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ECONOMIC RESOURCES, MORTALITY AND INEQUALITY

Orazio P. Attanasio
Torben Heien Nielsen

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Economic Resources, Mortality and Inequality

Orazio P. Attanasio[*] & Torben Heien Nielsen[†]

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Abstract

Using full-population register data from Denmark, this study shows that estimates of the economic gradient in mortality depends on the specific measure of economic resources used, where we investigate permanent income, annual income or financial and housing wealth. Our favorite measure is what we call 'Permanent income', that is the average level of income over a long interval. We find that when using annual income or current wealth, the gradient is overestimated, unless one controls for a number of additional variables, such as education, civil status and initial health. In the last part of the paper, we compare the results from Denmark to results from the UK. Although the countries are very different in terms of inequality, the estimates of the gradient we find are very similar, suggesting that differential levels of resources (including information), rather than inequality itself, determine the gradient in survival and mortality.

Keywords: Mortality, Permanent Income, Economic resources and Inequality.

[*] University College London, Department of Economics, Institute for Fiscal Studies and NBER.

[†] University of Copenhagen, Department of Economics and CEBI. We gratefully acknowledge Paul Bingley, Søren Leth-Petersen, Martin Browning, Jacob Roland Munch and Michael Svarer. This research was supported by The Danish Council for Independent Research, grant no. 11-104234.

INTRODUCTION

A large body of literature within economics and epidemiology has used micro data to estimate the link between economic resources (e.g. income or wealth) and mortality—the economic gradient in mortality. The magnitude of such a gradient is relevant for scholars and policy makers for many reasons: a large negative gradient reduces life-time progressivity of social security, Auerbach et al. (2017), and can even make it regressive, Haan et al. (2017); a negative relation between longevity and wealth gives the poor fewer incentives to save for retirement and the composition of saving is likely to be affected by differential mortality. The literature has found, perhaps not surprisingly, a negative relationship between economic resources and mortality both across countries and within countries: rich people live longer, sometimes much longer even within the same country or the same city. However, the extent to which longevity and wealth relate differs across studies and countries. Furthermore, the causal relation between economic inequality itself and mortality is much debated, e.g., in Angus Deaton's book "The Great Escape - Health, Wealth and the Origins of Inequality". No consensus exists on the origin and mechanisms behind such a relationship. One obvious link is between the different material resources available to rich and poor and mortality. Another hypothesis links differential mortality to different information or life styles of rich and poor individuals, Chetty et al. (2016). Some epidemiologists have also hypothesised that inequality per se could increase mortality for those at the bottom of the resource distribution, Pickett and Wilkinson (2015).

Our starting point is that different results across studies are partially caused by the use of different measures of economic welfare. The choice of the relevant variable used in the analysis is often dictated by data availability. However, some choices could be problematic. If, for instance, lifetime resources are what determine health and mortality, using current income to proxy them could give a very imprecise proxy of the relevant concept and introduce a substantial attenuation bias. Moreover, if the variability of income and its relation to life time resources is different across countries, the apparent relationship between current income and mortality can look different.

The purpose of the current study is twofold: First, using a rich data set from Denmark, where different measures of economic resources are available, we investigate the empirical importance of different measures of economic resources (a measure of 'permanent income', wealth or annual income) as well as the impact of including covariates when estimating the relationship between economic resources and mortality. Second, using some of the results from the first analysis and some available evidence, we compare the gradients in Denmark and UK, two societies that have similar average income levels but differ in the degree of inequality. Such a comparison can be informative on the issue of whether inequality per se is a determinant of mortality: if the inequality hypothesis holds, we should see a difference in the gradients in Denmark and UK. However, using comparable measures of permanent income to represent the level of economic resources available to individuals, we find more similarities than differences in the mortality patterns in the two countries.

In the first part of the study, we construct measures of 'permanent income' as better proxies for lifetime resources and use them in the estimation of the mortality gradient. The main virtue of such measures is that they might be better at capturing the underlying heterogeneity in the population that determines economic choices, such as consumption, savings and health investments—quintessential for evaluating individual long-run health and welfare. Our approach is motivated by Friedman's permanent income hypothesis suggesting that *permanent income*—rather than current income—determines consumption and, ultimately, welfare. By leveraging administrative income data back from 1980, we are able to construct permanent income measures. We do so by averaging income over ages 45-53, as this period in the life-cycle is available for a large number of individuals in a reliable fashion and reflects the pre-retirement life-cycle income peak.

Longitudinal data sets, including administrative and survey data sources (such as HRS in the US and SHARE in Europe) are becoming increasingly available for researchers not only in Scandinavia, but also the US, (Chetty et al. (2016); Auerbach et al. (2017)), and Germany, Haan et al. (2017), e.g.,). As a consequence it is in fact possible to calculate permanent income measures in many environments. Because our administrative income and mortality data is measured with no or only minor error, the current analysis can be seen as a baseline analysis for the importance of permanent income in predicting mortality.

Obviously, the use of permanent income or long run averages of income is not exempt from conceptual problems. Early health shocks may affect the ability of an individual to earn over the life cycle and be, also, related to mortality, Almond and Currie (2011). As with wealth, such a situation would imply that the associations we document could not be given a causal interpretation. However, these events are likely to be less common and, as with wealth, we can control for initial health conditions to reinforce a causal interpretation.

The subjects used for the current analysis are approximately 1,000,000 Danish residents, aged 53 to 68. Using Danish administrative data from 1980-2003 on individual income for the subjects of interest and their spouses, we construct a measure of permanent income at the household level averaging household income over the period when the subjects are aged 45-53. Having estimated each individual 'permanent income', information from the Danish death registers allows us to predict five-year individual survival probabilities from 2003 through 2008.

As alternative measures of economic resources relevant for mortality, and to mimic what has been done in the literature, we use income and wealth. For the latter, we add financial wealth deposits in banks and financial intermediaries measured on the 31st of December 2003, as well as the value of houses owned by the subjects and their spouses at that time. Moreover, to control for important covariates when estimating the economic gradient in mortality, we add individual education levels from the education registers and hospital records from the Danish National Patient Register that covers all public and private hospital admissions, duration and diagnoses in Denmark. These data allow us to estimate the economic gradient in mortality robustly using three different measures of economic resources: permanent income, financial and housing wealth and annual income—all at the household level. Hence, we are able to control for education, civil status and initial health.

In the second part of the paper, we compare the UK and Denmark. Such a comparison is of interest for several reasons. As mentioned above, several recent studies have focused on whether what matters for mortality is absolute income, relative income or income inequality itself (Gerdtham and Johannesson (2004); Eibner and Evans (2005); Schultz Hansen et al. (2007); Brï¿œnnum-Hansen and Baadsgaard (2007); Hoffmann (2011); Wagstaff and van Doorslaer (2000); Pickett and Wilkinson (2015)). If this is interpreted as a causal statement, policy makers, who intend to decrease mortality rates, could focus on decreasing inequality rather than increasing absolute levels of economic resources. Critics, on the other hand, have pointed out that if the relationship between mortality and resources is non-linear, it may be very difficult to identify the effect of 'relative' resources or inequality. As the level of inequality (and the redistribution implemented by the state) is very different between the UK and Denmark, comparing the relationship between mortality and wealth in the two countries can be quite informative in this respect. According to Penn World Tables average GDP/capita from 1980-2003 was 20,250 ppp in Denmark and 18,705 ppp in the UK. According to OECD figures the median after tax Gini coefficient within the OECD countries was around 0.29-0.30 from the mid-1980's through the mid-2000's. The corresponding Gini-figures varied between 0.33-0.37 for the UK and 0.21-0.23 for Denmark. The UK, therefore, seems considerably more unequal than Denmark.

Our results show that permanent income is a strong predictor of mortalit and seems to approximate best the relationship between the level of economic resources and mortality, even when we do not control for other observable variables, such as education and initial health status. This is probably because the level of permanent income already captures the effect of many of these covariates.

When we use the Danish data to estimate the mortality model set up in Attanasio and Emmerson (2003) and compare the survival probabilities of economic resources in Denmark and the UK directly, we find striking similarities in the gradients in the two countries. As the two countries differ very much in inequality, this evidence,suggests that the level of economic resources (at least as measured by our approximation of permanent income) rather than inequality itself is determining mortality.

The remainder of the study is organized as follows: Section I provides a review and discusses related literature, Section II shows the features of the Danish data, Section III presents the model and estimation strategy, Section IV reports the estimation results and compare them with state-of-the-art results from the UK and Section V concludes.

I. RELATED LITERATURE

The economic gradient in mortality has received much attention, because it reveals striking differences in a fundamental measure of welfare within a society. The explanation of such a gradient is of course not easy and could be directly related to economic resources (maybe through access to better care) or to different life styles associated with high resources, or differential information (possibly driving different demand for health care), or many other factors. Before delving into the causes, however, it is crucial to establish well the nature of the relationship and the 'size' of the gradient. If the relevant economic resources are mis-measured or are related to variables that covary with mortality, the gradient is inconsistently estimated. For example, health and education are likely to be determinants of both income and mortality through different channels. Moreover, unemployment and other shocks that affect income and wealth transitorily have been shown to be determinants of mortality (Browning and Heinesen (2012)). The same is true for short run access to liquidity: Evans and Moore (2012) show that over a calendar month mortality incidence correlates with the timing of earnings and social insurance payments. If, however, the relevant measure for mortality is permanent income, as measured as the amount of resources available to an individual over the life course, then estimating the gradient from current income potentially leads to biased estimations of the relevant relationship between economic resources and mortality.

A few studies have used *wealth* as a proxy for permanent income (e.g. Hurd et al. (1999); Attanasio and Emmerson (2003)), which is probably an improvement over using current income. Differences in wealth across individuals, especially when controlling for age, probably better reflect differences in the overall control of resources over the life cycle. However, different shapes of the life cycle profile of income may induce different (optimal) wealth profiles with these differences being unrelated, even at a given age, to differences in lifetime resources. Moreover, people who expect to live longer are likely to save more. And finally, wealth can be affected substantially by negative health shocks that can be obviously related to mortality. In the latter case, the relationship between wealth and mortality would be over-estimated (see

Attanasio and Hoynes (2000)).

Education is likely to be related to health investments both because higher human capital command higher resources and because, and as shown by (Cutler et al. (2006)), more educated people are more likely to adopt health improving technologies. Thus, the same underlying economic mechanisms are expressed in both permanent income levels and mortality rates. Permanent income (rather than transitory elements in the income process) determines, to a large extent, consumption. By the same token, investigating the inequalities in permanent income and mortality is essential for welfare analysis.

While Deaton and Paxson (1998) stress the importance of the relation of life-cycle patterns in economic resources and health, the majority of the literature has focused on investigating the relationship either between health and mortality or income and mortality (see e.g.. Idler and Benyamini (1997), Marmot (2002),Wagstaff and van Doorslaer (2000) for reviews and discussions).

In recent years, an increasing literature suggests that very early life conditions determines health outcomes in adult life. The hypothesis is backed up by numerous empirical studies (Almond and Currie (2011)). Hence, long run health is determined by early characteristics. These early life traits are not only determinants of health, but as it turns out also labor market outcomes seems to be related with early life time characteristics (Black et al. (2007)). This insight suggests that long-run health is a function of characteristics and events that do not change when people have reached mature ages. This motivates further measuring average household income at, say, ages 45 to 53 for permanent income.

Still, as we mention above, a big issue in this literature is that of the simultaneity of economic resources and the occurrence of health shocks: the causal link might be running in both directions with economic resources causing health (and mortality) and health causing economic resources. While early life traits may determine both permanent income and long-run health, the occurrence of adverse health shocks may in particular affect both transitory income and an immediate health decline. A few papers have tried to circumvent the potential reverse causation between economic resources and mortality by controlling for education and initial health. For example, once they controlled for such measures, Hurd et al. (1999) find no significant gradient in mortality in the US: people are able to correctly access their own survival probabilities, and once they control for this, the economic gradient vanish. For the UK, instead, Attanasio and Emmerson (2003) find that even after controlling for initial health and education, the gradient in wealth persists. These studies emphasize the importance of the applied measures for economic resources and controls included. However, non of these studies reveal the comparable effects of permanent income.

In our analysis we turn to Denmark, because data availability allows us to construct permanent income measures with no (or only little) measurement error, as well as comprehensive initial health variables from hospitalization records. The case of Denmark has been studied previously in the literature: the crude pattern is that while other OECD countries experienced declining mortality rates in 1970s through the mid-1990 the Danish rates remained at the same level. Although the mortality rates did decline after the mid-1990s they did not improve as much as in other developed countries—neither for men nor women, Jacobsen et al. (2002). By investigating the patterns at different ages Juel et al. (2000) argue that the difference between life expectancy in Denmark and seven other European countries[1] is found in the mortality of the 35-75 age groups. The excess mortality of the Danes is driven by ischaemic heart diseases and cancer, i.e., life style diseases related to smoking (Jacobsen et al. (2004);Jacobsen et al. (2006)).

A few Danish studies have analyzed the socio-economic gradient in health and mortality, broadly interpreted as differences in socio-economic status and combinations of annual income, wealth, education, skill level of salaried work, home-ownership or sector of occupation, e.g., Osler et al. (2002) and Osler and Anne-Marie Nybo Andersen (2005). However, none of these studies addresses the problem of reverse causality; none of these studies uses permanent income or even just controls for initial health conditions. Most recently, Hoffmann (2011) shows that the Danish economic gradient in mortality is even larger than those in the US estimated using the HRS. It is, however, unclear how these estimated gradients are confounded by the lack of initial health controls. Munch and Svarer (2005) use multiple variables (among these wealth and annual income) to estimate a competing risk proportional hazard model looking at how socio-economic differences affect mortality in different diseases (cancer, circulatory diseases, ill-defined conditions and other causes). Using Danish register data from 1992-1997, they find an inverse correlation between socio-economic status and mortality for men. For men annual income is negatively correlated with mortality. But the inverse relation between socio-economic and life expectancy is to a large degree absent among women, when looking at variables such as being married and income.

II. DATA SOURCES AND DESCRIPTIVE STATISTICS

In this section, we present the available Danish register data and provide some initial descriptive evidence on the relationship between permanent income and mortality. We start by describing the nature of the data we use.

Data sources

All Danish residents are assigned a unique personal identification number (CPR), which is used by all government institutions to administer information specific to Danish citizens. A large number of regis-

[1] Norway, the former Federal Republic of Germany, the Netherlands, the UK, France, Italy and the former Czechoslovakia

ters are stored at Statistics Denmark and can be linked via the CPR. Under strict security precaution, the register data is available for researchers affiliated to authorized Danish research institutions. For the years 1980-2006, we have access to the Danish tax, transfers, patient and education registers for all Danish residents older than 44. In addition, the data contains financial wealth information from banks and financial intermediates on December 2003. Furthermore, we have access to the Danish death registers from 1980 through 2008. These registers include the death date of all deceased individuals in the population. When we combine all these registers, we end up with 1,016,635 individuals residing in Denmark aged 45-53 and alive on 31 December 2003. All subjects are born between 1935 and 1950. The data include similar information for their spouses (regardless of their age or birth-cohort).

To construct permanent and annual income measures, we use the information, available in the registers, on disposable income, which includes all taxable and non-taxable income (earnings and transfers), net of taxes, alimony and pension contributions. Our wealth measure includes the quoted value of financial and housing wealth on 31 December 2003 and is measured after taxes are paid. Financial wealth includes holdings in savings accounts, stocks, bonds, mutual funds and deeds. Housing wealth captures the public valuation of all houses owned by the household. We deflate all income and wealth variables by the Danish consumer price index and measure the variables in 2000-prices.

We define our measure of *permanent income* as the average household income, obtained as the sum of subject's and spouse's disposable incomes, over the nine years when the subjects were between 45 and 53 years old. When taking this average, we equivalise income to compare single and married (or cohabitating) individuals. Because we want to compare the Danish gradient with that estimated in Attanasio and Emmerson (2003) for the UK, we use the same household equivalizing scale used in that study. In particular, we divide singles' income by 0.61. Formally, permanent income, PI_i is therefore calculated as follows:

$$PI_i = \frac{\sum_{t=45}^{53} \left[(I_{it} + I_{spouse,it}) (couple_{it}) + \left(\frac{I_{it}}{0.61} \right) (1 - couple_{it}) \right]}{9} \tag{1}$$

The variable $couple_{it}$ is a dummy variable that equals 1 if individual i is married (or cohabiting) in a given calendar year, t, and zero otherwise. I_{it} measures individual i's annual disposable income. $I_{spouse,it}$ measures the annual disposable income of individual i's spouse in year t. If individual i is cohabiting a spouse household income is simply the sum of I_{it} and $I_{spouse,it}$. In years the individual i is single, the income is divided by the equivalizing factor, 0.61. We only measure PI_t individual *i's* if disposable income is observed in all years from age 45 through 53. Consequently, we exclude individuals who pass away or migrate between ages 45 and 53. We do not go beyond 53 because early retirement was possible down to age 55 in some years of our income data window.

Descriptive correlations

Table 1 shows distributional features of permanent income, wealth and annual income for males and females. The mean permanent income level is approx. 260,000 DKr for men and 254,000 DKK for women. For men (women), mean wealth is 5.34 (5.25) times larger and annual income is 1.14 (1,10) times larger than mean permanent income level (note that wealth and annual income are measured in 2003 when individuals are between age 53 an 67). Permanent income has, for both genders, the least disperse distribution of the three measures. Financial and housing wealth is by far the most dispersed measure.

[Table 1 here]

In addition to gender and age, we can also control for initial health conditions. Our health control captures a three-year-history of hospital records from the National Patient Register. For both public and private hospitals, the National Patient Register contains admission dates and durations of all hospitalizations (hospital, emergency, in-patients and psychiatric hospital admissions), as well as ICD10-diagnoses for the full population. We include variables that measure the time distance to the most recently experienced hospitalization, the count of hospital days and diagnoses as well as dummies for diagnoses covering three main diagnosis groups related to life-style diseases (lung, nerve and metabolic diseases) three years back in time.

[Table 2 here]

Table 2 shows the distributions of number of hospital nights and diagnoses within a classification of 23 diagnoses-groups.[2] The table also reports the share of the population diagnosed with the three diagnosis groups in 2001-2003. In this time period approx. 50% of the population had at least one hospitalization record (regardless of gender). The table shows that men (women) on average spend 2.2 (2.0) nights in

[2] The Danish National Board (the government institution under the Danish Ministry of Health responsible for compiling the National Patient Register) grouped ICD10-codes into 23 categories: 1) infection, 2) lung disease, 3) nerves, 4) circulation, 5) lymph, 6) veins, 7) blood, 8) digestive system, 9) urinary, 10) musculoskeletal, 11) gynecology, 12) pregnancy, 13), skin, 14) eyes, 15) ear nose throat, 16) metabolic, 17) mental illnesses, 18) breast, 19) sterilization, 20) concussion, 21) poisoning, 22) live born child and 23) other illnesses. Appendix A shows the exact ICD-10 categories that make up each group 23-category.

hospitals in 2003. The standard deviations are large and reflect two features of the distributions: 1) the measures inferred from hospital records are truncated at zero (the median had no records in none of the years from 2001-2003; the third quartile had one) and 2) the distribution is skewed to the right. We also find (not reported in the table) that men (women) in bottom permanent income quintile have 59% (44%) more hospital nights in 2003 than those in the top quintile, which is indicative of a positive relationship between permanent income and initial health.

In addition to initial health we will also control for the education background of our subjects. From the education registers we know, for each individual, the highest educational degree achieved. We grouped these education levels into 6 categories: 1) Basic school (up to nine years schooling) 2) high school (up to twelve years) including short educations such as office clerks, 3) vocational educations (e.g., skilled craftsmen such as carpenters, painters and hairdressers) 4) Intermediate educations (e.g., journalists and nurses) 5) long educations (academic educations) and 6) unknown educations (i.e., information on education is missing, which is particularly relevant for immigrants).

The first six rows of Table 3 report the share of the population in each of the six education categories. These rows reveal that men are generally more educated than women in these age groups. The next two rows report the shares of the population single in 2003 and at least once in the period from age 45-53 (the time period in which we calculate permanent income).

Although we have income data for both self-employed and wage earners, the data might not capture available economic resources for both occupation groups, e.g., self-employed could potentially reallocate revenues from the business between business equity and personal income to minimize tax-payments. To circumvent this problem in the mortality analysis, we include a dummy for self-employment status of the household in the years we measure income. The ninth row of Table 3 shows the share of households in which either the subject or their spouse is self-employed in 2003. The tenth row reports the share of subjects for whom either the subject or the spouse was self-employed at least once in the period the subject was 45-53 years old.

[Table 3 here]

For both males and females, Table 4 explores the correlation between permanent income and five-year survival probabilities. Mortality implies that the number of individuals in the population (and in our sample) declines with age, so that we have a larger number of individuals in the younger cohorts—people aged 57-60 consists of the large births cohorts of 1943-1946. We divide the population in permanent income quintiles within each cohort, and compute the survival probabilities for the four age groups. The table shows a positive relation between permanent income and survival. Not surprisingly, survival probabilities decrease with age and are generally lower for men than for women. The difference in surviving probabilities by permanent income quintiles (the gradient) is most pronounced for men.

[Table 4 here]

III. METHOD

As mentioned above, in this paper, we investigate the extent to which our definition of permanent income, wealth or annual income determines the estimated gradient in mortality and whether the gradients in mortality in Denmark and the UK are similar. To pursue these goals we use the model set up by Attanasio and Emmerson (2003), who have studied the UK gradient. In particular, using Danish data on mortality and a variety of income and wealth measures, we estimate:

$$s_i^* = \alpha + f(y_i) + \delta h_i + \eta e_i + \theta c_i + \gamma_1 a_i + \gamma_2 a_i^2 + \varepsilon_i \tag{2}$$

where s_i^* a latent variable determining five-year survival for individual i.[3] The model assumes that survival probability is a function of economic resources, y_i; initial health, h_i; education, e_i; civil status, c_i; age, a_i; age squared, a_i^2 , and a random variable, ε_i. In what follows we assume that ε_i is normally distributed so that we estimate equation (2) as a probit.

Notice that the explanatory variables refer to a period prior to that over which survival is measured: in the UK study, the covariates are measured at the first round of the BRS while survival or mortality is

[3] In the UK-study the survival spell runs between two interview rounds of the British Retirement Survey (BRS) the 1988/89 and 1994 waves; in the current study the spell runs from 31 December 2003 through 2008. Thus, the survival window is open for a slightly longer period in the UK-study than in the current study. Therefore, we expect the predicted survival probabilities to be slightly higher in Denmark than in the UK.

measured between the two waves; in the Danish data, the variables are constructed using register data from 1980-2003 as described in Section I while survival is observed between 2003 and 2008.

In equation (2), the relationship between mortality and economic resources is captured by the function $f(y_i)$. We want to be flexible on the nature of this relationship and, therefore, we experiment with three different functional assumptions for $f(.)$: we report estimates obtained assuming that $f(.)$ is a third order polynomial in y_i ; or a third order polynomial in $log(y_i)$ or that is linear in the rank of individual i relative to y_i within a birth cohort and gender. The rank specification, besides being a different non-linear transformation of the variable of interest, deals with the problem of comparing levels of wealth across age groups. For instance, if wealth peaks just prior to retirement, as a simple life-cycle theory would predict, then wealth levels differ mechanically across age groups. However, if the rank of wealth within cohorts is constant over time, then the estimation of the gradient is not flawed by in-comparability across age groups .

As mentioned above, we also investigate different proxies for economic resources. In our baseline specification, we assume that y_i is best represented by permanent income, as we defined it above. We then compare how the estimates of the parameters of the various specifications of $f(y_i)$ change when we use different definitions of y_i . In particular, we consider wealth (including financial wealth and housing) and current annual income. Finally, we also investigate how the relationship between mortality and economic resources change when we include covariates, and in particular when controlling for education (which can represent permanent income or proxy for information about health) and health conditions. Therefore we estimate equation (2) with and without h_i, e_i, and, c_i . This analysis is suggestive of what are the best proxies for economic resources and on the relevance of the different types of biases we discussed above.

Attanasio and Emmerson (2003), to control for initial health when estimating the mortality gradient for the UK to which we compare our Danish results, used calculated severity scores from BRS. In the case of the Danish data, instead, we can use objective health measures deduced from the National Patient Register. In particular, we proxy initial health by second order polynomials in the time passed from the most recent hospitalization (measured in days from 31 December 2003) and the number of hospital days in 2003, 2002 and 2001, the number of different diagnosis-groups in each of the three years, and dummies for having lung, nerve or metabolic diagnoses in each of the three years.

For the UK study, Attanasio and Emmerson (2003) controlled for education by including a dummy for having an A-level. For the Danish specification, we include five dummies for high school, vocational education, intermediate, long or unknown education (the reference is basic schooling). In the UK data, age is measured at the first round of the BRS. In the Danish data, we measure age on 31 December 2003. The outcome of interest is five-year survival.

IV. RESULTS

In this section, we report the results from estimating the probit survival models described above for men and women separately. For ease of exposition, we do not report the parameter estimates on the initial health variables and education here. The full set of parameter estimates can be found in the appendix. The appendix also contains parameter estimates of the models estimated without education, civil status in 2003 and initial health covariates. In the remainder of the section, we first compare the estimation of the gradient using permanent income, wealth and annual income and plot survival probabilities given the estimations. Next we compare directly the predicted survival probabilities to those in the UK and in particular the nature of the gradient.

To obtain the results we report, we trimmed the data so to exclude the top and bottom 1% percent of the variables measuring economic resources (permanent income, financial and housing wealth and annual income).

Permanent Income, Wealth or Annual Income

In this subsection, we compare the estimated mortality gradient using the three different measures of economic resources, different functional forms and different sets of controls. Table 5 reports the parameter estimates we obtain using permanent income as the measure of economic resources.[4] The first three columns report estimates for men: Column (1) contains the estimates for the specification where mortality depends on a third order polynomial in permanent income, where the latter is measured in 100,000 Danish 2000-prices (1£~10DKK: 1$~6DKK); Column (2) contains the results obtained assuming that mortality is a function of a polynomial in log permanent income and Column (3) the results for the rank transformation. Columns (4)-(6) report similar estimates for women. The bottom row of the table reports the likelihood ratio of jointly excluding the permanent income variables. The large LR values (around 1000 for men and 500 for women) for the first two specifications reveal that permanent income is a very important determinant of mortality. We should stress that the relationship between mortality and economic resources seem indeed non-linear across the permanent income distribution.

As a baseline specification, we started including both age and age-squared as determinants of mortality. As for men the squared term turns out to be insignificant, we have excluded it from the statistical model we report. To control for civil status in the period permanent income was earned, we include a dummy

[4] In appendix B table 9 reports the full set of parameter estimates. Furthermore, table 10 reports the parameter estimates of the model estimated without controlling for initial health, education and single status in 2003.

indicating if the subject was single at least once between age 45 and 53. Similarly, we include a dummy indicating if either the subject or the spouse was self-employed when permanent income is measured. Both of these variables are significant for both genders indicating that married or cohabiting individuals are more likely to survive.

[Table 5 here]

[Figure 1 here]

Since we estimate survival probabilities in a probit framework, we cannot interpret magnitudes of the parameter estimates as marginal effects. Given the nonlinearities of our specification, we find that the best way to interpret our results is by plotting estimated survival probabilities against age at different points of the permanent income distribution for a representative individual who is married or cohabiting and is currently in good health and with basic education, as we do in Figure 1. The graphs plot the age-survival profiles (the probability of surviving five years given a specific age) at the 90th (marked with diamonds), 50th (triangles) and 10th percentile (squares) of the permanent income distribution. By plotting survival against age at different percentiles (instead of plotting survival against income levels for instance), we are able to compare directly how the estimation of inequality varies for different specifications of the model, such as levels-, logs- and rank-transformations of permanent income. The left (right) column of pictures plots the results for men (women). Each row of pictures presents the predictions for each of the transformations of the permanent income variable: levels (top), logs (middle) and rank (bottom). In each graph, the bold lines represent estimated survival probabilities that control for several other regressors (such as education and initial health) while the dashed lines refer to specifications that include no covariates other than age .

The gap between the various percentiles in the permanent income distributions reflects inequality in mortality. Not surprisingly, survival probabilities are higher at younger ages, Moreover, as expected, wealthier individuals have higher survival probabilities. This inequality increases with age. For example, when we include all covariates the prediction of the five-year survival probability men aged 53 in the 90th percentile of the (levels specification) permanent income distribution is 98%, while men in the 10th percentile have a 95% survival probability. This gap in survival probabilities widens at older ages: at age 68 there is a 6 percentage-point difference between the top and bottom percentiles in the permanent income distribution. Whilst non-linearities are obviously important, this general pattern is robust across the three non-linear functional forms we use (levels, logs or rank). Whilst survival levels are obviously higher for women, more interesting is the fact that inequality in mortality seems less pronounced for them. Although richer women do tend to live longer, at age 68 the difference between the top and bottom percentile of the permanent income distribution is only about 3.5 percentage-points.

Figure 1 also reveals how the inclusion of covariates changes the age profiles at different levels of permanent income. For both men and women, the gradient tend to change when covariates are included, but the shape of the age-profiles are remarkable similar whether or not the covariates are included. For example, looking at the rank specification for men at age 53, we do see that the survival probabilities are slightly higher when the covariates are not included, but survival-inequalities between the richest and the poorest remain the same at about 3 percentage-point. At age 68 the 90/10 differential in survival is 6 percentage-points when the covariates are included but 9 percent when they are not. The results are similar for women, but again for them the effect of inequality is less pronounced. The shapes of the age-profiles are similar across percentiles of the permanent income distribution. It should be stressed that, when we include controls, we are comparing the profiles for a given group (in particular, low educated and good health individuals). These variables will obviously be correlated with permanent income: not many individuals with low education will be in the top 10% of the permanent income distribution. In this sense, results that do not include control might be more interesting. However, it is interesting to note that even when controlling for initial health condition, permanent income is a strong predictor of mortality, possibly indicating that it plays a role, after age 53, over and above the level of health at 53.

We now turn to compare the estimates we obtain with the measures of economic resources that have been used in the literature to date: wealth and annual income. We first estimate the probit equation above using these measures instead of permanent income, and then compare graphically the estimated gradients with and without covariates. Table 6 reports the parameter estimates using wealth and annual income instead of permanent income.[5] The upper part of the table reports the parameter estimates using financial and housing wealth (measured in millions, Danish 2000-prices). In all specifications the measures of economic resources we use are statistically significant, as indicated by the LR and most t-values.[6]

The lower part of the table reports the estimated values using annual household income in 2003 as the measure of economic resources. All parameter estimates (except for the squared term for both men and women levels-transformation) are significant. To control for differential income effects for self-employed we included a dummy indicating if the subject, or the spouse, is self-employed in 2003. This variable is

[5] The full set of estimates are found in tables 11 and 13 in appendix B. Furthermore, tables 12 and 14 report the parameter estimates of the models estimated without controlling for initial health, education and single status in 2003.

[6] In the specification for women's mortality that includes log wealth the coefficients of the third order polynomial are not individually significant but they are clearly jointly significant.

significant in all specifications.

[Table 6 here]

[Figure 2 here]

[Figure 3 here]

We are interested in how the different measures determine inequalities in survival probabilities. To make this comparison as clear as possible, Figures 2 (men) and 3 (women) plot the difference in the estimated survival probabilities of the first and the ninth decile relative to that of the median for each of the three measures of economic resources we have considered.[7] The points above the x-axis reflect the pattern of 'excess survival' of individuals at the 90th percentiles of resources relative to the median, while the points below the x-axis show how much lower the survival probabilities of individuals in the first decile are relative to those of individuals with median resources. Circles ("o") represent permanent income; crosses ("x") are housing and financial wealth; and plusses ("+") annual income. The upper panel of pictures are the levels-, the middle panel is the logs-, and the bottom panel is the rank-transformation. Pictures on the left include no other controls than age, and pictures on the right include all covariates.

When no covariates are included, we see that the normalized age-profiles are extremely sensitive to which measure of economic resources we use; the transformation (levels, logs or rank) and whether we look at the richer (ninth decile) or the poorer (first decile) people. For example, by looking at the levels-transformation permanent income and wealth line up almost perfectly for the top of the distributions, while estimates based on annual income tends to overestimate the 90-50 survival gradient for individuals over sixty—the most common early retirement age in Denmark. Hence, at this age income sources are likely to change from labor to retirement income. This pattern is more pronounced in the logs-specification.

These patterns are *not* mirrored in the bottom of the wealth and annual income distributions, which shows the non-linearity of the gradient in mortality. A marginal increase in economic resources affects the rich and poor differentially. The levels- and the log-transformations of wealth tend to overestimate the excess mortality of the poor. Interestingly, the shape of the profiles for annual income is very different in the bottom. While inequality increases monotonically with age in the top of the distribution, the poorest

[7] Note that the graphs for permanent income do not contain additional information than in Figure 1, which in fact also contains information of the survival levels. Figures 2 and 3 plot the differential survival probabilities to ease the exposition when comparing inequality features of many variables.

decile has a u-shaped profile—with a turning point exactly at age 60 for both genders. This pattern is found in both the levels and the logs-transformation, but is more pronounced in the latter.

This pattern completely disappears when we look at the rank-specifications: no-longer do we see any breaks at age 60—in fact annual income and wealth line up almost perfectly. This is consistent with the feature of the rank-transformation that we mentioned earlier: if people over time keep their position in the given resource distribution (within their cohort), the rank specification is insensitive to level changes in these measures. Consequently, we can better compare the gradient across ages. For annual income, for instance, the changes in the age profiles at age 60 could stem from people changing income sources at retirement and a change in the level of income upon retirement. Given that people plan for retirement, this income drop may be compensated by the release labor resources for home production, i.e., although income is falling the overall welfare (consumption) of the household is not. That a changing shape at age 60 does not materialize in the rank specification is consistent with people maintaining their rank in the income distribution even though their levels of income change. Hence, the levels- and log transformations of annual income are subject to an attenuation bias when people crosses into retirement.

Also for wealth we observe a break in the survival pattern on the first decile at age 60. This break is most pronounced in the logs-transformation. At age 60 capital pensions (lump-sum pension withdrawals) become eligible for withdrawal. Our wealth measure captures financial and housing wealth—pension balances are unobserved. When capital pensions are withdrawn they are likely to be transferred to liquid financial balances, which we do observe in our data. This mechanic generates noise in our estimations. If capital pensions make up a relatively large share of wealth in the household portfolio—which is likely the case in the bottom of the wealth distribution—then the log-transformation, that captures relative changes in wealth, accentuates the break at 60. Again, the break at 60 vanishes in the rank transformation.

The permanent income specification has no peculiar breaks at age 60, because the measure in all cases is measured at ages 45-53—well before the normal retirement age. In fact, the shape of the profiles is robust to the use of either the levels, logs, or rank-transformations.

Nevertheless, permanent income shows a lower mortality inequality than the other measures. However, these differences among different measures of wealth disappear once we control for a number of observable variables. This is clear when we compare the pictures on the left with those on the right. We find that covariates reduce the attenuation bias around retirement age, and the shape of age-profiles to become more similar across the three resource measures. Furthermore, when we use the rank specification, the normalized survival probabilities line up across all three measures—even among the old and the poor.

In summary, the permanent income gradient in survival is larger for men and than for women, and compared to wealth and annual income, robustly estimated. Once covariates are included in the estimations, both wealth and annual income are predicting survival inequalities in the same ranges as permanent income. Among the various functional forms considered, those based on the rank, seem particularly useful. The results raise a note of caution for studies that rely solely on annual income or wealth—such studies should be careful to not only include the relevant covariates (education, civil status and initial health), but also make relevant non-linear transformations (such as a rank transformation) of the economics resource measure.

Inequality and Mortality

The previous subsection showed a positive and significant relationship between permanent income and survival in Denmark. Furthermore, once the estimations control for education, civil status and initial health, predicted survival probabilities estimated from wealth or annual income fit the range of the predicted survival probabilities estimated from permanent income—most robustly in the rank specification. However, the subsection did not consider whether the magnitude of the gradient is small, compared to an economically more unequal country, which would be the prediction of the inequality hypothesis in mortality. To answer this question an ideal experiment would randomly allocate individuals with similar characteristics into societies with differential economic inequality. Since we obviously lack this opportunity, we compare the economic gradient in Denmark and the UK. Both countries have for decades been among the richest in the world, and both have universal health care, but they differ in inequality measures such as the Gini-coefficient. This difference makes the comparison of the economic gradients in mortality particularly interesting.

This subsection directly compares the estimates of financial and housing wealth in UK and Denmark, which is available in the current study and for the UK (Attanasio and Emmerson, 2003). We use the probit parameter estimates from the ranks specifications, which as we mentioned above, fit the data well. We can compare this specification, (which implies a fit very similar to the other functional forms we considered) directly with that in Attanasio and Emmerson (2003). Figure 4 plots the 90-50 and 50-10 survival probability differentials against age for both countries. For Denmark, the picture corresponds to the lower right pictures in Figures 2 and 3.

[Figure 4 here]

For the UK the bold and marked lines plot the predicted differences in median and the 1st (9th) decile wealth in 5-6 years survival the thin line plots the difference in five-year survival in Denmark. The UK-study measures survival between two waves of the British Retirement Survey, which are 5-6 years apart, whereas the Danish study plots the estimated probability of survival over an exact period of five years. This complicates the comparison. To circumvent this problem, we also approximate a six-year survival probability for Denmark, simply by multiplying the difference in five year survival by (6/5). This approximation would be valid under the assumption that the difference (inequality) across the resource distribution we predicted for the first 5 years in Denmark, persists from the 5th to the 6th year, too. Given that inequality mortality increase in age for the groups of interest—which the widening inequality gap by age suggests—there is no reason to believe that the inequality in mortality rates would decrease from the fifth to the sixth year. In that sense, our approximation is in fact a lower bound for the six-year survival probability in Denmark. The shaded area in 4 plots the bounds for the 5-6 years-survival in Denmark. We see that the predictions of the inequality in the UK-men's survival probability are within the range of the Danish men's. But we do, however, see a slightly larger inequality among the UK-women. However, what is most striking about the Figure is the similarity of the pattern of inequality in mortality between the two countries. Although the two countries have very different levels of inequality, with the UK being considerably more unequal, the distribution of mortality rates across the distribution of economic resources is substantially the same in the two countries.

All together we find a significant survival gradient in Denmark with striking similarities to the survival gradient in the UK. This finding suggests that inequality itself is not determining differential mortality. Consequently, studies relying on macro data (e.g. regressions of national longevity on GDP per capita) potentially miss the heterogeneity within populations, which our analysis showed to be important controls when estimating the gradient.

V. CONCLUSION

In this study, we have explored the relationship between three different measures of economic resources (permanent income, annual income and wealth) and mortality. Using administrative records for Denmark covering all residents aged 53-68 in 2003, we show that permanent income is robustly estimating the gradient in survival. However, both annual income and wealth provide unbiased estimates of the gradient, once we control for education, civil status and initial health. Moreover, we find a non-linear relationship between mortality and economic resources, which is approximated best with a rank transformation of the economic resource data. Of the variables we have considered, permanent income seems to be fitting the data best and approximate the relationship between the level of economic resources and mortality even when we do not control for other observable variables. This is probably because the level of permanent income, at least in the way we approximate it, seems to capture already the effect of many of these variables, such as education and initial health status.

The current study is furthermore pointing to similarities in the economic inequality in mortality in Denmark and the UK. Because both countries are highly developed, yet Denmark is more equal, this seems to contradict the inequality hypothesis claiming that inequality itself is a main determinant mortality. Instead, we suggest that differential permanent income determine mortality.

Tables

Table 1: Equivalized household income and wealth distributions

	Men:			Women:		
	Permanent Income	Financial and Housing wealth	Annual Income	Permanent Income	Financial and Housing wealth	Annual Income
Mean	261687	1399907	298840	253808	1333335	281292
	(81976)	(1333817)	(120130)	(78364)	(1284939)	(110979)
Median	252580	1125874	279755	244066	1081320	259236
Quantiles relative to median						
1st decile	0.65	0.02	0.61	0.67	0.02	0.63
1st quintile	0.78	0.18	0.71	0.78	0.11	0.72
2nd quintile	0.93	0.81	0.90	0.93	0.79	0.90
3rd quintile	1.07	1.23	1.10	1.07	1.24	1.11
4th quintile	1.26	1.91	1.36	1.27	1.96	1.39
9th decile	1.46	2.73	1.62	1.46	2.76	1.66
N	504923	504923	504923	511712	511712	511712

Standard Errors in parenthesis. Measured after tax in Danish 2000-prices (1£ app. 11 DKK).

Table 2: Initial health distributions deduced from the National Patient Register

	Men:			Women:		
	2003	2002	2001	2003	2002	2001
Hospitalnights	2.228	2.020	1.801	2.025	1.892	1.724
	(9.609)	(9.639)	(8.106)	(8.346)	(8.122)	(7.176)
1st percentile	0	0	0	0	0	0
Median	0	0	0	0	0	0
75th percentile	1	1	1	1	1	1
99th percentile	39	34	31	35	31	30
Max	365	365	365	365	365	365
Number of diagnoses	0.557	0.517	0.476	0.550	0.524	0.483
	(1.084)	(1.018)	(0.957)	(1.047)	(0.998)	(0.941)
1st percentile	0	0	0	0	0	0
Median	0	0	0	0	0	0
75th percentile	1	1	1	1	1	1
99th percentile	5	4	4	5	4	4
Max	12	11	12	12	13	12
Lung disease	0.025	0.021	0.019	0.024	0.021	0.019
(sd)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Nerves	0.022	0.021	0.019	0.017	0.016	0.015
(sd)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Metabolic	0.030	0.026	0.023	0.028	0.025	0.021
(sd)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	504923	504923	504923	511712	511712	511712

Standard deviations in parenthesis for hospital nights and number of diagnoses. Binary standard errors for diagsnosis groups.

Table 3: Covariates

	Men	Women
Education level:		
Basic School	0.313	0.419
	(0.001)	(0.001)
High School	0.065	0.048
	(0.000)	(0.000)
Vocational	0.423	0.351
	(0.001)	(0.001)
Intermediate	0.112	0.137
	(0.000)	(0.000)
Long	0.065	0.027
	(0.000)	(0.000)
Unknown	0.022	0.018
	(0.000)	(0.000)
Single in 2003	0.233	0.293
	(0.001)	(0.001)
Ever single from age 45-53	0.309	0.315
	(0.001)	(0.001)
Selfemployed in 2003	0.113	0.093
	(0.000)	(0.000)
Ever Self-employed from age 45-53	0.245	0.237
	(0.001)	(0.001)
N	504923	511712

Binary standard Errors in parenthesis.

Table 4: 5-year survival probabilities by permanent income quintiles, age and gender

		Permanent Income quintiles:				
Age	All	1st	2nd	3rd	4th	5th
Men						
53-56	0.959	0.911	0.956	0.971	0.976	0.981
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
N	148976					
57-60	0.941	0.899	0.931	0.950	0.958	0.967
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
N	152261					
61-64	0.918	0.886	0.903	0.918	0.933	0.949
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
N	112116					
65-68	0.882	0.856	0.864	0.877	0.896	0.915
	(0.001)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
N	91570					
Women						
53-56	0.973	0.950	0.971	0.977	0.983	0.984
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	148343					
57-60	0.961	0.940	0.956	0.964	0.970	0.975
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	150877					
61-64	0.947	0.929	0.935	0.949	0.955	0.965
	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
N	114299					
65-68	0.919	0.904	0.906	0.919	0.925	0.942
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
N	98193					

Binary Standard Errors in parenthesis.

Table 5: The five-year survival probability (Probit)

	Men:			Women:		
	Levels	Natural Logs	Rank (percentile)	Levels	Natural Logs	Rank (percentile)
	(1)	(2)	(3)	(4)	(5)	(6)
Permanent Income	-.0175	-214.3***	.3791***	.08665	-190.8***	.2822***
	(.05345)	(15.01)	(.01192)	(.06774)	(19.92)	(.01351)
Permanent Income Squared	.08234***	17.36***		.03901	15.52***	
	(.0183)	(1.221)		(.0237)	(1.618)	
Permanent Income Cubed	-.0117***	-.4674***		-.007812**	-.4201***	
	(.001918)	(.03308)		(.002547)	(.04378)	
Single age 45-53	-.08388***	-.08155***	-.08395***	-.05604***	-.05347***	-.05437***
	(.008022)	(.008029)	(.008021)	(.008897)	(.008906)	(.008898)
Selfemployed age 45-53	.1232***	.1231***	.1228***	.09108***	.08988***	.08824***
	(.007414)	(.007399)	(.007203)	(.0085)	(.008487)	(.008289)
Age	-.3784***	-.378***	-.4436***	.5923**	.5911**	.4887*
	(.006773)	(.006767)	(.006666)	(.2164)	(.2164)	(.2161)
- squared				-.0754***	-.07525***	-.07131***
				(.0178)	(.0178)	(.01777)
Single in 2003	-.3271***	-.3241***	-.3285***	-.1578***	-.1565***	-.1588***
	(.008292)	(.008301)	(.008288)	(.008772)	(.008778)	(.008773)
constant	3.499***	883.7***	3.996***	.5736	781.1***	1.236
	(.07148)	(61.49)	(.05135)	(.6564)	(81.7)	(.6551)
Initial Health	Yes	Yes	Yes	Yes	Yes	Yes
Education	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R-squared	0.126	0.126	0.126	0.129	0.129	0.129
LR	1036.8***	1165.7***	1022.7***	456.7***	500.9***	439.3***
N	494825	494825	494825	501478	501478	501478

Permanent income measures equivalized average household income from age 45-53 (100k Danish 2000-prices)

Significanse levels: ***<0.001, **<0.01, *<0.05.

The table shows the parameter estimates of probit models regressing a dummy indicating whether people are a alive on December 31st 2008 on permanent income (household equivalized average disposable income from age 45-53) and the set of covariates used in Attanasio and Emmerson (2003). The squared age term did not come out significant for the men. Therefore we excluded it from the regression. Only people alive on December 31st 2003 are included in the estimation sample. Columns 1-3 report the estimations results for men, and Columns 4-6 report the results for women.

We trimmed the top and bottom 1% of the permanent income distribution.

The full set of parameter estimates, i.e. a table including the estimates of education and initial health is found in table 9 in the appendix. Estimation results including the permanent income and age-variables only are found in Table 10 in the appendix.

Table 6: The five-year survival probability (Probit) - Other measures of household resources

	Men:			Women:		
	Levels	Natural Logs	Rank (percentile)	Levels	Natural Logs	Rank (percentile)
Wealth: Equivalized Financial and Housing wealth (1000k Danish 2000-prices) at the household level						
Wealth	.2895***	.0481*	.5075***	.2272***	-.00877	.3695***
	(.009842)	(.0201)	(.01105)	(.01195)	(.06207)	(.01273)
Wealth Squared	-.06259***	-.009966***		-.05561***	.000701	
	(.004085)	(.002731)		(.005306)	(.006985)	
Wealth Cubed	.004324***	.0007514***		.004244***	.0001702	
	(.0004103)	(.0001161)		(.0005759)	(.000256)	
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R-squared	0.128	0.128	0.128	0.129	0.129	0.129
LR	2199.3***	2241.9***	2155.9***	852.4***	887.7***	854.8***
N	494841	494841	494825	501485	501470	501478
Equivalized Annual Income in 2003 (100k Danish 2000-prices) at the household level						
Annual Income	.1585***	-143***	.4727***	.09506*	-150.8***	.3092***
	(.02838)	(7.883)	(.01189)	(.04074)	(14.78)	(.01321)
Annual Income Squared	.006257	11.46***		.01302	12.08***	
	(.00758)	(.6349)		(.01136)	(1.183)	
Annual Income Cubed	-.00205***	-.3053***		-.002561**	-.3216***	
	(.0005917)	(.01703)		(.0009417)	(.03155)	
Selfemployed in 2003	.1575***	.1445***	.1538***	.09298***	.08633***	.09031***
	(.01089)	(.01089)	(.01073)	(.01371)	(.01372)	(.01359)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R-squared	0.128	0.129	0.128	0.129	0.129	0.129
LR	1477.6***	1728.8***	1598.7***	514.2***	572.8***	551.0***
N	494825	494825	494825	501478	501478	501478

Significanse levels: ***<0.001, **<0.01, *<0.05.

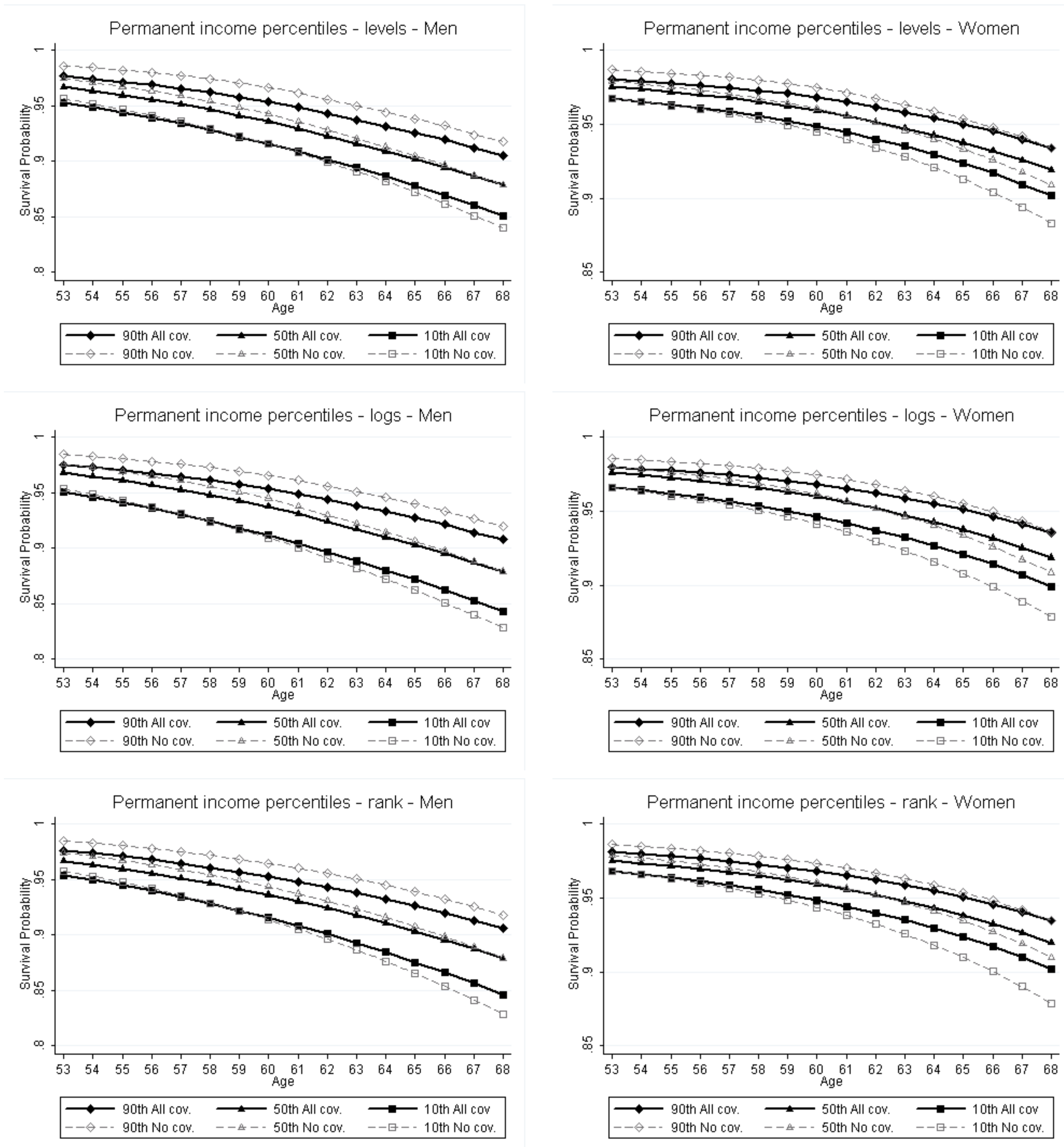
The table shows the parameter estimates of probit models regressing a dummy indicating whether people are a alive on December 31st 2008 on household equivalized financial and housing wealth in 2003 (upper panel) and household equivalized annual disposable income in 2003 (lower panel) as well as the set of covariates used in Attanasio and Emmerson (2003). The squared age term did not come out significant for the men. Therefore we excluded it from the regression. Only people alive on December 31st 2003 are included in the estimation sample. Columns 1-3 report the estimations results for men, and Columns 4-6 report the results for women.

We trimmed the top and bottom 1% of the permanent income distribution.

Covariates include age, civil status in 2003, education levels and initial health. The full set of parameter estimates are found in Tables 11 and 13 in the appendix. Estimation results including the wealth/annual income and age-variables only is found in Tables 12 and 14 in the appendix.

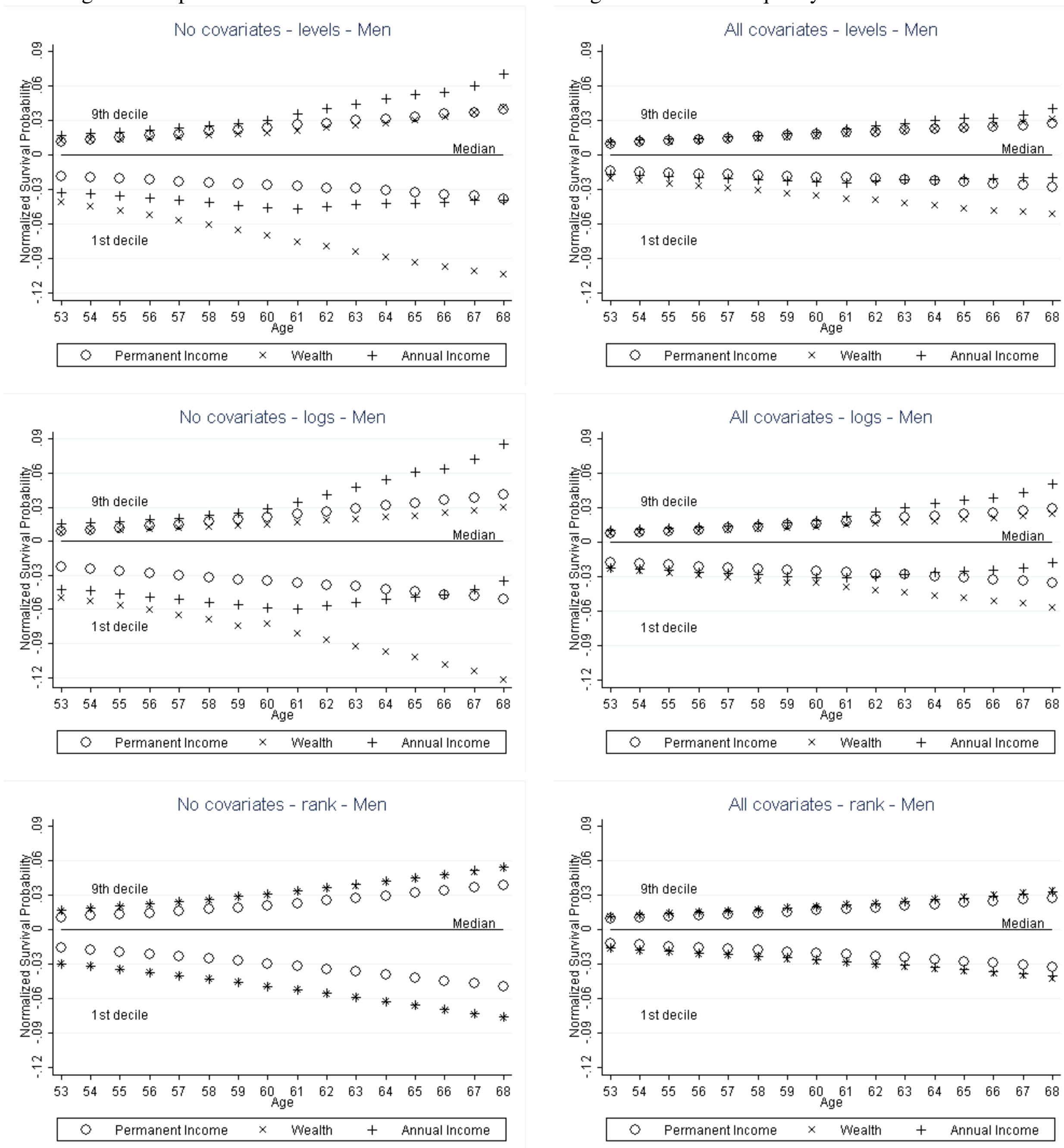
Figures

Figure 1: Impact of Permanent Income and age on Survival



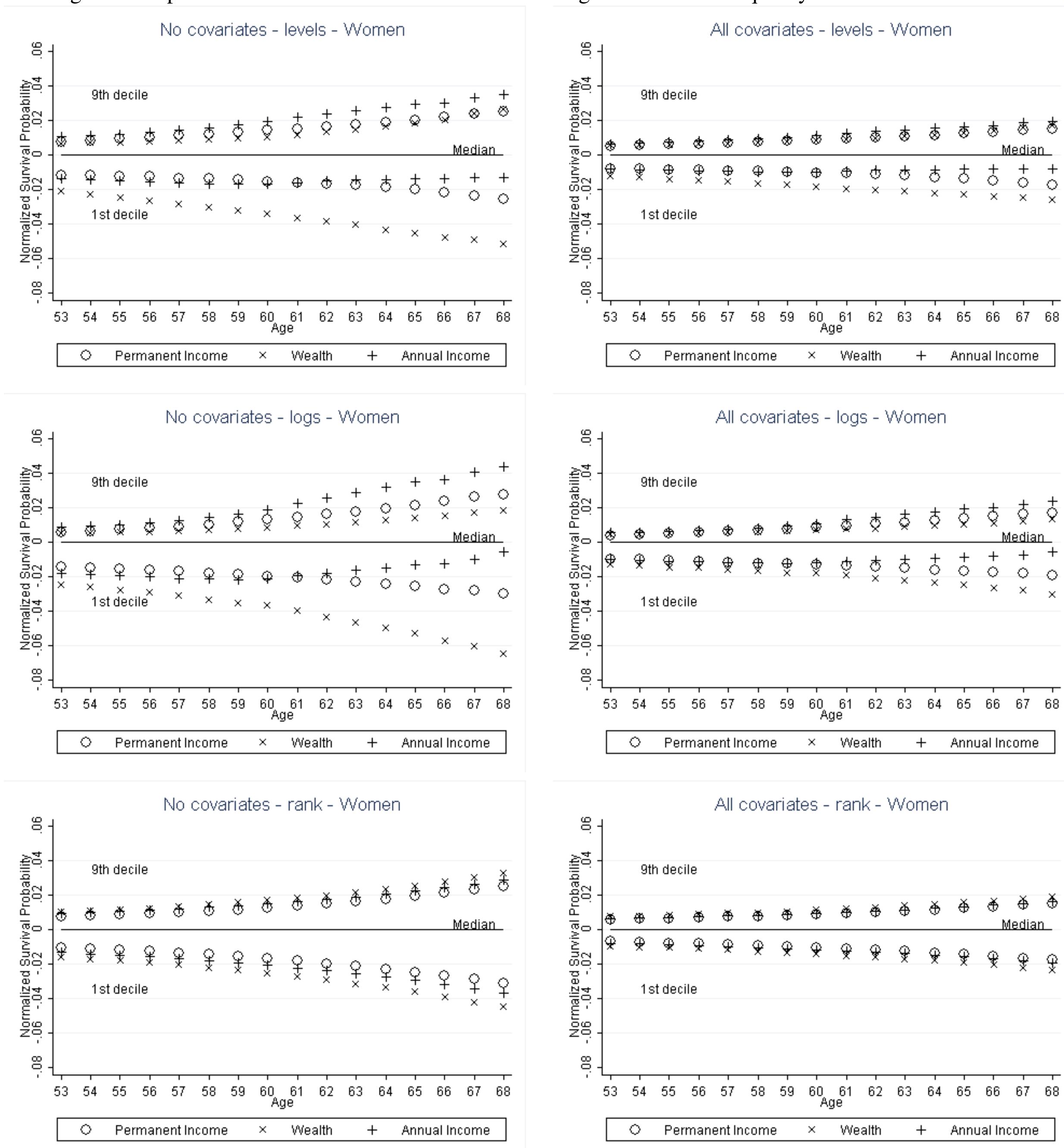
Note: The pictures show the predictions of five-year survival for non-single men (left) and women (right) with basic education and in good health given their position in the permanent income distribution. Lines marked with a diamond are predictions for people on the 90th percentile in the age and gender specific permanent income distribution. Triangles are those on the median and squares are people on the lowest decile. The upper row graphs the predictions using the levels-specification of permanent income; the middle-row the log-transformation; and the bottom-row the rank-transformation. The bold lines are predictions from the models that include all covariates. The dashed lines include no covariates other than age (and age-squared for the women).

Figure 2: Impact of Different Economic Resources and Age on Survival Inequality - Men



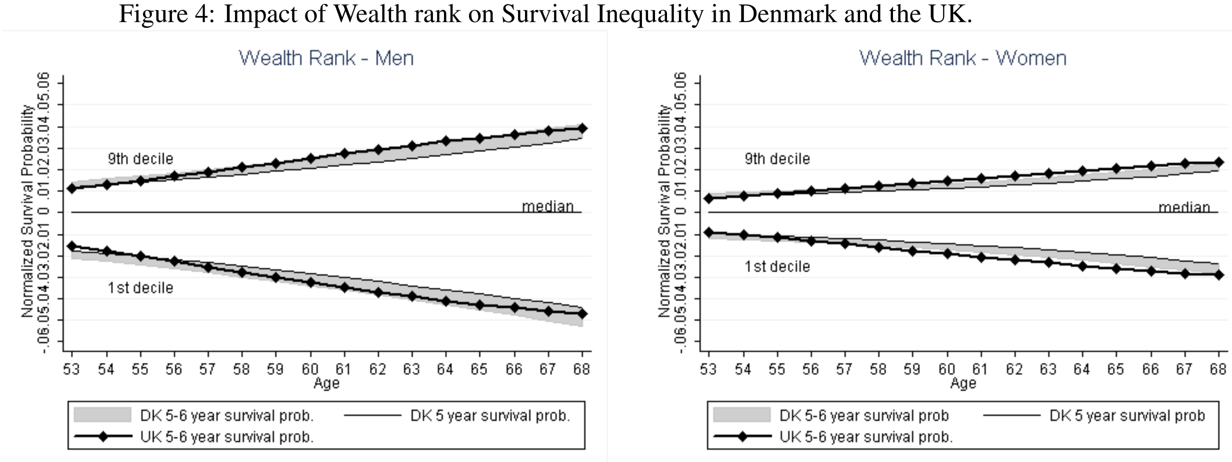
Note: For married (and cohabiting) men with basic education and in good health, the pictures show at different ages the five-year survival probabilities normalized around the median in a given distribution of resources. Hence, the normalized median survival probability is the horizontal line at zero. The scatters above the median line are the difference between the ninth decile and median; and the scatters below the median line are the difference between the first decile and median. The circles ("o") represent permanent income; the crosses ("x") financial and housing wealth; and the pluses ("+") annual income. All variables are measured at the household level. The upper row graphs the predictions using the levels-specification of economic resources; the middle-row the log-transformation; and the bottom-row the rank-transformation. Pictures on the left are predictions from the models that include no other covariates than age. Pictures on the right control for age, civil status, education and initial health.

Figure 3: Impact of Different Economic Resources and Age on Survival Inequality- Women



Note: For married (and cohabiting) women with basic education and in good health, the pictures show at different ages the five-year survival probabilities normalized around the median in a given distribution of resources. Hence, the normalized median survival probability is the horizontal line at zero. The scatters above the median line are the difference between the ninth decile and median; and the scatters below the median line are the difference between the first decile and median. The circles ("o") represent permanent income; the crosses ("x") financial and housing wealth; and the pluses ("+") annual income. All variables are measured at the household level. The upper row graphs the predictions using the levels-specification of economic resources; the middle-row the log-transformation; and the bottom-row the rank-transformation. Pictures on the left are predictions from the models that include no other covariates than age. Pictures on the right control for age, civil status, education and initial health.

Figure 4: Impact of Wealth rank on Survival Inequality in Denmark and the UK.



Note: The pictures plot the normalized survival probabilities for the 1st and 9th decile in the financial and housing wealth distribution for married and cohabiting men (left) and women (right) with basic education and in good health (see notes for Figure 5.2 and 5.3 for detailed description). For Denmark the models predict the five-year survival probabilities from 31st December 2003 to December 2008. For the UK the graphs are predictions of 5-6 years survival from 1988/1989 to 1994. This is because survival in the UK is captured by an indicator of whether respondents are alive in both the first and the second wave of the British Retirement Survey. The time between the interviews varies from 5 to 6 years. In both countries the models of the rank-transformation of financial and housing wealth (WE) are used. The graphs for the UK are constucted using the estimates from Table 9A and 9B in Attanasio and Emmerson (2003). The thick (and marked) lines represent the inequality in 5-6 years survival in the UK. The thin lines are the inequality in five-year survival in Denmark. To make the predictions in the two countries directly comparable—in terms of the period we measure survial probabilites within—the shaded areas plot the lower (five-year survival) and upper bound (six-year survival) inequality in Denmark. Under the assumption that the gradient in five- and six-year survival ais the same on average, the upper bound is calculated by multiplying the five-year survival inequality by (6/5).

Appendix A. Grouping ICD-10 codes

Table 7: Grouping of ICD-10 diagnoses, a

Infections	Lung disease	Nerves	Circulation	Lymphs	Veins	Blood	Disgestive system	Urinary	Musculoskeletal	Gynecology	Pregnancy
DA000-DA099	DA150-DA169	DA170-DA179	DT820-DT829	DI700-DI809B	DI830-DI839B	DC463	DA183-DA183E	DA181-DA181F	DA180-DA180G	DB373-DB373B	DA349
DA182	DA190-DA199	DA800-DA899	DT862-DT863B	DI820-DI829B		DC754	DB150-DB199	DB374-DB374A	DB453	DC510-DC589	DO000-DO979
DA188-DA188H	DB371	DB003-DB004A		DI870-DI899		DC770-DC779B	DB942	DB901	DB902-DB902B	DC796	DO994
DA209-DA339	DB440-DB441	DB020-DB022B		DL040-DL049		DC810-DC969	DC150-DC269	DC600-DC689	DC400-DC419B	DD060-DD073	DO998-DP969
DA359-DA499A	DB450	DB375		DQ270-DQ279		DD360	DC451	DC790-DC791X	DC461	DD250-DD289	DR090
DA659-DA709B	DB909	DB451-DB451A		DR590-DR599		DD459-DD479	DC480-DC488	DD074-DD091	DC491-DC492B	DD390-DD399	DZ370-DZ379
DA740-DA799	DC339-DC379	DB900		DS090		DD500-DD729	DC494-DC495A	DD176	DC764-DC765	DI862-DI863	
DA909-DA999	DC381-DC399	DB919		DS150-DS159		DD740-DD849	DC762-DC763	DD290-DD309	DC795-DC795B	DN700-DN989	
DB007-DB019	DC450	DB941		DS350-DS359		DD861	DC784-DC788	DD400-DD419	DD160-DD169B	DN992-DN993	
DB027-DB069	DC761	DC470-DC479B				DD890-DD899	DD001-DD019	DI861	DD172-DD172B	DQ500-DQ529	
DB084-DB084A	DC780-DC783	DC700-DC729				DO990-DO991A	DD120-DD139	DN000-DN518C	DD192-DD192D	DS314-DS314B	
DB088-DB099	DD021-DD024	DC751-DC753				DT860-DT860A	DD175	DN990-DN991B	DD211-DD212B	DS374-DS376	
DB200-DB279	DD142-DD150	DC793-DC794				DZ832A	DD191	DN995-DN999	DD480		
DB330-DB349A	DD152-DD159	DD320-DD339					DD194-DD195	DQ530-DQ559	DG560-DG563		
DB377-DB379	DD174	DD353-DD354					DD200-DD201	DQ600-DQ649	DG570		
DB399	DD190	DD361-DD361B					DD214-DD215	DR300-DR398C	DG572-DG576A		
DB447-DB449	DD193	DD420-DD439					DD371-DD379	DS302-DS302P	DL030-DL031I		
DB457-DB459	DD213	DD482-DD482E					DD483-DD484	DS312-DS313B	DM000-DM999		
DB509-DB839	DD381-DD389	DG000-DG558					DD730-DD739	DS370-DS373A	DQ650-DQ749		
DB908	DD860	DG564-DG569					DI819	DT190-DT199	DQ760-DQ789		
DB929	DD862	DG571-DG571A					DI840-DI859	DT283	DQ798-DQ799		
DB948-DB999	DJ120-DJ229	DG578-DG998					DI864-DI864A	DT288	DS000-DS019		
DJ100-DJ118C	DJ409-DJ998E	DI600-DI698					DK209-DK938	DT830-DT839	DS091-DS091B		
DO980-DO980C	DO995	DQ000-DQ079					DO984-DO984C	DT861-DT861B	DS097-DS109		
DO985-DO988	DQ320-DQ341	DQ280-DQ283E					DO996		DS118-DS119		
DT899	DR040-DR068E	DQ750-DQ753					DQ390-DQ459		DS169-DS169B		
	DR091	DQ850-DQ859					DQ790-DQ794A		DS200-DS233A		
	DS270-DS281	DR250-DR261					DQ890-DQ890C		DS234-DS235A		
	DT174-DT179A	DR270-DR278A					DR100-DR108B		DS290-DS301		
	DT275-DT275B	DS020-DS021I					DR129		DS307-DS311		
	DT914	DS027-DS029					DR149-DR162B		DS317-DS328C		
		DS040-DS049					DR190-DR198H		DS334-DS335		
		DS061-DS080A					DS360-DS369		DS336-DS337B		
		DS120-DS146					DT180-DT189		DS390-DT019		
		DS189					DT281-DT282		DT021-DT039		
		DS233B					DT286-DT287		DT041-DT059		
		DS240-DS246					DT855-DT855C		DT063-DT149		
		DS330-DS333B					DT864-DT864B		DT840-DT849		
		DS335A					DT915-DT915B		DT870-DT876F		
		DS340-DS348C							DT920-DT939		
		DT020									
		DT040									
		DT060-DT062									
		DT850-DT851A									
		DT902-DT903									
		DT905									
		DT911									
		DT913									

Table 8: Grouping of ICD-10 diagnoses, b

Skin	Eyes	Ear/nose/Throat	Metabolic	Mental Illnesses	Breast	Sterilization	Consussion	Poisoning	Live Born Child	Other Illnessess
DA184-DA184I	DA185-DA185D	DA186	DA187-DA187A	DF000-DF999	DC500-DC509	DZ302	DS060	DT360-DT659	DZ380-DZ388P	DC457-DC459
DA500-DA649	DA719	DB002-DB002B	DC739-DC750	DO993-DO993B	DD050-DD059			DT969-DT979		DC467-DC469
DB000-DB001B	DB005-DB005G	DB085	DC759	DR410-DR418A	DD249-DD249W					DC490-DC490C
DB079-DB083	DB023-DB023G	DB370-DB370A	DC797	DR440-DR458	DD486					DC758
DB350-DB369	DB300-DB309	DB442	DD093-DD093B	DR620-DR629	DI972					DC767-DC768
DB372-DB372C	DB940	DC000-DC148	DD349-DD352A		DN600-DN649					DC798-DC809
DB389	DC690-DC699	DC300-DC329	DD357		DQ830-DQ839					DC979
DB409-DB439A	DD092	DC462	DD359		DT854					DD097-DD099
DB452	DD221-DD221B	DD000-DD000C	DD440-DD449							DD173-DD173B
DB469-DB499A	DD231-DD231B	DD020	DE000-DE909							DD177-DD179
DB850-DB899A	DD310-DD319	DD100-DD119	DO992-DO992A							DD196-DD199
DC430-DC449	DH000-DH599	DD140-DD141	DQ891-DQ892I							DD216-DD219
DC460	DQ100-DQ159	DD220	DQ900-DQ999							DD358
DC493-DC493C	DS050-DS059	DD222-DD222B								DD367-DD369
DC496-DC499	DT150-DT159	DD230								DD481
DC760-DC760C	DT260-DT269	DD232-DD232B								DD487-DD489
DC792	DT852-DT853C	DD370-DD370C								DD868-DD869
DD030-DD049		DD380								DI868-DI868A
DD170-DD171B		DH600-DH959								DI950-DI959
DD180-DD181B		DI860								DI978-DI979
DD210-DD210C		DJ009-DJ069								DI980-DI999
DD223-DD229		DJ300-DJ399								DN994
DD233-DD239		DK000-DK149								DO989
DD485		DQ160-DQ189								DQ288-DQ289
DD863-DD863A		DQ300-DQ319								DQ348-DQ349
DI979A-DI979E		DQ380-DQ388C								DQ560-DQ564
DL009-DL029C		DQ754-DQ755								DQ758-DQ759
DL032-DL039A		DR139								DQ795-DQ796
DL050-DL998B		DR430-DR438C								DQ860-DQ878J
DO981-DO983		DR470-DR498B								DQ894-DQ899
DO997		DS022-DS026E								DR010-DR031
DQ350-DQ379		DS030-DS035								DR070-DR079
DQ800-DQ829		DS081								DR092-DR098G
DQ840-DQ849		DS092								DR119-DR119C
DR200-DR238B		DS110-DS117								DR179-DR189
DT200-DT257B		DS170-DS179								DR262-DR268F
DT290-DT339		DT169-DT173								DR290-DR298A
DT950-DT959		DT270-DT274B								DR400-DR402
		DT280-DT280B								DR429
		DT285-DT285B								DR460-DR468
										DR500-DR589
										DR600-DR619A
										DR630-DR999
										DS088-DS089
										DS197-DS199
										DS315
										DS377-DS383C
										DT276-DT277
										DT284
										DT289
										DT340-DT357
										DT669-DT819
										DT856-DT859
										DT868-DT869
										DT880-DT889
										DT900-DT901
										DT904-DT904B
										DT908-DT910D
										DT912-DT912B
										DT918-DT919
										DT940-DT941
										DT980-DZ301
										DZ303-DZ369
										DZ390-DZ832
										DZ833-DZ999

Appendix B. Full sets of estimates

Table 9: The survival/permanent income gradient

	Men:			Women:		
	Levels	Natural Logs	Rank (percentile)	Levels	Natural Logs	Rank
Average household income from age 45-53 (100k Danish 2000-prices)						
Permanent Income	-.0175	-214.3***	.3791***	.08665	-190.8***	.2822***
	(.05345)	(15.01)	(.01192)	(.06774)	(19.92)	(.01351)
Permanent Income Squared	.08234***	17.36***		.03901	15.52***	
	(.0183)	(1.221)		(.0237)	(1.618)	
Permanent Income Cubed	-.0117***	-.4674***		-.007812**	-.4201***	
	(.001918)	(.03308)		(.002547)	(.04378)	
Single age 45-53	-.08388***	-.08155***	-.08395***	-.05604***	-.05347***	-.05437***
	(.008022)	(.008029)	(.008021)	(.008897)	(.008906)	(.008898)
Selfemployed age 45-53	.1232***	.1231***	.1228***	.09108***	.08988***	.08824***
	(.007414)	(.007399)	(.007203)	(.0085)	(.008487)	(.008289)
Age	-.3784***	-.378***	-.4436***	.5923**	.5911**	.4887*
	(.006773)	(.006767)	(.006666)	(.2164)	(.2164)	(.2161)
- squared				-.0754***	-.07525***	-.07131***
				(.0178)	(.0178)	(.01777)
Single in 2003	-.3271***	-.3241***	-.3285***	-.1578***	-.1565***	-.1588***
	(.008292)	(.008301)	(.008288)	(.008772)	(.008778)	(.008773)
High School	.1158***	.1127***	.1136***	.1686***	.166***	.1663***
	(.01353)	(.01353)	(.01354)	(.0182)	(.0182)	(.01822)
Vocational	.04411***	.04133***	.0423***	.09333***	.09061***	.0942***
	(.006684)	(.006692)	(.006685)	(.007694)	(.007706)	(.007709)
Intermediate	.1135***	.1095***	.1119***	.1803***	.1762***	.1799***
	(.01133)	(.0113)	(.01133)	(.012)	(.01199)	(.012)
Long	.1589***	.1628***	.1648***	.1335***	.1355***	.1148***
	(.01603)	(.016)	(.01575)	(.02552)	(.0255)	(.02502)
Unknown	.1701***	.1676***	.1689***	.1729***	.1714***	.1686***
	(.02005)	(.02006)	(.0201)	(.02623)	(.02624)	(.02628)
Hospital record 2001-2003	-.08833***	-.08854***	-.08842***	-.1493***	-.1492***	-.1503***
	(.02012)	(.02013)	(.02012)	(.0225)	(.0225)	(.0225)
Days to next hospital record	-.0007781***	-.0007781***	-.0007792***	-.0008261***	-.0008263***	-.0008229***
	(.0000588)	(.0000588)	(.0000588)	(.0000654)	(.0000654)	(.0000654)
- Squared	-5.13e-07***	-5.14e-07***	-5.15e-07***	-5.92e-07***	-5.92e-07***	-5.91e-07***
	(5.16e-08)	(5.16e-08)	(5.16e-08)	(5.73e-08)	(5.73e-08)	(5.73e-08)
Hospital record in 2003	.1738***	.1736***	.1729***	.1812***	.1814***	.181***
	(.01737)	(.01738)	(.01737)	(.01936)	(.01937)	(.01937)
Hospitalnights in 2003	-.01903***	-.01902***	-.019***	-.02391***	-.02392***	-.02401***
	(.0004346)	(.0004347)	(.0004345)	(.0004925)	(.0004925)	(.0004924)
- Squared	.0000598***	.0000598***	.0000597***	.0000798***	.0000798***	.0000798***
	(2.24e-06)	(2.24e-06)	(2.24e-06)	(2.77e-06)	(2.77e-06)	(2.77e-06)
No of diagnoses in 2003	-.03329***	-.03314***	-.03313***	-.02044***	-.02029***	-.02057***
	(.004329)	(.00433)	(.004329)	(.004718)	(.004718)	(.004717)
Lung disease in 2003	-.2947***	-.2942***	-.294***	-.3665***	-.3662***	-.3674***
	(.01543)	(.01544)	(.01544)	(.01644)	(.01644)	(.01644)
Nerves in 2003	-.06624***	-.06619***	-.06774***	-.04613*	-.04629*	-.04711*
	(.01707)	(.01707)	(.01705)	(.02066)	(.02067)	(.02067)
Metabolic in 2003	.05258**	.05299**	.05093**	.04592*	.04642*	.04487*
	(.01624)	(.01625)	(.01624)	(.01822)	(.01823)	(.01821)
Hospital record in 2002	.03618**	.03579**	.03627**	.024	.02385	.02343
	(.01138)	(.01138)	(.01137)	(.01253)	(.01254)	(.01254)
Hospitalnights in 2002	-.01062***	-.01064***	-.01063***	-.01583***	-.01582***	-.01572***
	(.0004596)	(.0004597)	(.0004596)	(.0005107)	(.0005107)	(.0005112)
- Squared	.0000314***	.0000315***	.0000314***	.0000472***	.0000473***	.0000468***
	(1.90e-06)	(1.90e-06)	(1.90e-06)	(2.41e-06)	(2.41e-06)	(2.41e-06)
No of diagnoses in 2002	-.02046***	-.02005***	-.02047***	.002437	.002522	.002697
	(.004629)	(.004631)	(.00463)	(.005038)	(.005039)	(.005042)
Lung disease in 2002	-.1887***	-.1885***	-.1895***	-.2167***	-.2166***	-.2182***
	(.01729)	(.0173)	(.01729)	(.01862)	(.01862)	(.01863)
Nerves in 2002	-.0547**	-.05422**	-.05398**	-.08035***	-.0808***	-.08214***
	(.0186)	(.01861)	(.01861)	(.02238)	(.02238)	(.02238)
Metabolic in 2002	-.03984*	-.04031*	-.03846*	.008102	.008689	.006068
	(.01768)	(.01769)	(.01769)	(.01963)	(.01963)	(.01962)
Hospital record in 2001	.06404***	.06392***	.06354***	.07418***	.07441***	.07481***
	(.01111)	(.01111)	(.01111)	(.01227)	(.01227)	(.01228)
Hospitalnights in 2001	-.007472***	-.007475***	-.007389***	-.01196***	-.01195***	-.01192***
	(.00052)	(.0005201)	(.0005186)	(.0006095)	(.0006095)	(.0006096)
- Squared	.0000233***	.0000234***	.0000228***	.00004***	.00004***	.0000399***
	(2.72e-06)	(2.73e-06)	(2.69e-06)	(3.97e-06)	(3.97e-06)	(3.97e-06)
No of diagnoses in 2001	-.04247***	-.04204***	-.04292***	-.02491***	-.02489***	-.02463***
	(.004861)	(.004863)	(.004859)	(.005305)	(.005305)	(.005311)
Lung disease in 2001	-.1417***	-.1421***	-.1447***	-.1445***	-.1439***	-.1471***
	(.01835)	(.01835)	(.01833)	(.01983)	(.01984)	(.01984)
Nerves in 2001	-.1112***	-.1116***	-.1089***	-.08199***	-.08222***	-.08457***
	(.01905)	(.01906)	(.01906)	(.0234)	(.0234)	(.0234)
Metabolic in 2001	-.04625*	-.04611*	-.04287*	-.0481*	-.04762*	-.04796*
	(.01844)	(.01845)	(.01846)	(.02065)	(.02065)	(.02065)
constant	3.499***	883.7***	3.996***	.5736	781.1***	1.236
	(.07148)	(61.49)	(.05135)	(.6564)	(81.7)	(.6551)
Pseudo R-squared	0.126	0.126	0.126	0.129	0.129	0.129
N	494825	494825	494825	501478	501478	501478

Table 10: The survival/permanent income gradient estimated without covariates

	Men: Levels	Men: Natural Logs	Men: Rank (percentile)	Women: Levels	Women: Natural Logs	Women: Rank
Average household income from age 45-53 (100k Danish 2000-prices)						
Permanent Income	-.1642**	-295.1***	.5637***	-.09757	-287.2***	.4405***
	(.05044)	(14.47)	(.01048)	(.06337)	(18.9)	(.01173)
Permanent Income Squared	.1638***	23.84***		.1337***	23.27***	
	(.01719)	(1.176)		(.02206)	(1.535)	
Permanent Income Cubed	-.02099***	-.6403***		-.01881***	-.6273***	
	(.001798)	(.03187)		(.002361)	(.04151)	
Single age 45-53	-.2963***	-.2908***	-.2954***	-.1599***	-.1557***	-.1586***
	(.005951)	(.005965)	(.005927)	(.006685)	(.006701)	(.006695)
Selfemployed age 45-53	.1545***	.1545***	.1598***	.1252***	.1234***	.1279***
	(.007109)	(.007093)	(.006896)	(.008058)	(.008041)	(.007856)
Age	-.4216***	-.4212***	-.5184***	.8577***	.8469***	.6601**
	(.006484)	(.006482)	(.006343)	(.2053)	(.2053)	(.2049)
- squared				-.1018***	-.1008***	-.09259***
				(.01688)	(.01689)	(.01685)
constant	3.816***	1219***	4.413***	-.007723	1179***	.913
	(.06147)	(59.29)	(.03894)	(.6217)	(77.54)	(.6203)
Pseudo R-squared	0.052	0.053	0.053	0.037	0.037	0.037
N	494825	494825	494825	501478	501478	501478

Table 11: The survival/Wealth gradient

	Men:			Women:		
	Levels	Natural Logs	Rank (percentile)	Levels	Natural Logs	Rank
Financial and housing wealth (1000k Danish 2000-prices)						
Wealth	.2895***	.0481*	.5075***	.2272***	-.00877	.3695***
	(.009842)	(.0201)	(.01105)	(.01195)	(.06207)	(.01273)
Wealth Squared	-.06259***	-.009966***		-.05561***	.000701	
	(.004085)	(.002731)		(.005306)	(.006985)	
Wealth Cubed	.004324***	.0007514***		.004244***	.0001702	
	(.0004103)	(.0001161)		(.0005759)	(.000256)	
Age	-.4307***	-.4332***	-.4286***	.2041	.1887	.472*
	(.006611)	(.006619)	(.006624)	(.217)	(.2171)	(.2169)
- squared				-.04616**	-.04517*	-.06922***
				(.01784)	(.01785)	(.01783)
Single in 2003	-.3532***	-.3451***	-.3649***	-.1559***	-.1499***	-.1661***
	(.006663)	(.00671)	(.006484)	(.007387)	(.007427)	(.0072)
High School	.1118***	.1146***	.1099***	.1623***	.1631***	.1557***
	(.01352)	(.01352)	(.01353)	(.01811)	(.0181)	(.01809)
Vocational	.05114***	.05232***	.05191***	.09734***	.0979***	.09561***
	(.006669)	(.006662)	(.006661)	(.007608)	(.007605)	(.007613)
Intermediate	.1235***	.128***	.1212***	.184***	.1844***	.1816***
	(.01104)	(.01102)	(.01104)	(.01162)	(.01161)	(.01163)
Long	.19***	.1932***	.1802***	.1361***	.1345***	.1231***
	(.01521)	(.01515)	(.01516)	(.02445)	(.0244)	(.02435)
Unknown	.1873***	.1921***	.1864***	.1913***	.1993***	.1896***
	(.02042)	(.02045)	(.02044)	(.02696)	(.02701)	(.02696)
Hospital record 2001-2003	-.08399***	-.08506***	-.0877***	-.1403***	-.1415***	-.1414***
	(.02024)	(.02024)	(.02023)	(.02266)	(.02266)	(.02266)
Days to next hospital record	-.000721***	-.0007233***	-.0007239***	-.0007967***	-.0007962***	-.000796***
	(.0000591)	(.0000591)	(.0000591)	(.0000657)	(.0000657)	(.0000657)
- Squared	-4.81e-07***	-4.83e-07***	-4.86e-07***	-5.65e-07***	-5.66e-07***	-5.65e-07***
	(5.19e-08)	(5.19e-08)	(5.19e-08)	(5.77e-08)	(5.77e-08)	(5.77e-08)
Hospital record in 2003	.1576***	.158***	.157***	.1817***	.1812***	.1819***
	(.01747)	(.01747)	(.01748)	(.01945)	(.01945)	(.01945)
Hospitalnights in 2003	-.0189***	-.0189***	-.01895***	-.0239***	-.02393***	-.02389***
	(.0004353)	(.0004354)	(.0004356)	(.0004944)	(.0004946)	(.0004945)
- Squared	.0000587***	.0000587***	.0000588***	.0000796***	.0000797***	.0000796***
	(2.22e-06)	(2.22e-06)	(2.22e-06)	(2.78e-06)	(2.78e-06)	(2.78e-06)
No of diagnoses in 2003	-.03231***	-.03204***	-.03245***	-.02038***	-.02013***	-.02039***
	(.004365)	(.004366)	(.004365)	(.004747)	(.004748)	(.004748)
Lung disease in 2003	-.2906***	-.2897***	-.2911***	-.3561***	-.3549***	-.3559***
	(.01555)	(.01555)	(.01556)	(.01656)	(.01656)	(.01657)
Nerves in 2003	-.06272***	-.06362***	-.06253***	-.04726*	-.04839*	-.04604*
	(.01718)	(.01718)	(.01718)	(.02076)	(.02076)	(.02077)
Metabolic in 2003	.06211***	.06178***	.06135***	.04589*	.04654*	.04718*
	(.01635)	(.01635)	(.01635)	(.01831)	(.01831)	(.01832)
Hospital record in 2002	.03673**	.03706**	.03673**	.0296*	.02976*	.02893*
	(.01145)	(.01145)	(.01145)	(.0126)	(.0126)	(.0126)
Hospitalnights in 2002	-.01086***	-.0109***	-.01085***	-.01605***	-.01607***	-.01602***
	(.0004627)	(.0004627)	(.0004632)	(.0005129)	(.0005129)	(.0005133)
- Squared	.0000323***	.0000324***	.0000324***	.0000478***	.0000478***	.0000477***
	(1.91e-06)	(1.91e-06)	(1.92e-06)	(2.43e-06)	(2.43e-06)	(2.43e-06)
No of diagnoses in 2002	-.017***	-.01672***	-.01732***	.003473	.003657	.003129
	(.004668)	(.004669)	(.004668)	(.005072)	(.005073)	(.005071)
Lung disease in 2002	-.1829***	-.1824***	-.187***	-.219***	-.2184***	-.2184***
	(.01744)	(.01744)	(.01742)	(.01871)	(.01872)	(.01872)
Nerves in 2002	-.05353**	-.05451**	-.05538**	-.06911**	-.07033**	-.06902**
	(.01873)	(.01873)	(.01873)	(.02259)	(.02259)	(.0226)
Metabolic in 2002	-.03325	-.03351	-.03291	.009137	.009676	.009283
	(.0178)	(.0178)	(.0178)	(.01975)	(.01975)	(.01975)
Hospital record in 2001	.0696***	.06989***	.07057***	.08065***	.08117***	.0809***
	(.0112)	(.0112)	(.0112)	(.01235)	(.01235)	(.01235)
Hospitalnights in 2001	-.007448***	-.00746***	-.007499***	-.01233***	-.01238***	-.01233***
	(.0005245)	(.0005245)	(.0005263)	(.0006229)	(.0006229)	(.0006231)
- Squared	.0000231***	.000023***	.0000237***	.0000428***	.000043***	.0000428***
	(2.75e-06)	(2.75e-06)	(2.78e-06)	(4.18e-06)	(4.18e-06)	(4.18e-06)
No of diagnoses in 2001	-.04156***	-.04107***	-.042***	-.02262***	-.02197***	-.02308***
	(.004908)	(.004909)	(.004907)	(.005344)	(.005345)	(.00534)
Lung disease in 2001	-.1385***	-.1378***	-.1399***	-.1473***	-.1465***	-.1463***
	(.01846)	(.01846)	(.01846)	(.01998)	(.01998)	(.01998)
Nerves in 2001	-.1037***	-.1045***	-.1036***	-.08577***	-.08648***	-.08515***
	(.0192)	(.0192)	(.01919)	(.02349)	(.02349)	(.02349)
Metabolic in 2001	-.04602*	-.04584*	-.04665*	-.05143*	-.05066*	-.05041*
	(.01857)	(.01858)	(.01856)	(.02076)	(.02076)	(.02076)
constant	3.896***	3.774***	3.873***	2.003**	1.993**	1.218
	(.05136)	(.06987)	(.05133)	(.6582)	(.6816)	(.6577)
Pseudo R-squared	0.128	0.128	0.128	0.129	0.129	0.129
N	494841	494841	494825	501485	501470	501478

Table 12: The survival/Wealth gradient estimated without covariates

	Men:			Women:		
	Levels	Natural Logs	Rank (percentile)	Levels	Natural Logs	Rank
Financial and housing wealth (1000k Danish 2000-prices)						
Wealth	.546***	-.06002**	.811***	.4076***	-.2522***	.6098***
	(.008966)	(.01967)	(.0101)	(.0107)	(.05983)	(.01125)
Wealth Squared	-.1375***	.006758*		-.1081***	.02815***	
	(.003856)	(.002649)		(.004934)	(.006702)	
Wealth Cubed	.01021***	.0001753		.008615***	-.000701**	
	(.0004003)	(.0001121)		(.0005496)	(.000245)	
Age	-.4828***	-.4901***	-.4791***	.213	.1803	.6635**
	(.006282)	(.006296)	(.006295)	(.2061)	(.2063)	(.2059)
- squared				-.05268**	-.05036**	-.09156***
				(.01695)	(.01696)	(.01693)
constant	4.033***	4.043***	4.006***	2.076***	2.756***	.7574
	(.03831)	(.06075)	(.03836)	(.624)	(.6478)	(.6233)
Pseudo R-squared	0.053	0.054	0.050	0.039	0.040	0.038
N	494841	494841	494825	501485	501470	501478

Table 13: The survival/annual income gradient

	Men:			Women:		
	Levels	Natural Logs	Rank (percentile)	Levels	Natural Logs	Rank
Annual Income in 2003 (100k Danish 2000-prices)						
Annual Income	.1585***	-143***	.4727***	.09506*	-150.8***	.3092***
	(.02838)	(7.883)	(.01189)	(.04074)	(14.78)	(.01321)
Annual Income Squared	.006257	11.46***		.01302	12.08***	
	(.00758)	(.6349)		(.01136)	(1.183)	
Annual Income Cubed	-.00205***	-.3053***		-.002561**	-.3216***	
	(.0005917)	(.01703)		(.0009417)	(.03155)	
Selfemployed in 2003	.1575***	.1445***	.1538***	.09298***	.08633***	.09031***
	(.01089)	(.01089)	(.01073)	(.01371)	(.01372)	(.01359)
Age	-.3412***	-.3307***	-.4295***	.2109	.2256	.4307*
	(.006772)	(.006808)	(.006601)	(.2161)	(.2162)	(.2157)
- squared				-.04139*	-.04217*	-.06577***
				(.01778)	(.01779)	(.01773)
Single in 2003	-.3611***	-.3547***	-.3555***	-.1926***	-.1897***	-.1929***
	(.006594)	(.006609)	(.006575)	(.007057)	(.007068)	(.007047)
High School	.113***	.1052***	.1053***	.1594***	.1541***	.1549***
	(.01354)	(.01355)	(.01353)	(.01821)	(.01822)	(.01815)
Vocational	.05251***	.04829***	.04943***	.09259***	.08924***	.08974***
	(.006629)	(.00664)	(.00664)	(.00767)	(.007683)	(.007683)
Intermediate	.1009***	.08965***	.09307***	.1611***	.1536***	.1595***
	(.0113)	(.0113)	(.0113)	(.01204)	(.01207)	(.01204)
Long	.1366***	.1326***	.1368***	.09635***	.09481***	.1009***
	(.01596)	(.0159)	(.0156)	(.02531)	(.02529)	(.02493)
Unknown	.1662***	.141***	.1521***	.1647***	.1484***	.1603***
	(.02065)	(.02072)	(.0206)	(.02715)	(.02721)	(.02724)
Hospital record 2001-2003	-.08838***	-.08839***	-.08804***	-.1458***	-.1459***	-.1452***
	(.02008)	(.02009)	(.0201)	(.02248)	(.02249)	(.0225)
Days to next hospital record	-.0007422***	-.0007434***	-.0007435***	-.0008129***	-.0008136***	-.0008131***
	(.0000587)	(.0000587)	(.0000587)	(.0000652)	(.0000653)	(.0000653)
- Squared	-4.92e-07***	-4.94e-07***	-4.92e-07***	-5.79e-07***	-5.80e-07***	-5.79e-07***
	(5.15e-08)	(5.15e-08)	(5.15e-08)	(5.72e-08)	(5.72e-08)	(5.73e-08)
Hospital record in 2003	.1635***	.163***	.1645***	.179***	.1794***	.1796***
	(.01734)	(.01735)	(.01735)	(.01931)	(.01932)	(.01932)
Hospitalnights in 2003	-.01892***	-.01892***	-.01894***	-.02388***	-.02388***	-.02385***
	(.0004331)	(.0004332)	(.0004334)	(.0004925)	(.0004926)	(.0004927)
- Squared	.0000592***	.0000592***	.0000593***	.00008***	.00008***	.0000799***
	(2.21e-06)	(2.21e-06)	(2.21e-06)	(2.79e-06)	(2.79e-06)	(2.79e-06)
No of diagnoses in 2003	-.03224***	-.03169***	-.03238***	-.02062***	-.0205***	-.02086***
	(.004322)	(.004324)	(.004324)	(.004707)	(.004708)	(.00471)
Lung disease in 2003	-.2969***	-.296***	-.2963***	-.3672***	-.3669***	-.3682***
	(.01541)	(.01542)	(.01542)	(.0164)	(.0164)	(.0164)
Nerves in 2003	-.06797***	-.06821***	-.06735***	-.04901*	-.0493*	-.04991*
	(.017)	(.01701)	(.01701)	(.0206)	(.0206)	(.0206)
Metabolic in 2003	.05644***	.05632***	.05937***	.04659*	.04693**	.04678*
	(.01622)	(.01622)	(.01623)	(.01816)	(.01816)	(.01816)
Hospital record in 2002	.03812***	.03791***	.03844***	.02607*	.02635*	.02639*
	(.01135)	(.01136)	(.01136)	(.0125)	(.01251)	(.01251)
Hospitalnights in 2002	-.01061***	-.01059***	-.01062***	-.0157***	-.0157***	-.01564***
	(.0004589)	(.000459)	(.000459)	(.0005114)	(.0005114)	(.0005117)
- Squared	.0000314***	.0000314***	.0000314***	.0000463***	.0000463***	.0000461***
	(1.90e-06)	(1.90e-06)	(1.90e-06)	(2.42e-06)	(2.42e-06)	(2.43e-06)
No of diagnoses in 2002	-.02016***	-.01989***	-.02017***	.001487	.001521	.001175
	(.00462)	(.004622)	(.004621)	(.005024)	(.005024)	(.005026)
Lung disease in 2002	-.1877***	-.1867***	-.1878***	-.2156***	-.2153***	-.2158***
	(.01727)	(.01728)	(.01727)	(.01859)	(.01859)	(.0186)
Nerves in 2002	-.05342**	-.05341**	-.05423**	-.08453***	-.08491***	-.08645***
	(.01855)	(.01855)	(.01855)	(.02234)	(.02234)	(.02234)
Metabolic in 2002	-.03714*	-.0357*	-.03576*	.005956	.006325	.006172
	(.01766)	(.01766)	(.01766)	(.01955)	(.01956)	(.01956)
Hospital record in 2001	.06644***	.06635***	.06736***	.07649***	.07672***	.07769***
	(.01109)	(.01109)	(.01109)	(.01224)	(.01225)	(.01225)
Hospitalnights in 2001	-.007347***	-.007328***	-.007318***	-.01195***	-.01195***	-.01194***
	(.000517)	(.0005172)	(.0005175)	(.0006091)	(.0006091)	(.0006091)
- Squared	.0000221***	.000022***	.000022***	.0000398***	.0000398***	.0000398***
	(2.68e-06)	(2.68e-06)	(2.68e-06)	(3.97e-06)	(3.97e-06)	(3.96e-06)
No of diagnoses in 2001	-.04342***	-.04298***	-.04374***	-.02477***	-.02462***	-.02533***
	(.004843)	(.004845)	(.004845)	(.005291)	(.005292)	(.005292)
Lung disease in 2001	-.1413***	-.1417***	-.1422***	-.1505***	-.1502***	-.1515***
	(.01829)	(.0183)	(.0183)	(.01977)	(.01977)	(.01978)
Nerves in 2001	-.1095***	-.11***	-.1086***	-.08522***	-.08557***	-.08547***
	(.01899)	(.019)	(.01899)	(.02332)	(.02332)	(.02332)
Metabolic in 2001	-.04048*	-.03965*	-.03938*	-.051*	-.05079*	-.05095*
	(.01841)	(.01841)	(.01841)	(.02055)	(.02055)	(.02055)
constant	3.127***	595.9***	3.871***	1.668*	628***	1.374*
	(.06333)	(32.6)	(.05108)	(.6533)	(61.49)	(.6541)
Pseudo R-squared	0.128	0.129	0.128	0.129	0.129	0.129
N	494825	494825	494825	501478	501478	501478

Table 14: The survival/annual income gradient estimated without covariates

	Men:			Women:		
	Levels	Natural Logs	Rank (percentile)	Levels	Natural Logs	Rank
Annual Income in 2003 (100k Danish 2000-prices)						
Annual Income	.3041***	-234.6***	.7829***	.05459	-257.9***	.4948***
	(.0262)	(7.805)	(.01015)	(.03792)	(14.08)	(.01121)
Annual Income Squared	.002442	18.85***		.04847***	20.6***	
	(.007002)	(.6275)		(.01056)	(1.126)	
Annual Income Cubed	-.003059***	-.503***		-.006244***	-.5473***	
	(.0005453)	(.01681)		(.0008708)	(.03002)	
Selfemployed in 2003	.2638***	.2427***	.2504***	.1824***	.1689***	.1825***
	(.01046)	(.01046)	(.01032)	(.01293)	(.01293)	(.01282)
Age	-.3286***	-.313***	-.4765***	.3399	.3706	.6388**
	(.006401)	(.006439)	(.006262)	(.2045)	(.2047)	(.2042)
- squared				-.05437**	-.05608***	-.08901***
				(.01683)	(.01684)	(.0168)
constant	2.67***	973.2***	3.969***	1.251*	1075***	.841
	(.05065)	(32.33)	(.03818)	(.6172)	(58.62)	(.6183)
Pseudo R-squared	0.049	0.051	0.050	0.034	0.035	0.034
N	494825	494825	494825	501478	501478	501478

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