor market conditions (Baldwin and Johnson, 2001; Kruse and Hale, 2003; Kruse and Schur, 2003).

indicators are defined separately for whether the respondent reported that he has been diagnosed with the following illnesses: diabetes (DIA); heart disease (HEA); arthritis (ART); psychological problem (PSY); and cancer (CAN). In this study, we also incorporate the presence of disability/heath status benefits, which is defined as DB.

There are numerous factors besides health conditions that may influence wage levels. To isolate the effect of health impairments on wages, we must appropriately control for all other factors that affect wages and correlate with health. Some of these factors pertain to respondent productivity. The productivity variables used in the study are age, education, fluency in the Greek language, and occupation. The variable AGE measured the respondent's age in years. To allow for a non-linear relationship between wage and age, the square of age (AGESQ) was included in the regression. The variable MARR was set to one if the respondent was married and zero otherwise. The variable CHIL measured how many children each respondent has. The variable HOMEM measured the respondent's household members. The variable IMM was set to one if the respondent was an immigrant (non-Greek) and zero otherwise. The variable FLUEN was equal to one if the respondent spoke the Greek language well or very well and zero otherwise.

The variable SCHOL was set to one if the respondent had completed the minimum mandatory education level, and it was zero otherwise. The variable GRAD was set to one if the respondent had graduated from high school and zero otherwise. The variable UNIV was set to one if the respondent had a university or technical school diploma and zero otherwise. The coefficients of these variables measure the effects of degree completion compared to workers who did not attain a comparable educational level. The variable PC was set to one if the respondent had computer skills (ECDL diploma) and otherwise it was zero. The variable ENGL was set to one if the respondent had knowledge of English and zero otherwise (FCE diploma). The variable DRIV was set to one if the respondent had a driving license and zero otherwise.

The variable EXPER measures the respondent's total years of working experience. For reasons discussed above, we also included the square of experience (EXPERSQ). Three dummy variables for occupational categories were included in the analysis. The variable WHITE was set to one if the respondent's occupation was considered white-collar, and otherwise it was zero. The variable BLUE was set to one if the respondent's occupation was considered blue-collar, and otherwise it was zero. The variable SERV was set to one if the respondent's occupation was considered a service occupation, and otherwise it was zero. For greater occupational control, two additional variables were considered. The variable PUBL was set to one if the worker was employed in the public sector and zero otherwise. The variable PRIV was set to one if the worker was employed in the private sector and zero otherwise. In addition, the variable IC was set to one if the employee had insurance coverage and zero otherwise[5]. Finally, the dummies MON_1 to MON_10 represent common time effects (10 months). As interviews were conducted over a period of ten months, it was necessary to control for common time effects via time dummies. For convenience, variables' definitions are summarized in the Appendix, Table I.

3. Descriptive Statistics

Our sample of adults consists of 7,071 healthy people (81.01%), 735 health-impaired people having work limitations (8.42%) and 922 health-impaired people having no work limitations (10.56%). At first glance, Table II, in the Appendix, the hourly wages of health-impaired men having work limitations seem to be slightly higher than those of both health-impaired men having no work limitations and healthy men. To correctly interpret this measurement, notice that the mean age differs significantly among the subgroups. Health-impaired people are significantly older, reflecting the fact that many impairments are age-related, which is one explanation for the higher mean pay levels of the health-impaired individuals with work limitations. Considering the age difference, health-impaired workers having no work limitations were found to have a greater chance of being married than health-impaired workers having work limitations and healthy workers. The group of workers with the highest rate of marriage also proved to have more children than the other groups. In addition, health-impaired workers' households consisted of more members than healthy workers'. The differences, however, are relatively small.

The number of years that healthy and health-impaired employed men devote to education is very different. Healthy workers have a greater chance of completing mandatory education, high school, and university/technical school than health-impaired workers. We observe that health-impaired workers with work limitations are less likely to have completed the minimum mandatory education than health-impaired workers

[5] In Greece, employee registration with insurance coverage implies mandatory contribution payments, for both the employer and the employee, based on employee wage level, which can not be lower than the legal minimum wage according to employee characteristic (human capital and marital status).

having no work limitations. As a result, health-impaired workers having work limitations are less likely to have a high school diploma than health-impaired workers having no work limitations and are less likely to have completed a university/technical school program than other groups. Furthermore, health-impaired workers are less likely to have computer skills, English knowledge, and a driving license than healthy workers.

Among employed men, health-impaired workers having no work limitations have more years of working experience than health-impaired workers having work limitations. At the same time, healthy workers have less working experience. Once again, the age differences among the subgroups can explain the assigned trends. A potentially important difference between health-impaired and healthy workers is occupational category. Health-impaired workers having work limitations are more often employed in white collar jobs than health-impaired workers having no work limitations and healthy workers. Only a small fraction of health-impaired workers having work limitations are employed in blue collar jobs, followed by health-impaired workers having no work limitations and healthy workers. The same pattern holds in service occupations.

Health-impaired employees having work limitations are over-represented in the public sector, followed by health-impaired employees having no work limitations and healthy workers. In addition, health-impaired employees having work limitations are less frequently employed in the private sector, followed by health-impaired employees having no work limitations and healthy workers. As our data demonstrate, the chances of being employed by the Government are higher for health-impaired workers. Legislation that potentially affects the costs of either labor force participation or of hiring a group of workers can be expected to impact the labor market of that group. Finally, health-impaired employees are more likely to report having insurance coverage than healthy workers.

Based on Baldwin and Johnson (1994), we exploit the availability in the AAS of detailed reports of chronic conditions. As expected, those conditions - diabetes, heart attack, arthritis, emotional problems, and cancer - are frequently reported for health-impaired employees who are work limited. In addition to chronic conditions, the AAS contains detailed information on the three categories of health and functional, daily living and instrumental activities. Similarly, in all classifications, health-impaired workers who declared having work limitations are likely to face tighter constraints in all such activities.

Focusing on unemployed individuals, we can see that health-impaired people face unemployment at an older age than healthy workers. This outcome is reasonable as health impairments exhibit themselves largely at older ages. Notice also that age discrimination might be prevalent for those groups, further reducing their chances in the market. Among unemployed men, health-impaired individuals having no work limitations are more likely to be married than men in the other two groups. Moreover, due to age differences, health-impaired unemployed men are likely to have more children and household members than healthy unemployed men. Like the healthy employed workers, healthy unemployed people have greater education attainment and more special skills (computer, English and driving knowledge) than health-impaired unemployed people. However, health-impaired unemployed men have more work experiences than healthy unemployed men due to the age difference. In addition, health-impaired unemployed males having work limitations reported more chronic medical conditions, as well as more significant constraints in their daily, instrumental and functional activities than health-impaired unemployed males having no work limitations. As a consequence, health-impaired unemployed people having work limitations receive more disability/health benefits than health-impaired unemployed people having no work limitations.

Health-impaired men having work limitations face a 37.9% unemployment rate. The health-impaired populations having no work limitations are unemployed at a lower rate of 22.3%, while healthy people face an unemployment rate on the order of 10.2%. This result supports previous findings that health-impaired people have higher rates of unemployment than healthy people (Kruse and Schur, 2003; Jones *et. al*., 2006). Importantly, notice that health-impaired unemployed men face a greater chance of having chronic conditions and constraints in everyday life activities than health-impaired employed workers. The low employment rates observed for health-impaired persons could be due in part to the high reservation wages associated with certain types of health conditions as a consequence of the extra demands on time and energy required to participate in the labor force and disability/health income transfers.

Individuals suffering from health impairments will incur a large cost to enter the labor market as, holding all else constant, greater effort or sacrifices must be made relative to healthy workers. The net result is that fewer health-impaired people will choose to enter the labor market, ceteris paribus. Low employment rates might also be due to the low market wage rates offered to the health-impaired as a consequence of lower levels of productivity and/or employment discrimination (Kruse and Schur, 2003). A mere perception of lower productivity or greater difficulty of predicting a health-impaired worker's productivity will reduce the likelihood of the individual being hired. The existence and expectation of discrimination may also affect the decisions of the health-impaired with regard to participation and investment in education and skills, resulting in the health-impaired having inferior characteristics in the labor market. Pre-labor market discrimination could also influence the characteristics of the health-impaired.

4. Modeling

There are a number of theoretical links between health status and work that suggest that better health improves labor outcomes (Becker 1965, 1966). The standard labor market economics model assumes that individuals select the combination of consumption and hours of work that maximizes their utility, subject to budget and time constraints. Health may be incorporated into the standard model through the budget constraints; through the time constraint via a lower wage offer; via more absences, reducing time available for work; or through the utility function itself if poor health reduces utility (Etlner, 2000).

Our empirical work is based on the standard human capital wage equation developed by Mincer (1974). We develop our estimates by systematically modifying the Mincer Equation. The wage equations written below relate the calculated wages to dummy variables for the demographic and control variables. We use the natural logarithm of the wage variable, which increases the efficiency of estimation because it increases the extent to which the variable approximates a Gaussian distribution. It also allows for an easier interpretation of the coefficients as percentages.

Equations (1) and (2) present a linearly estimable specification of this basic model estimated by work-limited and non-work-limited health status, respectively:

$$\ln W_{WD_i/N_i} = a_1 + b_1 \mathrm{X}_i + g_1 D_{WD_i} + e_{1i} \qquad (1)$$

$$\ln W_{NWD_i/N_i} = a_2 + b_2 \mathrm{X}_i + g_2 D_{NWD_i} + e_{2i} \qquad (2)$$

where W_i = hourly wage of individual i; X_i = vector of characteristics that describe individuals and that are thought to be related to wages; D_{WD_i} = dummy variable that equals 1 if the individual has a work limitation based on his ill health (WD_i) and 0 if the worker is healthy (N_i); D_{NWD_i} = dummy variable that equals 1 if the individual is in ill health but it is not work limiting (NWD_i) and 0 if the worker is healthy (N_i); $\alpha_1, \alpha_2, \beta_1, \beta_2, \gamma_1, \gamma_2$= parameters to be estimated by the OLS model; and $\varepsilon_{1i}, \varepsilon_{2i}$, = error terms. The key variables of interest are the dummy variables indicating that the worker is in poor health; D_{WD_i} and D_{NWD_i}. Following Halvorsen and Palmquist (1980), the percentage impact on wages given the presence of the characteristic represented by the dummy variable must be measured using the formula $100y = 100\{\exp(y) - 1\}$, where ψ = the relative effect on wages and y = the dummy variables' coefficient.

In any study, isolating unbiased outcomes requires attention to unobserved heterogeneity. In the current study, we addressed this issue as it relates to the effects of health and potential employment heterogeneity by estimating a preliminary employment equation in order to construct an Inverse Mills Ratio term that will serve as a statistical correction when estimating wage equations for only individuals with observed wages[6] (called LAMBDA_1). An estimation procedure proposed by Heckman (1974) was applied, which translates sample selection into a problem of an omitted variable. It is important to correct for sample selection given that ill health in particular is unlikely to affect a random subset of the population as a whole. Indeed, if wage discrimination against health-impaired workers is substantial and leads those subject to significant discrimination to exit the labor force, the estimate of wage discrimination would be below its true level. This ratio is known as the hazard rate in reliability theory.

Our empirical work relies on the following specification of the Probit model applied to employment, in which the continuous latent variable x_i^*, reflecting preferences for paid work, is expressed as the observed discrete employment outcome:

$$\Lambda_i = 1 \text{ if } x_i^* > 0 \qquad (3)$$
$$= 0 \text{ otherwise,}$$

where $x_i^* = a_3 + b_3 \text{E}_i + g_3 D_i + e_{\Lambda i}$; Λ_i = 1 if individual i participates in the labor market and has positive wages and is 0 otherwise; D_i = health status identification; α_3, β_3, γ_3 are parameters to be estimated by the probit model; and $\varepsilon_{\Lambda i}$ is an error term. The

[6] For instance, the sample in Equation 1 is systematically selected according to the condition $\varepsilon_{1i} > -\alpha_1 - \beta_1 X_i - \gamma_1 D_{WDi}$. As a result, the expected value of the error term is not zero, and the use of OLS generates inconsistent estimates.

variables that are included in the estimation of employment, E_i, but not wages, and that therefore help the model's identification, include, the number of members in the household, and 10 common time effects. We then use the Inverse Mills Ratio, which we denote as $l_i = f(bE_i)/F(bE_i)$, for each observation in the sample of workers, where *f* and *F* are the standard normal and cumulative density.

When an individual's health status is not observable by the data collector, the respondent has a choice to make about whether to report the condition. The incentives the individual faces, both economic and psychological, may affect his reply to the health limitation questions, which means that the self-reported measures will be endogenous. This kind of endogeneity of self-reported measures is likely to amplify the effects of health on employment. The most common empirical strategy for dealing with the endogeneity in these self-reported measures is to use objective health measures that can be used to supplement self-reported health status (Stern, 1989). The explanatory variables that we use to explain and identify health status, besides the individual's age, are the detailed health measurements: functional disabilities, limitations in daily activities and other instrumental activities, the presence of diabetes, heart disease, arthritis, psychological problems, and cancer, as well as the presence of disability/health benefits.

The precise model to be estimated is an endogenous regression model analogous to those described by Maddala (1983) and Amemiya (1985). This method is common in the empirical literature, and we replicate the empirical work in Lee *et. al* (1980), Lee (1983), Dubin and McFadden (1984), and Zhang *et al.* (2009). For empirical convenience, we estimate the work-limitation health model by Conditional Logit as in Hollenbeck and Kimmel (2008). We then create a Mill's ratio term, which is used as an extra regressor in the wage equations (called LAMBDA_2).

Let the observed work-limitation be represented by:

$$T_{ij} = j \text{ if } f^*_{ij} > f^*_{ik} \text{ , for all } k \neq j, \qquad (4)$$

where $f^*_{ij} = m_j S_{ij} + e_{ij}$; f^*_{ij} = is the latent variable describing the propensity of individual i to report work health status j; j = healthy individuals, health-impaired individuals having work limitations, or health-impaired individuals having no work limitations; S_{ij} = vector of characteristics describing i that are thought to be related to the likelihood of reporting status j; m_j = vector of parameters to be estimated by Logit; and ε_{ij}= error term. We assume that the ε_{ij} are independent and identically distributed with a Weibull distribution (see, Hollenbeck and Kimmel, 2008). Then:

$$\Pr ob(T_{ij} = j) = e^{m_i S_{ij}} / \sum_{j=1}^{3} e^{m_j S_{ij}} \qquad (5)$$

and the μ parameters can be estimated by a Maximum Likelihood Logit model. We use the Health-Reporting-Mills, which we denote as $\hat{w}_i$, for each observation in the sample of workers, where $w_i = \hat{P}_i^* \ln(\hat{P}_i)/(1-\hat{P}_i)$, and $\hat{P}_i$ = predicted probability. Although chronic illness and activities do not appear in the wage and selection equations, they still indirectly impact the respondents' wage and employment through the endogenous health variables.

Equations (6) and (7) present the wage regressions above, which include correction terms to adjust the employment selection correction term, as well as the endogenous stratification on reported health status:

$$\ln W_{WD_i/N_i} = a_1 + b_1 X_i + g_1 D_{WD_i} + v_1 \hat{l}_i + h_1 \hat{w}_i + e_{1i} \qquad (6)$$

$$\ln W_{NWD_i/N_i} = a_2 + b_2 X_i + g_2 D_{NWD_i} + v_2 \hat{l}_i + h_2 \hat{w}_i + e_{2i} \qquad (7)$$

Estimations of Equations (6) and (7) yield consistent parameter estimates (Amemiya, 1985).

5. Estimations and Discussion

The results of first-stage Probit regressions on employment selection and Conditional Logit regressions on self-reports of health conditions are in the Appendix, Tables III and IV. Table 1, below, presents coefficients from the OLS wage regressions. Panel A documents a large and significant wage gap on the order of 21.1% for health-impaired employees having work limitations relative to healthy employees (see the transformation in Halvorsen and Palmquist, 1980). As shown, health-impaired employees having work limitations have significantly lower monthly earnings than healthy employees. Human capital theory suggests that differences in wages can be explained by differences in workers' education; more educated workers tend to earn

Table 1. Selectivity and Health-Reporting Corrected Wages

	Healthy Employees / vs Health-Impaired Employees having Work-Limitations *Panel A*	**Healthy Employees / vs Health-Impaired Employees having No Work-Limitation** *Panel B*
$D^{WL/NWL}$	-0.211 (0.010)*	-0.116 (0.007)*
AGE	0.072 (0.002)*	0.074 (0.002)*
AGESQ	-0.0006 (0.0000)*	-0.0006 (0.0000)*
MARR	0.046 (0.006)*	0.039 (0.006)*
CHIL	0.032 (0.009)*	0.037 (0.010)*
IMM	-0.029 (0.009)*	-0.012 (0.005)*
FLUEN	0.013 (0.028)	0.011 (0.031)
SCHOL	0.051 (0.011)*	0.052 (0.011)*
GRAD	0.057 (0.006)*	0.059 (0.006)*
UNIV	0.073 (0.005)*	0.070 (0.005)*
PC	0.008 (0.005)	0.003 (0.004)
ENGL	0.010 (0.003)*	0.007 (0.003)*
DRIV	0.037 (0.007)*	0.038 (0.007)*
EXPER	0.021 (0.001)*	0.022 (0.001)*
EXPERSQ	-0.0002 (0.0000)*	-0.0002 (0.0000)*
WHITE	0.019 (0.009)*	0.013 (0.006)*
BLUE	0.008 (0.004)*	0.009 (0.004)*
SERV	0.008 (0.009)	0.009 (0.009)
PUBL	0.005 (0.010)	0.005 (0.010)
PRIV	0.018 (0.010)	0.013 (0.011)
IC	0.010 (0.007)	0.011 (0.017)
INTERCEPT	1.384 (0.053)*	1.384 (0.055)*
LAMBDA_1	1.947 (1.322)	1.604 (1.102)
LAMBDA_2	0.504 (0.359)	0.636 (0.493)
ADJ. R^2	0.334	0.395
N.	7806	7993

*Notes: Standard errors are in parenthesis. *Significant at the 1% level. ** Significant at the 5% level. *** Significant at the 10% level* more because of their increased productivity. To the extent that human capital variables are unable to explain wage differences between groups, the remainder of the assigned differential is generally interpreted as evidence of discrimination. However, in this case, health-impaired employees do have capacity limitations. The 21.1% difference between the healthy workers and health-impaired workers who are limited in terms of their productivity is likely to be due to the combined effects of health incapacity and discrimination.

On the other hand, Panel B documents a significant wage difference on the order of 11.6% against the health-impaired employees with no work limitations relative to the healthy employees. As long as the two groups of workers have no productivity differences, the observed difference can be interpreted as a measure of discrimination against the health-impaired workers having no work limitations. An individual's productivity will not be limited in a job that does not require workers to perform the functions that are affected by his or her health impairments. Even when a job requires the performance of functions that are limited by a worker's medical condition, the limitations may be offset by compensatory technologies or workplace modification. Thus, impairment that limits the amount or kind of work individuals can do, does not necessarily limit their productivity in all jobs for which they are otherwise eligible. Our estimations seem to be in line with other empirical studies. Baldwin and Johnson (1994) distinguished between handicapped and disabled workers and found that 14.7% attributed to discrimination. DeLeire (2001) found that an earnings gap of roughly 5 to 8% was due to discrimination. Jones ***et. al.*** (2006) found comparable evidence of wage discrimination against individuals with chronic medical conditions.

Studying labor market discrimination against persons with health impairments is more difficult than analyzing discrimination against ethnic minorities and women because the characteristics that identify individuals as "persons with ill health" also limit productivity. Following DeLeire (2001) and Jones *et al.* (2006) and assuming that the degree of discrimination is the same among health-impaired employees regardless of their work capacity, then if we subtract the health-based discrimination factor (11.6%) from the wage difference calculated for health impaired employees having work limitations (21.1%), we can estimate that the "productivity penalty" of health-impaired employees having work limitations is on the order of 9.5%. As our estimations show, health-impaired workers face two penalties of similar magnitudes: a productivity penalty resulting from their capacity constraints and a health-based discrimination factor for being in poor health. For convenience, our analysis is summarized in Table 2 below.

Table 2. Discrimination and Productivity Components of the Healthy and Health-Impaired with Work-Limitations Wage Gap

Components	**Coefficients**
- Combined Effects (1) + (2)	21.1%
- (1) Health-based discrimination factor	11.6%
- (2) Productivity penalty	9.5%

With respect to other variables of interest, the results are as expected. Age, marital status, and number of children have positive and statistically significant effects on wages. The variable used to control for immigrant status has a negative and significant impact on earnings in both specifications. On the other hand, fluency in Greek has a positive but insignificant effect on earnings. Work experience has a positive and significant correlation with earnings. Each education variable is positive and significant in each specification. A higher return on education is observed for those with a degree from a university or technical school. Moreover, special knowledge of computers, English, and driving have positive effects on earnings. Concerning the occupation covariates, all but one have positive effects on the dependent variable. In white-collar and blue-collar jobs, we observe positive and statistically significant covariates. The assigned positive effects for service occupations and public and private jobs are statistically insignificant. Those who have insurance coverage earn insignificantly higher wages. The controls for sample selectivity and endogeneity of self-assessed health responses are statistically insignificant in both regressions. This implies the success of the steps taken to deal with these issues, which might have biased the analysis of the return of health-impaired individuals to the labor market. Empirical analysis shows that the signs of the coefficients of the variables that measure human capital are consistent with human capital theory. It is important to keep in mind, however, that numerous factors that should affect the level of wage discrimination, such as the importance of unobservable skills, apparent qualifications, precision of observable skills, and ease of performance measurement, may vary greatly across jobs.

The observed discrimination trend both violates principles that are central to Greek democracy and imposes high costs on health-impaired people. When people and groups are consistently denied equal opportunities, perceive law enforcement as providing little protection, and face discrimination in other aspects of community life, this combination adds up to a powerful recipe for exclusion. As such, it forms the antithesis of inclusion, which is the fundamental notion of integration. Hence, discrimination opposes the interest of equality. Thus, it is interesting to ask how previously proposed theories explain the observed effects associated with health-impaired people. Economic discrimination occurs when persons of equal productivity are offered unequal wages or unequal opportunities for employment. Discrimination can result from prejudice (Becker, 1957) and differential information concerning the average productivity of majority and minority workers (Phelps, 1972; Arrow, 1973).

The basic argument of Becker's discrimination model suggests that health-impaired people potentially face lower earnings. The distaste hypothesis describes discrimination as a preference or taste for which the discriminator is willing to pay. In particular, the taste for discrimination by employers is based on the idea that they want to maintain a physical or social distance from certain groups or they fear that their customers or co-workers will dislike transacting with health-impaired people. Instead of making the common assumptions that employers consider only the productivity of employees, that workers ignore the characteristics of those with whom they work, and that customers care only about the quality of the goods and services provided, Becker suggests that discrimination coefficients incorporate the influence of characteristics unrelated to productivity, such as tastes and attitudes toward health-impaired people.

The statistical theory of discrimination may also explain the lower wages earned by the health-impaired population. The common hypothesis embraced by classical economists is that competition in a capitalist economy decreases the impact of discrimination. Discrimination imposes a cost on the employer, and therefore, a profit-driven employer will avoid racist hiring policies. Statistical discrimination predicts that unequal treatment is a result of a profit-maximizing response by employers to uncertainty about the quality of individual workers (Arrow, 1973). In a world of imperfect information, employers face risks regarding workers' productivity and specific characteristics become inexpensive screening devices. If employers believe that there is a systematic difference between health-impaired people and healthy people in their reliability, aptitude, and job stability, then sufficient conditions exist to create a permanent differential in wages. The beliefs of employers and other influential groups that health-impaired people are less productive can be self-fulfilling. In this situation, discrimination is not the consequence of exogenous preferences, but a result of the profit-maximizing behavior of risk-averse employers. Unlike in the Taste theory, in the Statistical theory, employers' prejudices are irrelevant.

Overall, the outcomes are consistent with the most competing theories of discrimination reviewed in this study. Nevertheless, we have to notice that we have no conclusive evidence to distinguish among these theories. We can only acknowledge that it is speculation as to whether taste, and/or statistical motivations are responsible, and the implications which each has for the differential evidence of discrimination. From a policy perspective, whether taste discrimination, or statistical discrimination plays a major role in wages is significant. If taste discrimination accounts for the unexplained lower wages of health-impaired people, then antidiscrimination legislation may be the only appropriate response. On the other hand, if statistical discrimination is important then better means of assessing workers' productivity may contribute to the reduction of discrimination at the individual or group level. It should be kept in mind, however, that more complicated formulations of the human capital approach have suggested a wider range of factors responsible for determining wage differences between majority and minority workers. For instance, Segmentation Theory made an attempt to demonstrate the roles of workplace practices and organizational levels in creating inequalities and leaving productive potential underutilized (Rubery and Wilkinson, 1994; Rubery, 1995). The issue of health discrimination is then complicated by the wide variety of firm-specific labor markets, the strong influence of occupational factors in determining employment practices and their impact on health-impaired workers' employment positions and prospects, as well as problems associated with making comparisons at the sectoral level across markets[7].

Over the past several years, policy makers have recognized the importance of expanding employment opportunities and eliminating barriers to obtaining employment for health-impaired people. These initiatives represent not only important policy changes, but also a fundamental recognition of the importance of work for people with health impairments. Despite the premise underlying legislation intended to assist people with health impairments, surprisingly, no Greek empirical economics literature exists

[7] Following an anonymous referees' meaningful point we use an interaction term of the dummies of health impairments (D^{WL} / D^{NWL}) with being employed in the public sector (PUBL). Coefficients for the health status variables change only modestly, but an interesting result is found. The wage estimations show positive interaction between health impairments and public sector, each at the 5% level. Thus, one additional factor might identify as a cause of the wage gap is the difference in occupations in which healthy and health-impaired are employed.

that measures discrimination against those groups. This study provides a useful benchmark against which one may judge the potential impact of the antidiscrimination legislation. Our hope is that by carefully formulating alternative motivations for wage differentiation against health-impaired people in the labor market, we have established an adequate foundation for future theoretical and empirical research. The systematic study of employment discrimination against health-impaired people is valuable for both its policy relevance and its potential to inform social scientists and policy makers about the functioning of the labor market.

6. Conclusion

Discrimination against health-impaired people has been totally ignored by the Greek economic literature. In the current study, we report the first estimates of the economic effect of being health impaired in the Greek labor market using the 2008 Athens Area Study. We attempted to examine to what extent differences in labor market outcomes between health-impaired and healthy workers may be attributed to differences in productivity and/or discrimination by using objective long-run illness in a simultaneous equations model of endogenous reported disability and labor force participation. A group of health-impaired workers who self-reported that their productivity is not affected by their impairment was used to measure the effects of discrimination separately from the effects of poor health on wages. A penalty for heath-impaired employees having work limitations exists. Evidence of wage discrimination against health-impaired employees having no work limitations was also observed. Both findings are statistically significant. The discrimination trend is consistent with the Taste and Statistical theories. Currently, health-impaired people do not appear to face a level playing field in the Greek labor market, even three years into the national implementation of European antidiscrimination labor legislation.

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Appendix. Table I. Definitions of Variables

Variable Name	Definition
NLHN	Natural logarithm of hourly wages
AGE	Years of age
AGESQ	Squared years of age
MARR	1 if respondent is married; 0 otherwise
CHIL	Number of respondent's children
HOMEM	Number of members in household
IMM	1 if respondent is an immigrant; 0 otherwise
FLUEN	1 if respondent is fluent in the Greek language; 0 otherwise
SCHOL	1 if respondent has completed minimum mandatory education; 0 otherwise
GRAD	1 if respondent has graduated from a high school; 0 otherwise
UNIV	1 if respondent has university or a technical school diploma ; 0 otherwise
PC	1 if respondent has computer skills (ECDL diploma); 0 otherwise
ENGL	1 if respondent has knowledge of English (FCE diploma); 0 otherwise
DRIV	1 if respondent has a driving license; 0 otherwise
EXPER	Total years of working experience
EXPERSQ	Squared years of working experience
WHITE	1 if respondent's occupation is among managerial or professional specialties, or the respondent works in a technical, sales, or administrative support position; 0 otherwise
BLUE	1 if respondent's occupation is among precision production, craft, or repair occupations, or the respondents works as an operator, fabricator or labourer; 0 otherwise
SERV	1 if respondent is in a service occupation; 0 otherwise
PUBL	1 if respondent is employed in the public sector; 0 otherwise
PRIV	1 if respondent is employed in the private sector; 0 otherwise
IC	1 if employee is registered with insurance coverage; 0 otherwise
$\mathbf{D^{WL}}$	1 if the respondent has a work-limitation; 0 if the respondent is healthy (N)
$\mathbf{D^{NWL}}$	1 if the respondent has a non-work limitation; 0 if the respondent is healthy (N)
FA	1 if the respondent has difficulty, in a sense of limited skills/constraints, performing one or more functional activities, for instance, seeing, hearing, speaking, lifting/carrying, using stairs, walking, or grasping small objects; 0 otherwise
DA	1 if the respondent has difficulty, in a sense of limited skills/constraints, with one or more activities of daily living, for instance, getting around inside the home, getting in or out of bed or chair, dressing, eating and toileting; 0 otherwise
IA	1 if the respondent has difficulty, in a sense of limited skills/constraints, with one or more instrumental activities of daily living, for instance, going outside the home, keeping tract of money and bills, preparing meals, doing light housework taking prescription medicines in the right amount at the right time, and using telephone; 0 otherwise
DIA	1 if the respondent has ever been told by doctor; diagnosis, that he has diabetes; 0 otherwise
HEA	1 if the respondent has ever been told by doctor that he had a heart attack, coronary heart disease, angina, congestive heart failure, or other heart problems; 0 otherwise
ART	1 if the respondent has ever been told by doctor that he has arthritis or rheumatism; 0 otherwise
PSY	1 if the respondent has ever been told by doctor that he had emotional, nervous, or psychiatric problem; 0 otherwise
CAN	1 if the respondent has ever been told by doctor that he had cancer;0 otherwise
DB	1 if the respondent receives disability/health benefits; 0 otherwise
MON_1 - MON_10	Common Time Effects
LAMBDA_1	Employment Mills
LAMBDA_2	Health Mills

Table II. Descriptive Statistics

	Healthy People		Health-Impaired People having Work-Limitations		Health-Impaired People having no Work-Limitations	
	Employed	Unemployed	Employed	Unemployed	Employed	Unemployed
Number of Observations	6,347	724	456	279	716	206
Mean hourly earnings (natural log)	3.61	-	3.63	-	3.64	-
Mean age	35.72	29.42	46.01	50.04	42.02	46.11
Percentage who are married	65.51%	47.03%	72.55%	70.63%	74.12%	67.43%
Mean number of children in household	0.91	0.67	1.21	1.11	1.23	1.33
Mean number of household members	4.23	4.33	4.38	4.54	4.24	4.41
Percentage who are immigrants	6.34%	12.23%	5.44%	5.01%	5.79%	9.82%
Percentage with Greek fluency	99.46%	99.07%	98.20%	98.40%	98.24%	98.01%
Percentage completing minimum mandatory education	95.42%	97.54%	89.42%	89.65%	92.51%	91.64%
Percentage of high school graduates	83.44%	84.56%	73.10%	68.11%	78.34%	68.45%
Percentage of university or technical school graduates	45.81%	46.64%	40.11%	40.18%	45.93%	43.20%
Percentage with computing skills	69.31%	78.42%	57.09%	45.13%	61.85%	53.32%
Percentage with English skills	44.28%	34.92%	35.33%	39.03%	38.93%	34.98%
Percentage with driving license	89.90%	81.04%	29.11%	19.74%	76.93%	56.76%
Mean years of experience	14.80	9.16	22.17	25.94	19.89	23.26
Percentage in white-collar jobs	39.52%	-	82.22%	-	64.80%	-
Percentage in blue-collar jobs	49.81%	-	11.83%	-	25.93%	-
Percentage in service occupations	12.86%	-	5.54%	-	11.56%	-
Percentage in public sector	39.36%	-	76.01%	-	67.54%	-
Percentage in private sector	58.11%	-	23.20%	-	30.30%	-
Percentage of employees being registered with insurance coverage	86.06%	-	91.46%	-	90.55%	-
Percentage who has difficulty performing one or more functional activities	0.00%	0.00%	7.80%	8.65%	5.33%	6.74%
Percentage who has difficulty with one or more activities of daily living	0.00%	0.00%	13.31%	15.43%	6.90%	8.75%
Percentage who has difficulty with one or more instrumental activities	0.00%	0.00%	16.42%	14.37%	7.11%	9.23%
Percentage who has ever been told by doctor that he has diabetes	0.00%	0.00%	11.12%	13.92%	8.73%	9.75%
Percentage who has ever been told by doctor that he had a heart attack	0.00%	0.00%	46.43%	45.86%	33.90%	32.54%
Percentage who has ever been told by doctor that he has arthritis or rheumatism	0.00%	0.00%	17.14%	20.05%	13.12%	16.91%
Percentage who has ever been told by doctor that he had emotional, nervous, or psychiatric problem	0.00%	0.00%	7.23%	7.11%	4.30%	5.83%
Percentage who has ever been told by doctor that he had cancer	0.00%	0.00%	3.21%	3.92%	2.23%	2.97%
Percentage who receives disability/health benefits	0.00%	0.00%	14.22%	19.42%	9.94%	15.03%

Table III. Coefficients from Employment Probit Model

	Healthy Employees / vs Health-Impaired People having Work-Limitations Panel A	**Healthy Employees / vs Health-Impaired People having No Work-Limitations** Panel B
$D^{WL/NWL}$	-1.077 (0.069)*	-0.623 (0.055)*
AGE	0.061 (0.022)*	0.067 (0.022)*
AGESQ	-0.0005 (0.0002)*	-0.0006 (0.0002)*
MARR	0.054 (0.016)*	0.129 (0.057)*
IMM	-0.224 (0.070)*	-0.184 (0.072)*
FLUEN	0.053 (0.202)	0.075 (0.217)
SCHOL	0.092 (0.039)*	0.122 (0.043)*
GRAD	0.154 (0.047)***	0.156 (0.057)*
UNIV	0.205 (0.044)*	0.244 (0.044)*
PC	0.007 (0.044)	0.014 (0.040)
ENGL	0.033 (0.034)	0.061 (0.030)***
DRIV	0.265 (0.055)*	0.339 (0.053)*
EXPER	0.007 (0.013)	0.019 (0.013)
EXPERSQ	-0.0001 (0.0003)	-0.0005 (0.0003)
CHIL	0.003 (0.025)	0.056 (0.027)**
HOMEM	0.018 (0.013)	0.015 (0.013)
MONTH CONTROLS	YES	YES
INTERCEPT	-0.030 (0.413)	-0.289 (0.425)

*Notes: Standard errors are in parenthesis. *Significant at the 1% level. ** Significant at the 5% level. *** Significant at the 10% level.*

Table III shows the results of the Probit estimation. The coefficients measure the influences of the variables on the probability of male individuals having been employed in the previous month. As we can observe, health-impaired people are significantly less likely to be employed than healthy people. Among health-impaired people, however, those having work limitations face greater chances of being unemployed. For both panels, the signs of the coefficients are reasonable. The probability of being employed increases with age, marital status, number of children and household members, fluency in Greek, working experience, and education. We can observe, nevertheless, that the outcomes are not always statistically significant. Moreover, the probability of being employed differs according to nationality. Non-Greeks face significantly lower chances of being employed than Greeks.

Table IV. Coefficients from Health-Reporting Conditional Logit Model

	Health-Impaired People having Work-Limitations Panel A	**Health-Impaired People having No Work-Limitations** Panel B
AGE	0.079 (0.009)*	0.037 (0.018)*
AGESQ	-0.0004 (0.0001)*	-0.0003 (0.0001)*
FA	0.090 (0.028)*	0.060 (0.042)
DA	0.243 (0.023)*	0.182 (0.043)*
IA	0.211 (0.021)*	0.236 (0.042)*
DIA	0.579 (0.018)*	0.564 (0.025)*
HEA	0.753 (0.009)*	0.732 (0.013)*
ART	0.485 (0.014)*	0.453 (0.020)*
PSY	0.484 (0.022)*	0.449 (0.034)*
CAN	0.650 (0.032)*	0.451 (0.047)*
DB	0.522 (0.016)*	0.354 (0.022)*
INTERCEPT	0.002 (0.018)	0.042 (0.024)***

*Notes: Standard errors are in parenthesis. *Significant at the 1% level. ** Significant at the 5% level.*** Significant at the 10% level.*

Table IV shows the results of the Conditional Logit estimation. The coefficients explain and identify individuals' characteristics that are thought to be related to the likelihood of reporting health status conditional on work limitations. As we can observe, individuals' choice to report having a health condition increases with age; the existence of limitations in functional, daily, and instrumental activities; the existence of objective illnesses such as diabetes, heart attack, arthritis, psychological problems, and cancer; as well as having disability/insurance benefits. More importantly, the magnitudes of the effects are stronger for the health-impaired people with work limitations than for the health-impaired people with no work limitations. As shown, all variables are statistically significant expect the functional activity variable for the health-impaired people having no work limitations. This result is reasonable for this group of people, who have limitations, including those involving sight, hearing, and speech, that could limit their capacity for work.