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ECONOMIC RESOURCES, MORTALITY AND INEQUALITY

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Economic Resources, Mortality and Inequality

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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.

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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); Brijænnum-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 countries¹ 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:

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

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

		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 rela	tive to mediar	1				
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
Ν	504923	504923	504923	511712	511712	511712

Table 1: Equivalized household income and wealth distributions

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

		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

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

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

Table 3: Covariate	es	
	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)
Ν	504923	511712

Binary standard Errors in parenthesis.

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

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

Binary Standard Errors in parenthesis.

		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***
Permanent Income Squared	(.05345) .08234*** (.0183)	(15.01) 17.36*** (1.221)	(.01192)	(.06774) .03901 (.0237)	(19.92) 15.52*** (1.618)	(.01351)
Permanent Income Cubed	0117*** (001918)	4674***		007812** (002547)	4201*** (04378)	
Single age 45-53	08388***	08155***	08395***	05604***	05347***	05437***
Selfemployed age 45-53	(.008022) .1232*** (.007414)	(.008029) .1231*** (.007399)	(.008021) .1228*** (.007203)	(.008897) .09108*** (.0085)	(.008906) .08988*** (.008487)	(.008898) .08824*** (.008289)
Age	3784*** (.00(772)	(.007399) 378***	4436*** (.00(((())	.5923**	.5911**	(.008289) .4887*
- squared	(.000773)	(.000707)	(.000000)	(.2104) 0754***	07525*** (.0179)	07131***
Single in 2003	3271***	3241***	3285***	(.0178) 1578***	(.0178) 1565***	(.01777) 1588***
constant	(.008292) 3.499*** (.07148)	(.008301) 883.7*** (61.49)	(.008288) 3.996*** (.05135)	(.008772) .5736 (.6564)	(.008778) 781.1*** (81.7)	(.008773) 1.236 (.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***
Ν	494825	494825	494825	501478	501478	501478
Permanent income measures	equivalized ave	rage household	income from a	ge 45-53 (100k	Danish 2000-p	rices)

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

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.

		Men:			Women:	
	Levels	Natural	Rank	Levels	Natural	Rank
		Logs	(percentile)		Logs	(percentile)
Wealth: Equivalized Finar	ncial and Housir	ng wealth (1000k	Danish 2000-p	prices) at the ho	usehold 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 Incon	ne in 2003 (100	x Danish 2000-pi	rices) at the hor	usehold 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***
Ν	494825	494825	494825	501478	501478	501478

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

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

	Pregnancy	DA349	DO000-DO979	D0994	D0998-DP969	DR090	DZ370-DZ379																																									
	Gynecology	DB373-DB373B	DC510-DC589	DC796	DD060-DD073	DD250-DD289	DD390-DD399	DI862-DI863	DN700-DN989	DN992-DN993	DQ500-DQ529	DS314-DS314B	DS374-DS376																																			
	Musculoskeletal	DA180-DA180G	DB453	DB902-DB902B	DC400-DC419B	DC461	DC491-DC492B	DC764-DC765	DC795-DC795B	DD160-DD169B	DD172-DD172B	DD192-DD192D	DD211-DD212B	DD480	DG560-DG563	DG570	DG572-DG576A	DL030-DL031I	DM000-DM999	DQ650-DQ749	DQ760-DQ789	DQ798-DQ799	DS000-DS019	DS091-DS091B	DS097-DS109	DS118-DS119	DS169-DS169B	DS200-DS233A	DS234-DS235A	DS290-DS301	DS307-DS311	DS317-DS328C	DS334-DS335	DS336-DS337B	DS390-DT019	DT021-DT039	DT041-DT059	DT063-DT149	DT840-DT849	DT870-DT876F	DT920-DT939							
	Urinary	DA181-DA181F	DB374-DB374A	DB901	DC600-DC689	DC790-DC791X	DD074-DD091	DD176	DD290-DD309	DD400-DD419	DI861	DN000-DN518C	DN990-DN991B	DN995-DN999	DQ530-DQ559	DQ600-DQ649	DR300-DR398C	DS302-DS302P	DS312-DS313B	DS370-DS373A	DT190-DT199	DT283	DT288	DT830-DT839	DT861-DT861B																							
)	Disgestive system	DA183-DA183E	DB150-DB199	DB942	DC150-DC269	DC451	DC480-DC488	DC494-DC495A	DC762-DC763	DC784-DC788	DD001-DD019	DD120-DD139	DD175	161 DD	DD194-DD195	DD200-DD201	DD214-DD215	DD371-DD379	DD483-DD484	DD730-DD739	DI819	DI840-DI859	DI864-DI864A	DK209-DK938	D0984-D0984C	D0996	DQ390-DQ459	DQ790-DQ794A	DQ890-DQ890C	DR100-DR108B	DR129	DR149-DR162B	DR190-DR198H	DS360-DS369	DT180-DT189	DT281-DT282	DT286-DT287	DT855-DT855C	DT864-DT864B	DT915-DT915B								
	Blood	DC463	DC754	DC770-DC779B	DC810-DC969	DD360	DD459-DD479	DD500-DD729	DD740-DD849	DD861	DD890-DD899	D0990-D0991A	DT860-DT860A	DZ832A																																		
•	Veins	DI830-DI839B																																														
	Lymphs	DI700-DI809B	DI820-DI829B	DI870-DI899	DL040-DL049	DQ270-DQ279	DR590-DR599	DS090	DS150-DS159	DS350-DS359																																						
	Circulation	DT820-DT829	DT862-DT863B																																													
	Nerves	DA170-DA179	DA800-DA899	DB003-DB004A	DB020-DB022B	DB375	DB451-DB451A	DB900	DB919	DB941	DC470-DC479B	DC700-DC729	DC751-DC753	DC793-DC794	DD320-DD339	DD353-DD354	DD361-DD361B	DD420-DD439	DD482-DD482E	DG000-DG558	DG564-DG569	DG571-DG571A	DG578-DG998	DI600-DI698	DQ000-DQ079	DQ280-DQ283E	DQ750-DQ753	DQ850-DQ859	DR250-DR261	DR270-DR278A	DS020-DS021I	DS027-DS029	DS040-DS049	DS061-DS080A	DS120-DS146	DS189	DS233B	DS240-DS246	DS330-DS333B	DS335A	DS340-DS348C	DT020	DT040	DT060-DT062	DT850-DT851A	DT902-DT903	DT905	DT911 DT913
	Lung disease	DA150-DA169	DA 190-DA 199	DB371	DB440-DB441	DB450	DB909	DC339-DC379	DC381-DC399	DC450	DC761	DC780-DC783	DD021-DD024	DD142-DD150	DD152-DD159	DD174	DD190	DD193	DD213	DD381-DD389	DD860	DD862	DJ 120-DJ229	DJ409-DJ998E	D0995	DQ320-DQ341	DR040-DR068E	DR091	DS270-DS281	DT174-DT179A	DT275-DT275B	DT914																
	Infections	DA000-DA099	DA182	DA188-DA188H	DA209-DA339	DA359-DA499A	DA659-DA709B	DA740-DA799	DA909-DA999	DB007-DB019	DB027-DB069	DB084-DB084A	DB088-DB099	DB200-DB279	DB330-DB349A	DB377-DB379	DB399	DB447-DB449	DB457-DB459	DB509-DB839	DB908	DB929	DB948-DB999	DJ100-DJ118C	D0980-D0980C	D0985-D0988	DT899																					

Table 7: Grouping of ICD-10 diagnoses, a

Other Illnessess	DC457-DC469 DC457-DC469 DC496-DC469 DC767-DC469 DC786-DC469 DC786-DC469 DC786-DC469 DC786-DC469 DC786-DC469 DC786-DC469 DC786-DC469 DC786-DC469 DC786-DD199 DD175-DD173-BD173-BD173-BD173-DD1569 DD175-DD1369 DD316-DD199 DD316-DD199 DD316-DD199 DD316-DD199 DD316-DD199 DD316-DD199 DD316-DD199 DD316-DD199 DD316-DD199 DD316-DD199 DD3175-DD199 DD3175-DD199 DC386-DQ765 DQ386-DQ765 DQ386-DQ765 DQ386-DQ765 DQ386-DQ765 DQ386-DQ765 DQ386-DQ765 DQ386-DQ765 DQ386-DQ765 DQ386-DQ765 DQ386-DQ765 DQ386-DQ765 DQ386-DQ765 DQ386-DQ765 DQ386-DQ755 DQ386-DQ755 DQ386-DQ755 DQ386-DQ755 DQ386-DQ755 DQ386-DQ755 DQ386-DQ755 DQ386-DQ755 DQ386-DD7269 DQ388-DD2899 DQ388-DD2899 DQ388-DD2899 DQ388-DD2899 DQ388-DD7295 D1726-D71377 D1726-D71379 D1726-D71379 D17280-D72301 D1790-D71910 D1790-D71910 D1790-D71910 D1790-D71910 D1790-D71910 D1790-D71910 D1790-D71910 D1790-D72301
Live Born Child	d 885 Zid- 685 Zid-
Poisoning	DT366-DT369 DT964-DT979
Consussion	DS000
Sterilization	DZ30
Breast	DC500-DC509 DD495-DD249-
Mental Illnesses	DF000.DF399 DR410.DR418A DR40.DR438 DR620.DR629
Metabolic	DA187-DA187A DC790-DC790 DC790 DC790 DD3440-DD332A DD3440 DD3470 DD349D32A DD3490 DD3995-DD9990 DQ900-DQ999 DQ900-DQ999
Ear/nose/Throat	DA186 DA186 DA186 DB425002 DB4870 DB4870 DB4870 DB4870 DB4870 DB4020D141 DD000-DD000 DD000-DD000 DD1400D119 DD1400D119 DD1232DD233 DD2320 DD2330 DD12320D233 DD2330 DD123005 DD1370-DD1399 DD1370-DD1390 DD1370-DD1390 DD1380 DD2380 DD2380 DD2380 DD2380 DD1370-DD1399 DD13800 DD1390 DD1390-D01399 DD13800 DD1390-D01399 DD13800 DD1390-D01399 DD13800 DD1390-D01399 DD13800 DD1390-D01399 DD1390-D01399 DD13800 DD1390-D01399 DD13800 DD1390-D01399 DD13800 DD1390-D01399 DD1370-D01399 DD1370-D01399 DD1370-D01399 DD1370-D01399 DD1370-D01399 DD1370-D01399 DD1370-D01399 DD1370-D01399 DD1370-D01399 DD1370-D01399 DD1370-D01399 DD1370-D01399 DD1370-D01399 DD1370-D01399 DD1370-D01399 DD1390-D01399 DD1370-D01399 DD1370-D01399 DD1330-D01399 DD1370-D01399 DD1370-D01399 DD1370-D01399 DD1370-D01399 DD1370-D01399 DD1370-D01399 DD1330-D01399 DD1370-D01399 DD1330-D01399 DD1
Eves	DA185-DA1850 DA185-DA1850 DA719 DA719 DA719 DB305-DB309 DB30-DB309 DD312-DD3218 DD310-DD199 DD310-DD199 DD310-DD199 DD130-DD199 DD100-DD199 DD180-DD199 DD180-DD199 DD180-DD199 DD180-DD199 DD180-DD180 DD180-DD180-DD180 DD180-DD180-DD180 DD180-DD18
Skin	DA184-DA1841 DA184-DA649 DB003-DB018 DB372-DB372 DB409-DB403 DB409-DB433 DB499-DB433 DB499-DB433 DB499-DB439 DB499-DB439 DB499-DB439 DB499-D5493 DC480-DC449 DC480-DC495 DC480-DC495 DC480-DC495 DC480-DC493 DD030-DD117B DD030-DD117B DD030-DD117B DD030-DD117B DD036-DD17B DD036-DD17B DD036-DD137B DD036-DD137B DD036-DD137B DD036-DD038 DD036-DD137B DD036-DD038 DD036-DD038 DD036-DD038 DD036-DD038 DD036-DD137B DD036-DD038 DD036-DD137B DD036-DD038 DD036-DD039 DD036-DD038 DD036-DD039 DD036-DD038 DD036-DD039 DD036-DD039 DD036-DD039 DD036-DD039 DD036-DD039 DD036-DD039 DD036-DD039 DD036-DD039 DD036-DD039 DD036-DD039 DD036-DD039 DD036-DD039 DD036-DD039 DD036-DD039 D036-DD039 DD036-DD039 DD036-DD039 DD036-DD039 DD036-DD039 DD036-DD039 DD036-DD039 D036-D039 D036-D039 D036-D039 D036-D039 D036-D039 D036-D039 D036-D039 D036-D039

Table 8: Grouping of ICD-10 diagnoses, b

Appendix B. Full sets of estimates

		Men:			Women:	
	Levels	Natural Logs	Rank (percentile)	Levels	Natural Logs	Rank
Average household income fro	m age 45-53 (100k l	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***	
Permanant Income Cubed	(.0185)	(1.221)		(.0237)	(1.618)	
remanent income Cubeu	(.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***
A	(.007414)	(.007399)	(.007203)	(.0085)	(.008487)	(.008289)
Age	3/84****	3/8****	4430****	.5925***	(2164)	.4887*
- squared	(.000775)	(.000707)	(.000000)	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***
Vocational	(.01353)	(.01353)	(.01354) 0422***	(.0182)	(.0182)	(.01822)
vocationai	(.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	.1/01***	.16/6***	.1689***	.1/29***	.1/14***	.1686***
Hospital record 2001-2003	- 08833***	- 08854***	- 08842***	- 1493***	- 1492***	- 1503***
1059/101100010 2001 2005	(.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***
Hamital manual in 2002	(5.16e-08)	(5.16e-08)	(5.16e-08)	(5.73e-08)	(5.73e-08)	(5.73e-08)
Hospital fectoru ili 2003	(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***
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*
Upperited another 2002	(.01624)	(.01625)	(.01624)	(.01822)	(.01823)	(.01821)
Hospital record in 2002	(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***
N. 6 P	(1.90e-06)	(1.90e-06)	(1.90e-06)	(2.41e-06)	(2.41e-06)	(2.41e-06)
ino of diagnoses in 2002	02046***	02005***	02047***	.002437	.002522	.002697
Lung disease in 2002	(.004029) - 1887***	(.0040.51)	(.0040 <i>3</i>) - 1895***	2167***	2166***	(.005042) 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
Hospital record in 2001	(.01768)	(.01769)	(.01769) 06354***	(.01963)	(.01963) 07441***	(.01962) 07481***
nospital fectitu III 2001	(.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***
Lung disease in 2001	(.004801) = 1417***	(.004803) = 1421***	(.004859) = 1447***	(.005305)	(.005505) = 1430***	(.005311) = 1471***
Lung unsense in 2001	(.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*
constant	(.01844) 2 400***	(.01845)	(.01846)	(.02065)	(.02065)	(.02065)
constant	5.499*** (07148)	883./***	3.990*** (05135)	.5/30	(81.7)	1.230
Pseudo R-squared	0,126	0,126	0,126	0,129	0.129	0,129
N	494825	494825	494825	501478	501478	501478
IN	474025	101020	101020	501170	2011/0	2011/0

Table	9:	The	survival/	permanent	income	gradien
ruore		1110	Sul vi vul	permanent	meonic	Liuuioi

Men: Women: Natural Logs Natural Logs Rank (percentile) Levels Levels Rank Average household income from age 45-53 (100k Danish 2000-prices) .4405*** (.01173) -.1642** (.05044) .1638*** (.01719) -.02099*** (.001798) -.2963*** (.005951) .1545*** (.007109) -.4216*** (.006484) -295.1*** (14.47) 23.84*** (1.176) -.6403*** (.03187) -.2908*** (.005965) 1.1545*** (.007093) -.4212*** (.006482) .5637*** (.01048) -.09757 (.06337) .1337*** (.02206) -.01881*** (.002361) -.1599*** (.006685) .1252*** (.008685) 8.577*** (.2053) -.1018** (.01688) -.007723 (.6217) 0.037 501478 $\begin{array}{c} -287.2^{***}\\ (18.9)\\ 23.27^{***}\\ (1.535)\\ -.6273^{***}\\ (.04151)\\ -.1557^{***}\\ (.006701)\\ .1234^{***}\\ (.006701)\\ .1234^{***}\\ (.008041)\\ .1234^{***}\\ (.008041)\\ .1234^{***}\\ (.008041)\\ .1234^{***}\\ (.008041)\\ .1234^{***}\\ (.008041)\\ .1234^{***}\\ (.008041)\\ .1234^{***}\\ .1234^{***}\\ .1234^{***}\\ .20533^{***}\\ .20$ Permanent Income Permanent Income Squared Permanent Income Cubed -.2954*** (.005927) .1598*** (.006896) -.5184*** (.006343) -.1586*** (.006695) .1279*** (.007856) .6601** (.2049) -.09259*** (.01685) .913 (.6203) 0.037 501478 Single age 45-53 Selfemployed age 45-53 Age - squared 3.816*** (.06147) 0.052 494825 1219*** (59.29) 0.053 494825 4.413*** constant (.03894) 0.053 494825 Pseudo R-squared N

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

		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)	1205000	(.0005759)	(.000256)	172.5
Age	430/***	4352***	4280***	.2041	.1887	.4/2*
- squared	(.000011)	(.000019)	(.000024)	- 04616**	- 04517*	- 06922***
- squared				(.01784)	(.01785)	(.01783)
Single in 2003	3532***	3451***	3649***	1559***	1499***	1661***
e e	(.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***
Total Parts	(.006669)	(.006662)	(.006661)	(.00/608)	(.00/605)	(.00/613)
Intermediate	.1235****	.128****	.1212****	.184***	.1844****	.1810****
Long	10***	1932***	1802***	1361***	1345***	1231***
Long	(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***
S	(.0000591)	(.0000591)	(.0000591)	(.0000657)	(.0000657)	(.0000657)
- Squared	-4.81e-0/****	-4.850-0/****	-4.80e-0/***	-5.650-0/****	-5.000-0/****	-5.05e-0/****
Hospital record in 2003	1576***	158***	157***	1817***	1812***	1819***
Hospital feedra in 2005	(.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***
I	(.004365)	(.004366)	(.004365)	(.004747)	(.004748)	(.004748)
Lung disease in 2003	2906***	2897***	2911****	3301****	3549***	3339****
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***
Samaad	(.0004627)	(.0004627)	(.0004632)	(.0005129)	(.0005129)	(.0005133)
- Squared	(1.01a.06)	(1.01a.06)	(1.02a.06)	(2.42a.06)	(2.43a.06)	(2.42a.06)
No of diagnoses in 2002	- 017***	- 01672***	- 01732***	003473	003657	003129
The of diagnoses in 2002	(.004668)	(.004669)	(.004668)	(.005072)	(.005073)	(.005071)
Lung disease in 2002	1829***	1824***	187***	219***	2184***	2184***
0	(.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
11	(.0178)	(.0178)	(.0178)	(.01975)	(.01975)	(.01975)
Hospital fectoru ili 2001	(0112)	(0112)	(0112)	(01225)	(01225)	(01225)
Hospitalnights in 2001	- 007448***	- 00746***	- 007499***	- 01233***	- 01238***	- 01233***
Hospitalinghts in 2001	(.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	103/***	1045***	1036***	085//***	08648***	08515***
Metabolic in 2001	- 04602*	- 04584*	- 04665*	- 05143*	(.02349)	(.02549) = 05041*
Aletabolic in 2001	(.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 11: The survival/Wealth gradient

Table 12: The survival/Wealth gradient estimated without covariates

		Men:			Women:	
	Levels	Natural Logs	Rank (percentile)	Levels	Natural Logs	Rank
Financial and housin	g wealth (1000k	Danish 2000-pric	es)			
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**
0	(.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

		Men:			Women:									
	Levels	Natural	Rank	Levels	Natural	Rank								
		Logs	(percentile)		Logs									
Annual Income in 2003 (100k	Annual Income in 2003 (100k Danish 2000-prices)													
Annual Income	.1585***	-143***	.4727***	.09506*	-150.8***	.3092***								
Annual Income Coursed	(.02838)	(7.883)	(.01189)	(.04074)	(14.78)	(.01321)								
Annual Income Squared	(.00758)	(.6349)		(.01136)	(1.183)									
Annual Income Cubed	00205***	3053***		002561**	3216***									
	(.0005917)	(.01703)	1500000	(.0009417)	(.03155)	00001000								
Selfemployed in 2003	.15/5***	.1445***	.1538***	.09298***	.08633***	.09031***								
Age	3412***	3307***	4295***	.2109	.2256	.4307*								
	(.006772)	(.006808)	(.006601)	(.2161)	(.2162)	(.2157)								
- squared				04139*	04217*	06577***								
Single in 2003	3611***	3547***	3555***	1926***	1897***	1929***								
	(.006594)	(.006609)	(.006575)	(.007057)	(.007068)	(.007047)								
High School	.113***	.1052***	.1053***	.1594***	.1541***	.1549***								
Vegetional	(.01354)	(.01355)	(.01353)	(.01821)	(.01822)	(.01815)								
vocational	(.006629)	(.00664)	(.00664)	(.00767)	(.007683)	(.007683)								
Intermediate Long	.1009***	.08965***	.09307***	.1611***	.1536***	.1595***								
	(.0113)	(.0113)	(.0113)	(.01204)	(.01207)	(.01204)								
	.1366***	.1326***	.1368***	.09635***	.09481***	.1009***								
Unknown	.1662***	.141***	.1521***	.1647***	.1484***	.1603***								
	(.02065)	(.02072)	(.0206)	(.02715)	(.02721)	(.02724)								
Hospital record 2001-2003	08838***	08839***	08804***	1458***	1459***	1452***								
Days to next hospital record	0007422***	0007434***	0007435***	0008129***	0008136***	0008131***								
Duys to next nospital record	(.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***								
M	(5.15e-08)	(5.15e-08)	(5.15e-08)	(5.72e-08)	(5.72e-08)	(5.73e-08)								
Hospital fecold in 2005	(.01734)	(.01735)	(.01735)	(.01931)	(.01932)	(.01932)								
Hospitalnights in 2003	01892***	01892***	01894***	02388***	02388***	02385***								
	(.0004331)	(.0004332)	(.0004334)	(.0004925)	(.0004926)	(.0004927)								
- Squared	.0000592*** (2.21e-06)	.0000592***	.0000593***	.00008***	.00008*** (2.79e-06)	.0000/99*** (2.79e-06)								
No of diagnoses in 2003	03224***	03169***	03238***	02062***	0205***	02086***								
0	(.004322)	(.004324)	(.004324)	(.004707)	(.004708)	(.00471)								
Lung disease in 2003	2969***	296***	2963***	3672***	3669***	3682***								
Nerves in 2003	06797***	06821***	06735***	04901*	0493*	04991*								
	(.017)	(.01701)	(.01701)	(.0206)	(.0206)	(.0206)								
Metabolic in 2003	.05644***	.05632***	.05937***	.04659*	.04693**	.04678*								
Hospital record in 2002	(.01622) 03812***	(.01622) 03791***	(.01623) 03844***	(.01816) 02607*	(.01816) 02635*	(.01816) 02639*								
Hospital Record in 2002	(.01135)	(.01136)	(.01136)	(.0125)	(.01251)	(.01251)								
Hospitalnights in 2002	01061***	01059***	01062***	0157***	0157***	01564***								
Course of	(.0004589)	(.000459)	(.000459)	(.0005114)	(.0005114)	(.0005117)								
- Squared	(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	18//***	186/***	18/8***	2156***	2153***	2158***								
Nerves in 2002	05342**	05341**	05423**	08453***	08491***	08645***								
	(.01855)	(.01855)	(.01855)	(.02234)	(.02234)	(.02234)								
Metabolic in 2002	03714*	0357*	03576*	.005956	.006325	.006172								
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***								
- Squared	(.000517) 0000221***	(.0005172) 000022***	(.0005175) 000022***	(.0006091)	(.0000091) 0000398***	(.0006091)								
No of diagnoses in 2001	(2.68e-06)	(2.68e-06)	(2.68e-06)	(3.97e-06)	(3.97e-06)	(3.96e-06)								
	04342***	04298***	04374***	02477***	02462***	02533***								
Lung diagona in 2001	(.004843)	(.004845)	(.004845)	(.005291)	(.005292)	(.005292)								
Nerves in 2001	1413****	141/****	1422****	(.01977)	1502****	1.515****								
	1095***	11***	1086***	08522***	08557***	08547***								
	(.01899)	(.019)	(.01899)	(.02332)	(.02332)	(.02332)								
Metabolic in 2001	04048*	03965*	03938*	051*	05079*	05095*								
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								
IN	494825	494825	494825	501478	501478	501478								

Table 13: The survival/annual income gradient

		Men:		Women:			
	Levels	Natural Logs	Rank (percentile)	Levels	Natural Logs	Rank	
Annual Income in 2003 (1	00k Danish 2000-p	rices)					
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	

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

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