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The health hazards of unemployment and poor education: the socioeconomic determinants of health duration in the European Union

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The health hazards of unemployment and poor education: the socioeconomic determinants of health duration in the European Union[♣]

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The effect of socioeconomic status on the likelihood that an individual enters a period of poor health is examined using an Accelerated Failure Time methodology. This study employs data from the European Community Household Panel for the years 1994-2002 across 13 European countries, using the Physical and Mental Health Problems, Illnesses and Disabilities measure of physical health. Some socioeconomic status indicators do impact on the length of time an individual remains in good health – these being unemployment, which has a negative effect, and education, which has a positive effect – but others, such as income, have far less of an impact. Age and gender effects are also found.

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1. Introduction

There has been considerable interest in recent years in the investigation of possible links between individuals' socioeconomic status and their health. Grossman (1972) developed the idea that individuals' health may be viewed as a stock of capital, depreciating with age and being augmented by investment, the better educated and those with higher wages being more efficient at this investment activity. However, these factors are tightly related to socioeconomic status. Cutler and Richardson (1997) develop a theoretical framework for measuring health capital and present empirical findings for the US using the years of life and quality of life approaches to measuring health capital. In general, most of the literature agrees that socio-economic status is one of the best predictors of health (Marmot *et al*, 1984 and Smith, 1999). Unemployment has been found in the literature to have serious adverse effects on health. Yet, this received wisdom has been challenged by Ruhm (2000), who argues that macroeconomic factors, such as unemployment rates, have positive effect on health as the unemployed are less likely, for example, to be able to afford expensive, but unhealthy, convenience foods (though these must be viewed alongside other effects such as stress, more leisure, less time to seek medical advice, and so forth). This paper focuses directly on the effect of socioeconomic status on health *duration.* This is defined as the length of time an individual enjoys good health. The period of good health is assumed to end when the individual reports that he or she acquires

chronic physical or mental health problems, illness or disability. Additional interest is provided through the methodological issues that this field of investigation uncovers. It is not obvious *a priori* whether low socioeconomic status *causes* bad health, or whether it is bad health that leads to poor socioeconomic status, or both. It is not known in advance whether it is the effects of poor socioeconomic status, such as the feeling of separation from the productive processes of society, poor housing, inadequate health care, poor diet, and low educational attainment, that lead to poor health, or whether poor health in itself inhibits the prospects of achieving secure and stable employment. Important new insights into such endogeneity and selection issues are revealed by this investigation, with important implications for the understanding of the processes that determine the relationship between socioeconomic status and health duration.

The effect of a selection of socioeconomic indicators, such as employment status and income, on health duration is investigated after controlling for a number of individual characteristics, such as age, gender and education. The influence of socioeconomic and individual characteristics on the length of time an individual remains in good health is estimated using the accelerated failure time model. This approach is thought to circumvent the issue of endogeneity in the socioeconomic status – health duration relationship since the probability of exit from a spell of good health is estimated over the whole time that the individual is in good health, while

the individual's socioeconomic status is recorded at the time the spell of good health comes to an end (that is, the individual is first observed to exit good health, then his or her socioeconomic status is recorded). Thus one would expect that lower health status cannot be the cause of lower socioeconomic status if the variables are measured accurately. Restricting the sample to those individuals who exhibit good health at the initial point of the survey is a technique frequently used in the literature to circumvent endogeneity problems (Black and Lynch, 2001; Buckley et al, 2004).

Unobserved individual heterogeneity is a major issue in this methodology since the econometrician is unable to observe all factors that may affect the change in the health status of the individual. Similar issue is the positive duration or state dependence (Heckman and Borjas (1980) and Lancaster (1979)). If the above issues are not taken into account the obtained estimates may be biased. Hence, corrections are made to take into account unobserved individual heterogeneity (frailty) using the inverse Gaussian distribution.

2. The relationship between socioeconomic status and health: a synopsis of the literature

The issue of the SES-health relationship has awakened substantial concern among policy makers and academics, and this interest has spawned a continually expanding volume of literature on the subject and

thus we cannot do more than present a brief synopsis of the key themes that have emerged.

Socioeconomic factors have emerged as an important influence on physical health, putting into shade the more direct impact of medical interventions (Mackenbach *et al*, 1990). The effect of labour force status has been widely researched, both in terms of its effects on physical health (Martikainen and Valkonen, 1996, Ruhm, 2000), and on psychological health (Clark and Oswald, 1994, Gerlach and Stephan, 1996, Theodossiou, 1998, Winkelmann and Winkelmann, 1998). Moreover, Duleep (1986) and Gerdtham and Johannesson (2001) identify a key distinction between direct and indirect effects of socioeconomic status on health.

In the above brief review of the literature, unemployment was identified as a key socioeconomic determinant of health. Direct negative effects of unemployment on health were found by Moser et al (1984), Dahl (1993), Bartley (1994) and Gerdtham et al (2003), while Rantakeisu et al (1999) have identified the financial hardship and shaming experiences associated with unemployment (including poorer social life, lower self-confidence and fewer leisure activities) as being important contributory factors. The spouses of the unemployed are also affected (Moser et al, 1986). Indeed, even the risk of unemployment has negative effects on health, particularly for men (Ferrie et al, 1995). Winefield et al (1990) also identified a nonlinear effect, in which psychological distress among young people

peaks at roughly 9 months of unemployment duration, and then declines. Ervasti (2002) provides a recent survey of this phenomenon. Grobe and Schwartz (2003) also found that permanently employed men have only a quarter the incidence of (self-reported) bad health, and spent less than half the amount of time in hospital, as unemployed men with one or more years of unemployment. Ruhm (2000) gives four reasons suggesting why health deteriorates in times of economic growth or improves when there is an economic downturn. First, when there is high employment or at times when there is a lot of work available and people are offered the chance to work longer hours, it becomes more costly for individuals to take part in activities that will be beneficial to health such as regular exercise, attending medical appointments, and so forth. Secondly, in areas with high accident rates or hazardous working conditions, an decrease in the level of production or working hours is very likely to result in less accidents and hence an improvement in employee health. Third, the by-product or joint product of an economic activity may have an effect on health, so a fall in production may lead to a beneficial fall in the negative externalities such as pollution. Finally, mortality rates or the number of individuals in poor health are likely to decrease in areas where there is economic downturn simply because the population will decline.

A large body of literature also identify the effect of personal characteristics on the relationship between socioeconomic status and health. Theodossiou (1998), for example, showed that men are more sensitive to unemployment

than women. Morrell *et al* (1999) and Grundy and Holt (2000) considered the effect of age, showing that the health of older men was strongly related to their employment status when young, whereas the health of older women was more strongly influenced by family related factors. Inactivity in old age has also been shown to precipitate rapid health deterioration (Glass *et al*, 1999).

3. Statistical and econometric methodology

Given that there is no well defined theoretical framework in which to contextualise this study, empirical modelling is employed to shed light on the issue. Data is used from the European Community Household Panel Survey (ECHP)[i], a longitudinal panel survey covering fifteen[ii] European Union countries, from 1994 -2001. In a number of countries, the data in the ECHP are collected for a national study, such as the British Household Panel Survey in the UK, and then converted into ECHP format. The first interviews were carried out in 1994. The sample consisted of approximately 130,000 individuals aged 16 or over in 60,500 households in each wave. The survey ran for 8 years and is now discontinued, with the final interviews taking place in 2001. Individuals are followed from year to year, making it possible to observe how circumstances change.

In all the regressions, the dependent variable is the duration of a spell of good health, measured in years, and is created as follows: individuals in good health are identified when they first enter the survey and are followed until the time that they report worsened health status namely when they report that they have acquired chronic physical or mental health problems, illness or disability. The exit point cannot be pinpointed more accurately than one year given the annual data. Therefore the sample consists only of individuals who are initially in good health (not having chronic physical or mental health problems, illness or disability). Individuals exiting the sample whilst in good health are censored observations. Multiple spells of health are not considered because the focus is upon the duration of a spell of good health. Once respondents exit from a spell of good health, they can no longer claim they had "remained" in good health, and hence cannot renter the sample.

The independent variables comprise employment status, education, income, age, gender, marital status[iii] recorded at the point at which the individual exits good health. The measure of income used is household equivalised income. By recording all the variables at the time of exit it eliminates the possibility of health deterioration causing the independent variables to change. Up to the time of exit the individual has been in good health and therefore the change in health should be expected to be attributed to the change in the independent variables.

The Physical and Mental Health Problems, Illnesses and Disabilities (PMID) measure of physical health is employed in this paper[iv]. It is based on the responses to the question "Do you have any chronic physical or mental health problem, illness or disability?" The definitions of the variables and their means may be found in Table 5. The average age of respondent is around 40 years old. There are a range of values for marital status. The proportion married or living as a couple is as low as slightly less than 60% in Ireland and is as high as almost 80% in the Netherlands. In most of the countries it is in the range 70% to 75%. There is also substantial variation in the proportion that are separated or divorced. In the countries with the highest proportion, this proportion can be three times that of the countries with the lowest proportion divorced or separated.

There is a considerable amount of variation between the proportions with the different levels of education. Some countries have a low proportion with high school (or equivalent) as their highest level of education but have a higher proportion with professional or University qualifications. For example, in the UK has the highest proportion of individuals with the highest level of education (0.42) compared to Austria where over three quarters have upper secondary school education but less than one in ten have University education or professional qualifications. In the sample, the majority of individuals from Portugal have the lowest level of

education with just less than three quarters having only basic secondary school education.

The proportions with each employment status vary between countries. In Greece, more than one in five is self-employed whilst in the Netherlands the proportion is only slightly greater than one in twenty. There is slightly less variation in unemployment. The figure is lowest in the UK at 3.8% and highest in Spain at just over 10%. The proportion of individuals who are in full-time education or training is between 4% and 11.5%. The percentages of those in good health that are unemployed in each wave are shown in Figure 1.

INSERT FIGURE 1 ABOUT HERE

Individuals exit the sample at 65 so depending on the retirement age in the respective countries the proportion could also vary considerably. The lowest proportion is in the Netherlands where only 0.3% is retired while in Italy 8% of the sample are in retirement by the time they lose their good health. In several of the countries, the proportion that is out of the labour market is between 10% and 14%. The smallest proportion is 2.4% in Denmark while in Greece more than ten times that proportion are out of the labour market.

The final two variables to consider are the length of the spell of good health and the proportion of individuals that exit from good health. Italy has the longest average spell of good health and it is the case that Italy has the lowest proportion of individuals exiting good health. Germany on average has the shortest good health spell and Finland has the largest proportion exiting good health.

McGarry (1995) and Hurd and McGarry (2002) provide a discussion of the issues surrounding the use of various subjective and objective measures of health. It is important to point out that in this study the respondents do not self-*assess* their own health, but rather *self-report* whether they have had a physical or mental health problem, illness or disability. Thus, the measure used in this study is a "relatively objective" measure in that individuals are self-reporting upon an assessment made by others – presumably by medical staff.

The influence of socioeconomic and individual characteristics on the length of time an individual remains in good health is modelled using the accelerated failure time (AFT) model (Kalbfleisch and Prentice, 1980). The natural logarithm of survival time is written as a linear function:

$$\ln \tau_j = x_j \beta + \sigma z_j$$

where $\tau_j = \exp(x\beta)\tau_0^{\sigma}$ is the survival time and $\tau_0 = \exp(z)$ where x_j is a vector of covariates, β is a vector of regression coefficients, σ is a scale parameter, and z_j is the error term. The error density determines the survival distribution. Several distributions are considered in order to find out which fit the data best. These are the Weibull, Exponential, Lognormal, Log-logistic and Gamma. The Akaike Information Criterion (AIC) is used to choose between these possible distributions. The lognormal distribution is found to have the lowest Akaike Information Criterion (AIC) value[v] for this particular dataset and hence best describes the data at hand.

Unobservable heterogeneity or frailty which is caused by failing to account for unobserved personal characteristics can bias the results. To account for this issue, one should correct for individual heterogeneity (frailty). Individual heterogeneity has a multiplicative effect on the hazard function. A model to be estimated is:

$$S_\theta(\tau) = \int_0^\infty S(\tau \mid \alpha) g(\alpha)\, d\alpha = \int_0^\infty [S(\tau)]^\alpha\, g(\alpha)\, d\alpha$$

The hazard is the probability of failure given that an individual has survived up to that point (Kalbfleisch and Prentice, 1980). Therefore the hazard function is obtained by:

$$h_\theta(\tau) = \frac{f_\theta(\tau)}{S_\theta(\tau)}$$

The density function is found by:

$$f_\theta(\tau) = -\frac{d}{d\tau}(S_\theta(\tau))$$

Unobserved heterogeneity is a positive quantity so a continuous distribution of positive numbers with expectation 1 and finite variance, θ is appropriate. The available distributions for heterogeneity are Gamma or the inverse Gaussian. After some experimentation, it was found that the inverse Gaussian with parameters $1/\theta$ and θ is used, giving

$$g(\alpha) = \left(\frac{1}{\sqrt{2\pi\theta\alpha^3}}\right)\exp\left\{-\frac{(\alpha-1)^2}{2\alpha\theta}\right\}$$

and

$$S_\theta(\tau) = \exp\left\{\frac{1}{\theta}\left[1-\sqrt{1-2\theta\ln(S(\tau))}\right]\right\}$$

as the heterogeneity survival model.

Given

$$\lim_{\theta \to 0} S_\theta(\tau) = S(\tau)$$

the model reduces to the usual survival function which in the case of the lognormal is $1-\Phi\left(\frac{\ln(t)-\mu}{\sigma}\right)$ where Φ is the standard normal cumulative distribution function. This shows that even when heterogeneity is incorporated into the model, the survival function stays the same.

The survival graphs are shown in Figure 2 - 4. The Kaplan-Meier method is a non-parametric method and is normally used when analysing time to some observable endpoint, which in this case is the loss of good health. The Kaplan-Meier method is designed for use when dealing with time-to-events in the presence of censored cases and there are a substantial number of these due to individuals leaving the panel whilst still in good health or still remaining in good health at the end of the period of study. The Kaplan-Meier approach estimates the conditional probabilities at each time point when an event occurs and uses the product limit of these as the survival rate at that point[vi]. The thirteen countries can be divided into three groups based on how the survival function changes over time (from the raw data). There are countries where the survival rate drops considerably between the time of the first exit and the final exit. This is particularly obvious in Denmark, Finland, Germany and the United Kingdom. Alternatively there are some countries where the survival rate only decreases by a small amount. This is most evident in Italy and also observed in Austria and Greece. The remaining countries display varying amounts of decreases in survival rate. There is a considerable drop in the Netherlands whilst the change in Ireland and Portugal is smaller.

INSERT FIGURE 2-4 ABOUT HERE

4. The socioeconomic effects on health duration in the European Union

The sample is disaggregated into two age groups - those aged 20-45 (which are referred to as the "young") who are in the most productive phase of their careers and those aged over 45 (the "older workforce") whose health, as they approach retirement, is of critical consequence for the success of labour force participation policies. How the socioeconomic effects of unemployment, education and income differ between males and females is also of significant importance to those designing social policy in the EU, given the lifestyles and physiological differences between the genders.

The hazard ratio indicates how a one unit change in the variable affects the hazard of failure. If the hazard ratio is greater than 1, then the hazard of failure (in the case of this paper, the probability of an individual losing his or her good health) increases as the relevant variable increases. If the hazard ratio is less than 1, then the hazard will be reduced. Hazard ratios must be greater than 0, but have no upper limit. For example, if the independent variable is a dummy variable and the hazard ratio is 1.4, then individuals in that group are 40% more likely to exit good health.

4.1 The effects of unemployment on good health duration

The unemployed are significantly more likely to exit from good health status than those who are not unemployed in most countries (as shown in

Table 1), after controlling for education, income, age, gender and marital status. The estimated coefficients of the other independent variables are reported in Table 2 through Table 4. An unemployed individual is between 22% (Italy) and 4.13 times as likely (Denmark) to enter a spell of bad health, compared with their compatriots who are not unemployed. In Belgium, France and the UK no significant effect of unemployment on health duration is observed in the aggregate sample. The results in the literature on the negative effects of unemployment on health are therefore reinforced by the results in this paper.

INSERT TABLE 1 ABOUT HERE

The results in Table 1 also reveal that there are five countries where there are significant effects for both the younger and older age groups. In these five countries the effect of unemployment is stronger for the older age group. In Germany the difference is only slight (1.64 to 1.58) whilst in Greece the difference is much larger (3.17 to 1.67). In Denmark and Netherlands there are very strong effects in the younger age group and even stronger effects in the older age group (4.19 to 4.47 and 3.51 to 4.06). There are three countries where there are significant effects for the younger age group, but not for the older age group. In the remaining countries where unemployment is not significant in either age group, the effects are mixed - sometimes the effect is stronger in the younger age group and at other times it is stronger in the older age group.

It is often asserted that the unemployment effect on health is stronger for males, since they are traditionally seen as the chief source of income in the household, and indeed, this appears to be the case in this study. There are few significant effects for females, whereas there are several countries where unemployment has a significant effect for males. Only in Netherlands and Spain are there significant effects for both genders to compare. In Spain the effect is slightly stronger for males (1.82 to 1.46) but in Netherlands it is much stronger (6.50 to 3.03). In eight out of the other eleven countries the effect is stronger for males, with the three exceptions being the countries where unemployment does not have a significant effect for males.

When looking at the experience of unemployment in Europe, a key consideration is comparability of the definition of unemployment across European countries. In France, those who have retired early or those in government relief jobs are not classed as being unemployed. Spain has a very low labour participation rate and as a result many unemployed individuals are classed as being out of the labour market. Moreover, very rigid labour markets may impact adversely on the unemployment rate. The incentive to work, for example, the level and duration of unemployment benefits, also may have an effect on the unemployment rate. Tax increases resulting in an increase in the gap between gross and net pay also has the effect of increasing the unemployment rate. Gilles

Saint-Paul (2004) also notes that, in the 1990s it was thought possible to reduce unemployment by making employment protection less strict, but despite this observation, employment protection has increased in Austria, Belgium, France, Germany, Ireland, Portugal, Sweden and the United Kingdom, though it has reduced slightly in Finland, Italy, Netherlands, Norway and Spain. Additionally, unemployment benefits have increased in Italy and lengthened in Germany. Spain, France, Italy, Portugal and Germany operate a two-tier employment system, since temporary workers are excluded from employment legislation. Another viewpoint often put forward is that the total amount of work available is fixed and this has to be shared by all those who want to work. For this reason, working time reduction and pre-retirement have been used to "make room" for younger workers. These policies are harmful to employment and have been used in France and to a lesser extent Netherlands, Germany and Belgium.
Public service monopoly of job placement is, or was until very recently, a problem in several European countries. Employers are allowed to advertise available jobs but only the state is allowed to act as an intermediary and therefore public sector jobs are more likely to be filled. Private intermediation was allowed in Ireland, Netherlands, Portugal, Switzerland and the UK. All of these countries have comparatively lower unemployment. Fiscal crises often also trigger reforms of the labour market, such as recently attempted in Germany. Moreover, membership of the Euro removes monetary policy as an instrument which can be used for stabilisation, and places some of the burden on supply side reforms. It is

interesting to note that Denmark, Sweden and the United Kingdom, who have rejected Euro membership, also have relatively low unemployment.

4.2 The effects of education on good health duration

All individuals in the ECHP are recorded as having one of three levels of education, which are standardised across countries. These are: third level education, second stage of secondary level education or less than second stage of secondary education[vii].

INSERT TABLE 2 ABOUT HERE

The results in Table 2 also confirm the sentiment of the recent literature that education has a powerful positive effect on the duration of good health in most countries, after controlling for employment status, income, age, gender and marital status. In three countries education turns out to be insignificant – Denmark, the Netherlands and Belgium. An individual educated to second level standard is between 19% (Italy) and 66% (UK) less likely to suffer deterioration in health compared to a person with only a basic standard of education during the span of the ECHP dataset. Surprisingly, in France second level education seems to cause a reduction in health duration. However, this result may be due to multicolinearity, as the effect of low income on health is uniquely significant for France. Those educated to third level standard are between 15% (France) and 61%

(Ireland) less likely to suffer deterioration in health compared to those who enjoyed only a basic standard of education. These results therefore add weight to the recent literature identifying education as being closely related to health (Muller, 2002, and Sturm and Gresenz, 2002), a good predictor of mortality (Muller, 2002), a catalyst for the adoption of healthy lifestyles (Duncan *et al*, 2002), and a promoter of the ability to take charge of own behaviour and become less short-termist in decision making (Fuchs, 2004).

For the whole sample it is clear that third level education has a stronger effect than second level education. It is only in the United Kingdom where second level education has a stronger effect. Some of the effects are only slightly stronger, for example, Finland (0.78 and 0.73), but others are larger, such as Ireland (0.65 and 0.39).

When the dataset is disaggregated into the two age groups, third level education appears to have a stronger beneficial effect than second level education, but it is harder to judge due to fewer significant effects. Second level education is more significant for the older age group than for the younger age group. The largest difference is in Portugal (0.46 and 0.08) though there are only five countries where there are significant effects in both of the age groups. Third level education is more significant for the younger age group. There are seven countries where the effect of third level education is significant. Five of these are very significant and in

Ireland, Italy and Portugal the hazard is reduced to less than 50% due to hazard ratios of 0.31, 0.43 and 0.25 respectively. There must be a large amount of variation in the older age group as although several of the effects appear very strong, there are only significant effects in Ireland, Italy and Portugal. Interestingly the hazard ratios of 0.11, 0.27 and 0.21 make the effects in these countries stronger than the corresponding effects in the younger age group.

When the data is disaggregated by gender it is still the case that third level education has a stronger effect than second level education. It is difficult to identify if there is a difference between genders in terms of the significance levels and strength of effects. In Ireland the effect of second level education has a hazard ratio of 0.73 for males and 0.62 for females. However, in Portugal the hazard ratios are 0.58 for males and 0.69 for females. Similar observations can be made for third level education. The hazard ratios in Italy are 0.53 for males and 0.65 for females whilst in Ireland the ratios are 0.69 and 0.18. To conclude there is no consistent pattern of differences due to educational level.

When the sample is disaggregated by age, the beneficial effect of education becomes more pronounced. Indeed, the only country where the effect of education weakens is for second-level education in the UK. However, while education to second and third levels has significant effects in the younger age group, the number of significant effects from third level

education in the older age group is considerably fewer. One reason for education being less significant in the older age group is that whilst younger individuals rely on qualifications to obtain a job which provides them with a good standard of living, older individuals have experience which will help them obtain jobs and therefore education is not as important a factor.

Such differences may also reflect the effects of different institutions across countries, such as different education systems, welfare states or health care arrangements. The surprising result that second-level education in France actually worsens health duration persists through both the age and gender disaggregations.

4.3 The effects of income on good health duration

Table 3 contains the effect of income[viii], after controlling for employment status, education, age, gender and marital status. The effects of income on health duration are generally insignificant in contrast to the earlier results. Although most of the significant results show that higher income individuals are less likely to enter a spell of poor health (the only exception being for Spain in the highest income quartile), for the most part the significant results are concentrated in the highest income quartile group. The results show that a person in the highest income quartile is between 18% (the Netherlands) and 30% (Germany) less likely to enter a

spell of bad health compared to a person in the lowest income quartile. In Denmark, Belgium, Ireland, Italy, Greece, Austria and Finland, there are no significant effects for any income quartile. Thus, it appears that unemployment and education are the more powerful predictors of health, in contrast to those studies which highlight income or wealth effects on health, *inter alia*, Goldman *et al* (1995), Ecob and Davey Smith (1999), Duncan *et al* (2002), Attanasio and Hoynes (2000), Blakely *et al* (2002), Grundy and Holt (2000), Ruhm (2000), van Rossum *et al* (2000), Crossley and Kennedy (2002), Meer *et al* (2003) and Wagstaff *et al* (2001). Moreover, the age and gender disaggregations appear to shed little light on the issue. For the highest income quartile, there are more significant effects for the older age group.

INSERT TABLE 3 ABOUT HERE

In comparison to unemployment and education there are only a small number of effects from income. In the complete sample most of these are beneficial effects from being in the highest income quartile.

In the disaggregations by age and gender, the strongest and most significant effects are from the highest income quartile. When the data is disaggregated by age, it is only possible to make comparisons between significant effects in France where the effect of income is more significant for the older age group. There are several other countries where there are

significant effects for the older age group from income. The effects from the highest quartile in the older age group can be very strong and halves the hazard in countries such as Germany (0.52), Greece (0.43) and Portugal (0.36). For the gender disaggregation, it is possible to compare significant effects in France and in Finland. In France all three of the income groups have significant beneficial effects with the effect on males stronger than the effect on females. In France being in one of the three highest income quartiles reduces the hazard by a factor of approximately 0.75. The comparison for Finland gives a different result. All of the levels of income have an adverse effect on males but a beneficial effect on females. In particular the highest and second highest income quartiles result in the hazard for females being reduced by 0.40 and 0.46 respectively. Apart from Finland and France there are beneficial effects from the highest income quartile for males in Portugal (0.72) and in Germany (0.54) for females. There are also some weak effects from other countries for both genders.

4.4 The effects of marital status on good health duration

Table 4 details the effect of marital status on health duration. The effect of marital status on the length of spells of good health appears, after controlling for employment status, education, income, age, and gender, to be much more limited in extent. In Germany and Austria, a single person is between 37 and 50 per cent less likely to enter a spell of bad health, and

this overall effect may be principally attributed to the young and to females. In contrast, single people in France are 19% more likely to enter a spell of bad health, and this overall effect appears to be driven by males and the young. In the UK, the older workforce is 12% more likely to enter poor health if they are single.

INSERT TABLE 4 ABOUT HERE

4.5 Sensitivity Analysis

The first part of this section examines whether using different income variables results in different effects of unemployment, education and income on health duration. The second part looks at the consequences of leaving income, education and employment status out of the analysis. This is done because there are significant correlations between these variables.

Instead of having dummy variables indicating the highest three income quartiles, one dummy variable is used to indicate an individual's income is in the lowest quartile and a second dummy variable is used to indicate an individual's income is in the upper 50%. Regressions are run using these variables and the results compared to the results that appear in the paper. These regressions are initially run using the complete sample.

The effect of unemployment is very similar to the original effect. There are only very small changes in the hazard ratios and significance levels. The effect on education is only slight as well. In a number of countries the effects become more significant though there are also a few where the effects are less significant. The changes are very small though. The only significant changes concern third level education in Austria and Belgium. The levels of significance decrease and increase respectively, so the effect in Austria is no longer significant whilst the effect in Belgium becomes significant.

The most noticeable differences are observed for the effect of the new income variables. While there were not a large number of effects from income in the paper, the highest income quartile was significant in six countries and there were a small number of effects from the lower income groups. When only two dummy variables are used, a number of the countries show adverse effects for the lowest quartile and nearly all of the countries have beneficial effects for the upper 50%. However France is the only country where there is a significant effect. This is for the lowest income quartile and supports the result in the paper where the three highest quartiles had beneficial effects.

Using the different income variables has not changed the effect of unemployment or education and has reduced the number of significant income effects observed.

The second part of the sensitivity analysis, involves dropping income, employment status and education from the regression in turn and comparing the effects to the earlier results in the paper.

Income only has a small number of significant effects, so dropping the variables from the analysis does not make a lot of difference. The only effect on unemployment is that there is now a slight effect in the UK. The effect of education also remains very similar, though there is now an effect for third level in Belgium.

Though this paper focussed on the effect of unemployment, rather than in the effect of other employment statuses, dropping just the unemployment dummy variable from the regression would have the effect of including unemployed in the base group, that is those in full-time employment. Therefore all of the employment status dummy variables are excluded. This has the effect of making the majority of education effects slightly stronger. There is only one further effect, that of the third level education in Belgium. The income effects are also slightly strengthened but there are not many major differences. Most of the changes occur in the second

highest income quartile, where there are now significant effects in Belgium and Ireland and the effect in the Netherlands is no longer significant.

Finally when the education levels are excluded, the greatest changes are observed. The education levels are very significant so this is to be expected. The significance of the unemployment effects is increased in several of the countries. The biggest change is in the UK, where unemployment is now significant at 1% having previously not been significant. Excluding the education variables makes the existing income effects more significant. The only exception to this is in the Netherlands where income no longer has a significant effect. There are also some additional effects. Second and third level education is now significant in Belgium, with the effect of third level education significant at 5%. Second level education has a significant and beneficial effect in Ireland, while in Italy and Greece, third level education reduces the hazard by factors of 0.82 and 0.84 respectively.

5. Conclusions.

This paper employed an Accelerated Failure Time methodology and a correction for unobserved individual heterogeneity to examine the effect of socioeconomic status on the likelihood of an individual entering a period of

poor health, using data from the ECHP for the years 1994-2002 across 13 European countries. It employs the Physical and Mental Health Problems, Illnesses and Disabilities (PMID) measure of health. This paper is novel in that it focuses on the effects of socioeconomic status on health *duration*. Unobserved individual heterogeneity is taken into account by correcting for frailty using the inverse Gaussian distribution.

The findings may be categorised into four areas. In general, being unemployed reduces the length of time individuals spend in good health and the effect of unemployment is more significant for males than it is for females. However, in Belgium, France and the United Kingdom the effect from unemployment on health is small. When it is possible to compare significant effects between the younger and older age group, the effects are more significant for older individuals. Unemployment is therefore found to be bad for health.

Secondly, the results indicate that the effects of having second or third level education are beneficial to health and very significant (it is also usually the case that third level education has the more significant effect). For second level education, there are approximately the same numbers of significant effects in the younger and older age groups, whereas third level education has more of an effect in the younger age group. Moreover, there appears to be little difference between the effects of education on the health of males compared to females. This may be because both males and

females are making the same informed choices about education, and hence this gives a similar return on health.

Third, the effects of income on health are weak. Where the effects are significant (and significant effects tend to be most prominent in the highest income quartile) they are beneficial and reduce the probability of an individual losing good health. Moreover, there are more significant income effects for the older age group than there are for the younger age group. In particular there are a number of strong income effects in France, across all of the income groups, more so than in any other country.

Finally, there are very few significant effects for the effect of marital status on health, and with the exception of France these effects are beneficial to health. Being married or living as a couple does appear to be more beneficial to the health of females but given the strength of the evidence it would perhaps be remiss to attach too much weight to this finding. When working with the complete sample, marital status does not have a significant effect in the UK or Finland but significant effects are observed after disaggregating.

The key message is that some socioeconomic status indicators do impact on the length of time an individual remains in good health – these being unemployment, which has a negative effect, and education, which has a positive effect. However, income effects are by comparison far less

powerful, chiefly being observed only for the highest income quartile and even then only in a small subset of European countries.

The clear policy message from this study is therefore that macroeconomic policies in the European Union do have a strong role to play in improving the health of the population. Strategies to reduce poverty and unemployment, and improve education, are vital to enhancing the health of European citizens.

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Table 1 The effect of unemployment on health (1994-2002)

Sample	Whole Sample		Individuals aged 20-45		Individuals aged 46-65		Males		Females	
Country	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value
Germany	1.53**	-2.07	1.58*	-1.74	1.64**	-2.04	1.46	-1.25	1.63*	-1.89
Denmark	4.13***	-3.89	4.19***	-3.90	4.47***	-3.16	4.26***	-4.22	3.33	-1.31
Netherlands	3.59***	-5.49	3.51***	-3.40	4.06***	-3.67	6.50***	-3.78	3.03*	-1.66
Belgium	1.22	-0.59	1.40	-0.51	1.70	-0.83	0.97	0.02	1.15	-0.45
France	1.09	-0.94	1.13	-1.07	0.93	0.24	1.00	0.00	1.16	-1.21
UK	1.51	-1.51	1.22	-0.86	2.17	-1.57	1.81*	-1.87	0.84	0.30
Ireland	1.81***	-2.79	2.05**	-2.05	3.10**	-2.03	1.75***	-3.27	1.47	-0.85
Italy	1.22**	-2.19	1.70**	-2.34	0.90	0.33	1.50***	-3.13	0.98	0.11
Greece	1.61***	-4.19	1.67*	-1.92	3.17**	-2.22	2.18***	-4.39	1.28	-1.51
Spain	1.64***	-6.17	3.99	-0.54	2.55	-1.37	1.82***	-4.63	1.46***	-3.12
Portugal	1.39***	-2.80	1.77*	-2.28	0.91	0.19	1.80***	-3.15	1.10	-0.58
Austria	1.96***	-2.85	2.75	-1.31	3.24	-1.41	1.99**	-2.20	2.02	-1.40
Finland	1.57**	-2.39	2.07**	-1.96	1.29	-0.67	2.01***	-2.84	1.33	-0.76

*significant at 10% level, **significant at 5% level, ***significant at 1% level

Table 2 The effect of education on health (1994-2002)

Sample	Whole Sample		Whole Sample		Individuals aged 20-45		Individuals aged 20-45		Individuals aged 46-65		Individuals aged 46-65	
Education	Second Level		Third Level		Second Level		Third Level		Second Level		Third Level	
Country	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value
Germany	0.75**	2.09	0.68**	2.03	0.80	1.29	0.65*	1.87	0.75*	1.82	0.79	1.11
Denmark	0.63*	1.89	0.83	0.80	0.69	1.28	0.74	0.96	0.52**	2.19	0.90	0.32
Netherlands	0.98	0.10	0.86	0.63	1.17	-0.77	0.85	0.54	0.65*	1.70	0.76	0.78
Belgium	0.81	1.04	0.69	1.56	0.95	0.11	0.51	1.33	0.70	1.06	0.87	0.32
France	1.61***	-8.11	0.85**	2.42	1.44***	-4.67	0.81**	2.52	2.67***	-4.34	0.90	0.49
UK	0.34***	6.40	0.55***	4.37	0.45***	5.47	0.63***	4.15	0.34***	3.13	0.58	1.60
Ireland	0.65***	3.67	0.39***	5.16	0.56***	2.67	0.31***	3.62	0.46**	2.34	0.11***	4.06
Italy	0.81***	4.03	0.60***	5.13	0.63***	2.88	0.43***	3.11	0.79	1.42	0.27***	3.89
Greece	0.72***	4.84	0.68***	4.19	0.54***	3.67	0.55***	2.56	0.48**	2.02	0.58	1.20
Spain	0.73***	4.10	0.61***	7.22	0.66	0.42	0.34	0.51	0.31	1.47	0.25	1.58
Portugal	0.65***	5.24	0.52***	5.81	0.45***	4.78	0.25***	4.64	0.08***	3.40	0.21**	2.44
Austria	0.69***	2.77	0.58*	1.93	0.42	1.51	0.65	0.52	0.68	0.91	0.64	0.47
Finland	0.78*	1.83	0.73**	2.01	0.73	1.04	0.65	1.29	0.84	0.71	0.67	1.38

Sample	Males		Males		Females		Females	
Education	Second Level		Third Level		Second Level		Third Level	
Country	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value
Germany	0.81	1.01	0.51*	1.68	0.73*	1.95	1.01	-0.07
Denmark	0.91	0.30	1.70*	-1.69	0.52	1.05	0.39	1.20
Netherlands	1.17	-0.58	0.87	0.38	0.71	1.32	0.76	0.88
Belgium	0.58	0.90	0.55	1.08	0.93	0.39	0.71*	1.67
France	1.54***	-5.71	0.74***	3.18	1.74***	-6.38	1.01	-0.14
UK	0.38***	3.86	0.58***	2.70	0.30***	5.01	0.55***	3.08
Ireland	0.73***	2.83	0.69**	2.38	0.62***	2.80	0.18***	6.42
Italy	0.87*	1.84	0.53***	4.10	0.74***	4.22	0.65***	3.25
Greece	0.74***	2.97	0.59***	3.78	0.70***	4.00	0.77**	1.96
Spain	0.72***	2.87	0.62***	4.18	0.75***	2.95	0.59***	5.47
Portugal	0.58***	4.27	0.53***	3.08	0.69***	3.11	0.49***	4.90
Austria	0.67*	1.92	0.51*	1.66	0.61*	1.95	0.59	1.03
Finland	0.81	1.15	0.73	1.49	0.75	1.14	0.77	0.93

Reference category: first level of education; *significant at 10% level, **significant at 5% level, ***significant at 1% level

Table 3 The effect of income on health (1994-2002)

Sample	Whole sample		Whole sample		Whole sample	
Income	Income Group 2		Income Group 3		Income Group 4	
Country	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value
Germany	0.90	0.71	0.92	0.56	0.70**	2.00
Denmark	0.83	0.77	0.74	1.16	0.74	1.16
Netherlands	1.28	1.10	0.98*	1.83	0.82***	3.38
Belgium	0.99	0.05	0.74	1.30	0.69	1.45
France	0.82***	2.84	0.78***	3.61	0.81**	2.46
UK	0.90	0.60	0.91	0.50	0.73*	1.72
Ireland	0.87	0.93	0.81	1.28	1.22	-1.15
Italy	1.02	-0.28	0.99	0.08	0.94	0.86
Greece	1.09	-1.09	0.99	0.13	0.97	0.32
Spain	1.03	-0.38	1.03	-0.36	1.15*	-1.84
Portugal	0.91	1.23	0.85**	2.24	0.80***	2.93
Austria	1.15	-0.84	0.96	0.28	1.17	-0.99
Finland	1.07	-0.43	1.05	-0.33	0.98	0.09

	Individuals aged 20-45		Individuals aged 20-45		Individuals aged 20-45		Individuals aged 46-65		Individuals aged 46-65		Individuals aged 46-65	
Income	Income Group 2		Income Group 3		Income Group 4		Income Group 2		Income Group 3		Income Group 4	
Country	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value
Germany	1.02	-0.11	1.07	-0.36	0.89	0.58	0.84	0.85	0.78	1.20	0.52***	3.11
Denmark	0.53**	2.16	0.48**	2.37	0.40***	2.59	2.06	-1.54	1.29	-0.53	1.44	-0.78
Netherlands	1.26	-0.92	0.80	0.83	0.82	0.70	1.24	-0.59	1.21	-0.57	0.97	0.08
Belgium	1.05	-0.11	1.22	-0.39	0.83	0.28	1.41	-0.86	0.44*	1.95	0.61	1.23
France	0.86*	1.67	0.82**	2.30	0.98	0.22	0.64**	2.20	0.57***	2.90	0.55**	2.31
UK	0.94	0.44	0.92	0.57	0.78	1.59	0.65	1.30	0.76	0.99	0.57*	1.84
Ireland	0.85	0.54	0.72	1.02	1.40	-1.07	0.95	0.13	1.07	-0.17	1.55	-0.98
Italy	0.91	0.46	1.13	-0.56	1.32	-1.26	1.04	-0.22	0.86	0.87	0.59***	2.72
Greece	1.22	-0.96	1.09	-0.40	1.23	-0.86	0.94	0.21	0.83	0.58	0.43**	2.23
Spain	1.31	-0.46	1.21	-0.43	2.09	-0.60	0.80	0.70	1.14	-0.51	1.03	-0.11
Portugal	0.82	1.07	0.87	0.78	0.91	0.48	1.06	-0.22	0.50	1.57	0.36**	2.35
Austria	2.52*	-1.67	0.69	0.58	2.68	-1.53	0.89	0.26	0.71	0.76	0.51	1.21
Finland	1.08	-0.27	1.19	-0.55	1.36	-0.94	1.15	-0.41	0.82	0.61	0.55*	1.76

Reference category: income group one; *significant at 10% level, **significant at 5% level, ***significant at 1% level

Income	Males Income Group 2		Males Income Group 3		Males Income Group 4		Females Income Group 2		Females Income Group 3		Females Income Group 4	
Country	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value
Germany	1.11	-0.55	1.02	-0.09	0.97	0.14	0.76	1.42	0.89	0.60	0.54***	2.94
Denmark	0.61	1.46	0.74	0.84	0.49*	1.92	1.15	-0.37	0.70	0.81	1.00	-0.01
Netherlands	1.67	-1.53	0.98	0.07	0.82	0.56	1.01	-0.03	1.02	-0.10	0.88	0.44
Belgium	0.91	0.15	0.28*	1.93	0.44	1.30	0.98	0.12	1.04	-0.17	0.83	0.85
France	0.77***	2.91	0.77***	3.15	0.76***	2.56	0.84*	1.73	0.76***	2.65	0.80*	1.91
UK	1.14	-0.48	1.18	-0.60	0.63	1.60	0.73	1.26	0.73	1.20	0.86	0.60
Ireland	0.85	1.07	0.81	1.08	1.02	-0.09	1.00	-0.01	0.92	0.39	1.47*	-1.64
Italy	1.06	-0.59	1.02	-0.22	0.99	0.12	0.99	0.12	0.96	0.45	0.89	1.17
Greece	1.18	-1.33	1.08	-0.61	1.20	-1.42	1.06	-0.55	0.92	0.86	0.81*	1.88
Spain	1.06	-0.52	0.99	0.05	1.15	-1.31	1.01	-0.17	1.06	-0.62	1.13	-1.28
Portugal	0.88	1.15	0.83*	1.67	0.72***	2.97	0.92	0.89	0.86	1.62	0.86	1.42
Austria	1.28	-1.11	1.04	-0.19	1.07	-0.34	1.08	-0.24	0.80	0.74	1.50	-1.32
Finland	1.55**	-2.13	1.73***	-2.60	1.68**	-2.34	0.61*	1.79	0.46***	2.78	0.40***	3.04

*significant at 10% level, **significant at 5% level, ***significant at 1% level

Table 4 The effect of marital status on health (1994-2002)

	Complete Sample		Males		Females		Individuals aged 20-45		Individuals aged 46-65	
Country	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value	Hazard Ratio	Z-value
Germany	0.505***	2.97	0.506*	1.78	0.492***	2.58	0.439***	3.57	1.019	-0.05
Denmark	0.637*	1.65	0.753	0.82	0.621	1.00	0.490**	2.29	1.286	-0.48
Netherlands	0.996	0.01	0.887	0.29	0.842	0.50	0.745	0.94	1.660	-1.04
Belgium	0.953	0.17	0.550	0.86	1.243	-0.84	0.937	0.11	1.665	-0.73
France	1.187**	-2.17	1.209*	-1.74	1.068	-0.55	1.215**	-2.23	1.015	-0.05
UK	0.850	0.79	0.842	0.57	0.920	0.28	0.916	0.62	0.122***	3.44
Ireland	0.898	0.69	0.903	0.71	0.944	0.23	0.950	0.21	0.804	0.34
Italy	1.032	-0.43	1.080	-0.74	0.956	0.44	0.872	0.68	1.459	-1.59
Greece	1.012	-0.12	0.777*	1.83	1.109	-0.73	0.946	0.26	0.615	0.72
Spain	1.105	-1.31	1.072	-0.56	1.057	-0.49	1.169	-0.42	1.580	-1.21
Portugal	1.102	-1.19	1.074	-0.59	1.026	-0.22	1.227	-1.25	0.910	0.21
Austria	0.634**	2.52	0.611**	2.50	0.472**	1.99	0.286**	2.12	0.560	0.72
Finland	0.823	1.22	1.001	-0.01	0.334***	3.21	0.809	0.73	1.042	-0.09

*significant at 10% level, **significant at 5% level, ***significant at 1% level

Table 5 Definition of variables

Variable Name	Description
age	Age in years
sex	0 = “male”, 1 = “female”
marital status	1 = “married” 2 = “separated” 3 = “divorced” 4 = “widowed” 5 = “never married”
live_together	If not married, do they live together 0 = “no”, 1 = “yes”
live_as_couple	0 = “no”, 1 = “yes”
emp_status_long	Employment status classed as one of 12 groups
emp_status_short	Employment status classed as one of 3 groups
age_sq	Age in years “squared”
education	Individual’s highest level of education
second_ed	Highest level of education is second level 0 = “no”, 1 = “yes”
third_ed	Highest level of education is third level 0 = “no”, 1 = “yes”
self_emp	Individual is self- employed 0 = “no”, 1 = “yes”
unemp	Individual is unemployed 0 = “no”, 1 = “yes”
educate_training	Individual is in full-time education or training 0 = “no”, 1 = “yes”
retired	Individual is retired 0 = “no”, 1 = “yes”
out_of_labour_market	Individual is out of the labour market i.e full-time housework, childcare, etc 0 = “no”, 1 = “yes”
separated	Individual is either divorced or separated 0 = “no”, 1 = “yes”
widowed	Individual is widowed 0 = “no”, 1 = “yes”
single	Individual has never been married 0 = “no”, 1 = “yes”
income	Household equivalised income
inc_gp2	Household equivalised income is in the 2nd lowest quartile 0 = “no”, 1 = “yes”
inc_gp3	Household equivalised income is in the 2nd highest quartile 0 = “no”, 1 = “yes”
inc_gp4	Household equivalised income is in the highest quartile 0 = “no”, 1 = “yes”
pmid_spell	Length of spell of good PMID health in years
end_pmid	Spell of good PMID health is observed to end Household equivalised income is in the 2nd lowest quartile 0 = “no”, 1 = “yes”

Means and Standard Deviations (in parenthesis) of the variables used

Variable Name	Germany	Denmark	Netherlds	Belgium	France	UK	Ireland	Italy	Greece	Spain	Portugal	Austria	Finland
age	39.210	39.271	40.403	40.062	39.074	37.954	38.556	39.852	41.259	38.244	38.641	39.409	39.111
	(12.067)	(12.373)	(11.689)	(12.023)	(12.522)	(11.982)	(13.292)	(12.735)	(12.895)	(12.524)	(13.096)	(12.742)	(12.182)
sex	0.497	0.488	0.507	0.520	0.505	0.523	0.492	0.502	0.526	0.504	0.502	0.507	0.488
	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.499)	(0.500)	(0.500)	(0.500)	(0.500)
live_together	0.301	0.518	0.402	0.335	0.353	0.335	0.071	0.067	0.058	0.091	0.100	0.224	0.459
	(0.459)	(0.500)	(0.490)	(0.472)	(0.478)	(0.472)	(0.258)	(0.251)	(0.234)	(0.288)	(0.300)	(0.417)	(0.498)
live_as_couple	0.748	0.768	0.785	0.734	0.721	0.707	0.591	0.661	0.718	0.645	0.696	0.679	0.771
	(0.434)	(0.422)	(0.411)	(0.442)	(0.449)	(0.455)	(0.492)	(0.473)	(0.450)	(0.479)	(0.460)	(0.467)	(0.420)
age_sq	1682.996	1695.252	1768.981	1749.522	1683.603	1584.055	1663.232	1750.388	1868.566	1619.421	1664.589	1715.442	1678.067
	(1005.303)	(1019.049)	(973.767)	(1003.319)	(1029.085)	(975.6053)	(1086.315)	(1069.362)	(1098.677)	(1032.914)	(1079.362)	(1059.918)	(980.775)
second_ed	0.569	0.505	0.455	0.364	0.221	0.247	0.415	0.418	0.364	0.229	0.170	0.716	0.471
	(0.495)	(0.500)	(0.498)	(0.481)	(0.415)	(0.431)	(0.493)	(0.493)	(0.481)	(0.420)	(0.376)	(0.451)	(0.499)
third_ed	0.212	0.297	0.185	0.372	0.286	0.420	0.209	0.095	0.183	0.247	0.091	0.084	0.317
	(0.409)	(0.457)	(0.388)	(0.483)	(0.452)	(0.494)	(0.407)	(0.293)	(0.387)	(0.431)	(0.288)	(0.277)	(0.465)
self_emp	0.055	0.056	0.052	0.089	0.063	0.088	0.112	0.141	0.212	0.110	0.150	0.096	0.137
	(0.227)	(0.230)	(0.222)	(0.285)	(0.242)	(0.283)	(0.316)	(0.348)	(0.409)	(0.314)	(0.357)	(0.295)	(0.344)
unemp	0.059	0.052	0.047	0.076	0.085	0.038	0.054	0.085	0.068	0.103	0.045	0.036	0.081
	(0.236)	(0.223)	(0.212)	(0.265)	(0.279)	(0.191)	(0.225)	(0.279)	(0.252)	(0.304)	(0.206)	(0.187)	(0.273)
educate_training	0.074	0.115	0.055	0.068	0.071	0.040	0.075	0.074	0.040	0.074	0.056	0.055	0.093
	(0.262)	(0.319)	(0.228)	(0.252)	(0.258)	(0.195)	(0.264)	(0.262)	(0.196)	(0.262)	(0.230)	(0.228)	(0.290)
retired	0.048	0.037	0.003	0.064	0.063	0.033	0.020	0.080	0.060	0.019	0.037	0.079	0.033
	(0.213)	(0.189)	(0.053)	(0.244)	(0.243)	(0.179)	(0.140)	(0.271)	(0.237)	(0.135)	(0.188)	(0.269)	(0.178)
out_of_labour_mkt	0.128	0.024	0.161	0.097	0.096	0.136	0.183	0.193	0.253	0.202	0.123	0.128	0.050
	(0.334)	(0.152)	(0.368)	(0.296)	(0.295)	(0.342)	(0.387)	(0.395)	(0.435)	(0.402)	(0.328)	(0.335)	(0.218)
separated	0.048	0.055	0.037	0.063	0.043	0.063	0.022	0.021	0.021	0.025	0.031	0.044	0.044
	(0.214)	(0.229)	(0.188)	(0.242)	(0.204)	(0.243)	(0.147)	(0.143)	(0.145)	(0.157)	(0.174)	(0.204)	(0.205)
widowed	0.013	0.010	0.012	0.018	0.016	0.014	0.016	0.018	0.027	0.018	0.024	0.019	0.009
	(0.112)	(0.100)	(0.111)	(0.133)	(0.127)	(0.119)	(0.125)	(0.133)	(0.163)	(0.134)	(0.154)	(0.138)	(0.097)
single	0.191	0.167	0.166	0.186	0.237	0.216	0.371	0.300	0.233	0.312	0.249	0.258	0.176
	(0.393)	(0.373)	(0.372)	(0.389)	(0.426)	(0.411)	(0.483)	(0.458)	(0.423)	(0.463)	(0.432)	(0.438)	(0.381)
income	63053.49	283859.1	64375.66	1431613	204971.1	22609.99	28608.57	45021.49	5498521	3524688	3124120	496316.3	180150.2
	(34600.11)	(135373.3)	(37714.58)	(1135407)	(125643.8)	(15501.56)	(48102.27)	(26593.98)	(3665096)	(2470994)	(2233005)	(271292.1)	(112927.2)
inc_gp2	0.240	0.237	0.228	0.240	0.238	0.220	0.242	0.234	0.239	0.225	0.224	0.234	0.237
	(0.427)	(0.425)	(0.420)	(0.427)	(0.426)	(0.414)	(0.428)	(0.423)	(0.426)	(0.417)	(0.417)	(0.424)	(0.425)
inc_gp3	0.249	0.275	0.259	0.269	0.262	0.256	0.274	0.256	0.261	0.253	0.271	0.256	0.257
	(0.433)	(0.447)	(0.438)	(0.444)	(0.440)	(0.436)	(0.446)	(0.436)	(0.439)	(0.435)	(0.445)	(0.437)	(0.437)
inc_gp4	0.276	0.287	0.270	0.267	0.256	0.299	0.307	0.274	0.302	0.292	0.309	0.294	0.259
	(0.447)	(0.452)	(0.444)	(0.442)	(0.437)	(0.458)	(0.461)	(0.446)	(0.459)	(0.455)	(0.462)	(0.456)	(0.438)
pmid_spell	2.689	3.311	3.507	3.973	3.925	2.757	3.630	4.278	4.128	3.725	4.262	4.042	3.409
	(2.081)	(2.056)	(1.977)	(1.972)	(2.009)	(2.105)	(1.914)	(1.946)	(1.991)	(2.031)	(1.951)	(2.015)	(1.869)
end_pmid	0.109	0.152	0.114	0.088	0.089	0.112	0.081	0.046	0.079	0.089	0.097	0.070	0.159
	(0.312)	(0.359)	(0.318)	(0.283)	(0.285)	(0.315)	(0.274)	(0.210)	(0.270)	(0.285)	(0.296)	(0.255)	(0.366)
observations	13448	3493	8018	4581	9954	9608	5636	14662	8192	11394	8398	5375	5596

Appendices

The following tables provide motivation for examining the effect of unemployment, income and education on the length of the spell of good health (measured in years). There are a number of ways to compare the length of good health spell between those individuals in employment and those who are unemployed. Those who experience unemployment at some point in their working life could be classed as unemployed or as is done here, the employment status when an individual exits good health could be used.

Country	Employed	Unemployed	Ratio E:U
Germany	2.540705	2.606796	0.975
Denmark	3.190359	2.430769	1.312
Netherlands	3.359072	2.828205	1.188
Belgium	3.7906	3.495845	1.084
France	3.753943	3.262514	1.151
United Kingdom	2.639964	2.120773	1.245
Ireland	3.458382	2.864162	1.207
Italy	4.101697	4.097938	1.001
Greece	3.846035	3.348875	1.148
Spain	3.535889	3.086662	1.146
Portugal	4.005809	3.490476	1.148
Austria	3.838877	3.37156	1.139
Finland	3.232215	2.776639	1.164

If individuals from all countries are grouped together, we get the following figures:

Employed	Unemployed	Ratio E:U
3.419828	3.147741	1.086

This average is obviously lower than the majority of countries in the above table. The number of observations in Germany is pulling the average down. Excluding Germany, we could say that unemployed individuals are about 14% more likely to lose their good health.

In most of the countries it is clear that individuals with higher incomes enjoy longer spells of good health. The difference between the highest two quartiles is small and in a number of countries those individuals in the second highest quartile have longer spells of good health than individuals in the highest quartile

	Income Group			
Country	Lowest quartile	Second lowest	Second highest	Highest quartile
Germany	2.54796	2.55651	2.46451	2.58193
Denmark	2.83413	3.09436	3.26306	3.41134
Netherlands	3.08545	3.33432	3.46323	3.49705
Belgium	3.52195	3.76360	3.84585	3.94828
France	3.39278	3.67912	3.81664	3.99015
United Kingdom	2.31758	2.61065	2.72301	2.80740
Ireland	3.25984	3.43985	3.50348	3.47424
Italy	4.19655	4.06575	4.09527	4.06883
Greece	3.80491	3.87223	3.76518	3.84326
Spain	3.37067	3.49378	3.54967	3.57728
Portugal	3.83072	3.94278	4.06860	4.06726
Austria	3.67299	3.80972	3.92499	3.87369
Finland	2.97340	3.24079	3.23105	3.36392

If individuals from all countries are grouped together, these are the average lengths of spells of good health. This is strong evidence of increased income resulting in longer spells of good health.

Income Group			
Lowest quartile	Second lowest	Second highest	Highest quartile
3.25479	3.40635	3.45885	3.50201

In most countries, there is a major difference in the length of the spell of good health between those with the different levels of education. Those who have less the second level education often have considerably shorter spells.

	Education Level		
Country	Less than second	Second	Third
Germany	2.06322	2.75991	2.78531
Denmark	2.53918	3.43517	3.42714
Netherlands	2.86758	3.78475	3.66542
Belgium	3.45660	3.97823	4.23077
France	4.14268	2.99543	3.90006
United Kingdom	2.44031	2.19566	3.08458
Ireland	3.30862	3.55216	3.83554
Italy	3.99775	4.33339	4.54832
Greece	3.76672	3.98342	3.85525
Spain	3.26224	3.61360	4.05921
Portugal	3.91156	4.12727	4.64780
Austria	3.29296	4.07729	3.99372
Finland	2.59265	3.41990	3.54828

Grouping all countries together shows that the length of the spell of good health increases with the level of education.

Education Level		
Less than second	Second	Third
3.35308	3.47387	3.58705

Figure 1 Percentage of those in good health who are unemployed

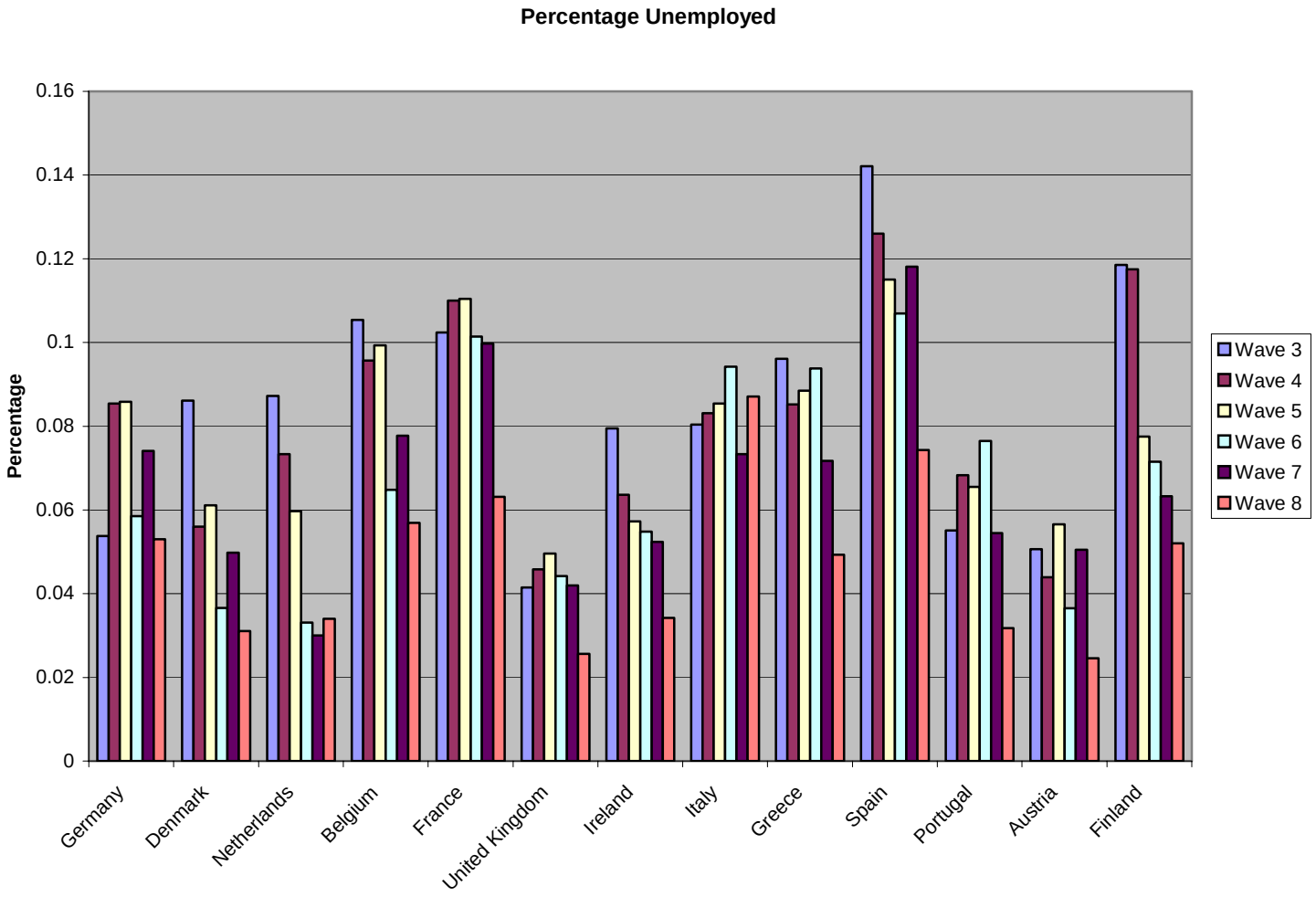


Figure 2 Survival functions

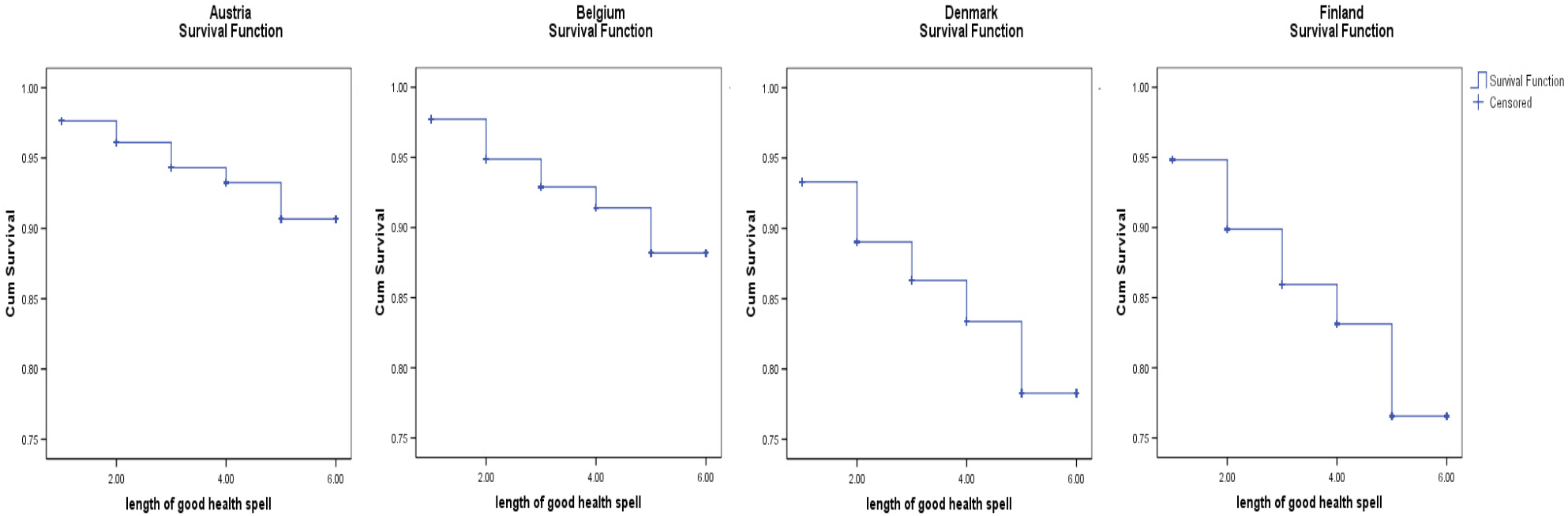


Figure 3 Survival functions

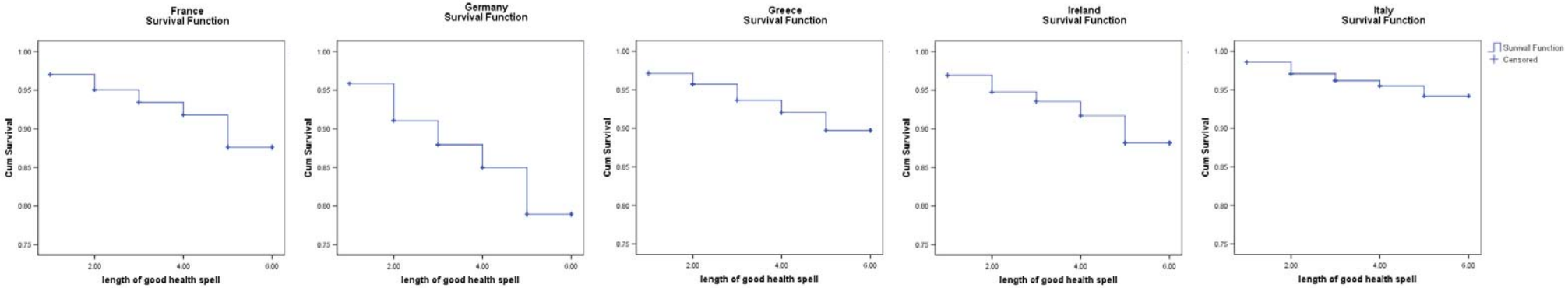
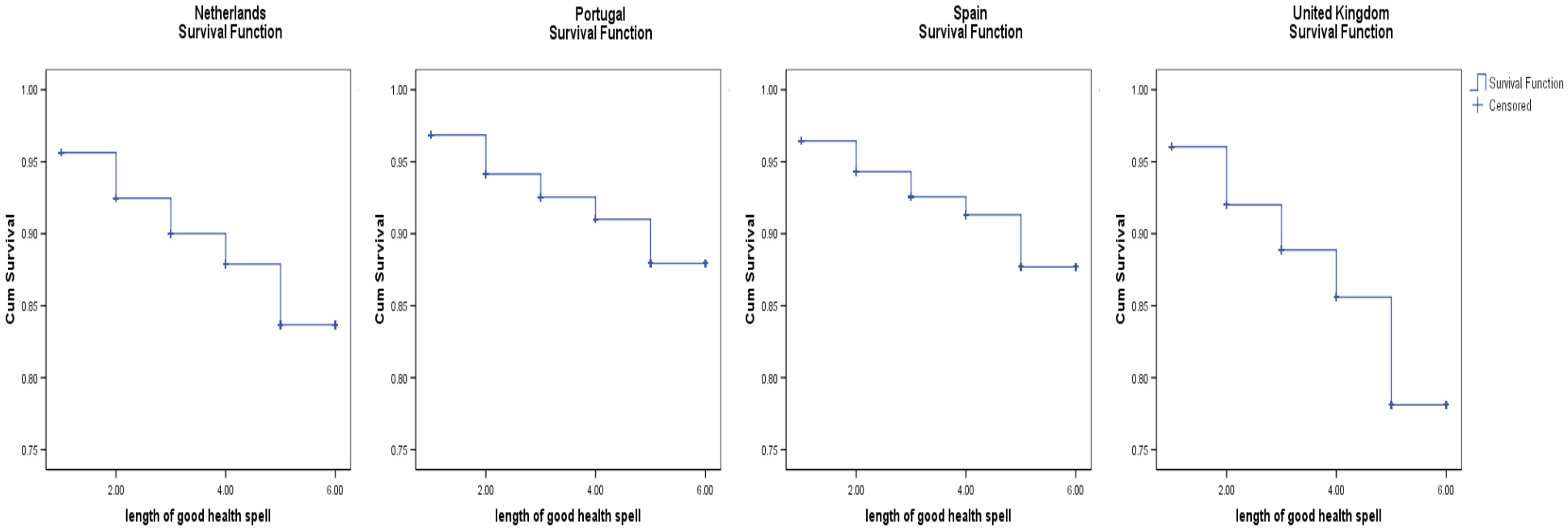


Figure 4 Survival functions



[i] See http://epunet.essex.ac.uk/echp_userguide_toc.php for the official guide and Cantarero et al (2005), Hildebrand and van Kerm (2005) and Iacovou as examples of other studies in this area also using this dataset.

[ii] The fifteen countries in the ECHP are Germany, Denmark, Netherlands, Belgium, Luxembourg, France, United Kingdom, Ireland, Italy, Greece, Spain, Portugal, Austria, Finland and Sweden. Data from Austria, Finland and Sweden are not available from wave one. Austria is available from two and Finland available from three. The Swedish data is not a panel so Sweden is excluded from this study.

[iii] Specifically: self employment, unemployment, retired, full-time education or training, out of the labour market (employed is the omitted variable); second level education, third level education (first level education is the omitted variable); income quartile 2, income quartile 3, income quartile 4; age, age squared; gender; separated or divorced, widowed, single (married is the omitted variable).

[iv] The PMID variable is given by Eurostat. Therefore it was not possible to distinguish between mental and physical health.

[v] The AIC is calculated by: $(-2\times\text{log-likelihood})+2(c+p+1)$ where c is the number of variables and p is the number of parameters that have to be estimated from the data.

[vi] The Kaplan Meier survival curve is used when measuring how long it takes for an event to occur. In the case of this paper, the length of time in question is how long it takes for an individual to lose their good health. The Kaplan-Meier survival curve estimates the proportion of individuals who remain in good health for one year, two years, three years and so on up to the end point of the study. Kalbfleisch and Prentice (1980) give further details on this issue.

[vii] These groupings are formed by combining the International Standard Classification of Education (ISCED) levels, which were designed in the early 1970s to aid the compiling of statistics on levels of education, and have been revised a number of times. The latest revision was in 1997 and has six levels: 0, pre-primary education; 1 primary education; 2 lower secondary education; 3, upper secondary education; 4, post-secondary non-tertiary education; 5, first stage of tertiary education (not leading to an advanced research qualification); and 6, second stage of tertiary education (leading to an advanced research qualification). In the ISCED 1976, which is used in the ECHP there was no level 4 and so levels 5-7 became levels 4-6. The ECHP then combines these six levels as follows: third level - levels 4-6; second – level 3; less than second level - levels 0-2. Therefore less than second level refers to the basic minimum education that almost everyone would have. Second level education includes those individuals who completed the later years of school while third level education includes college and University qualifications.

[viii] It may be noted that the income quartiles do not contain exactly 25% of the observations since the quartiles are based on all individuals in the country and only subsequently is the data restricted to exclude individuals younger than 20 or older than 65.