Inequalities in Health and Happiness in Great Britain

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Jing Shen

Business School
University of Newcastle upon Tyne

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To my parents and my grandmother,

with all my love

Abstract

The PhD thesis investigates the issue of inequalities in health and happiness in Britain. Consisting of three empirical studies and one piece of conceptual modelling, the research undertakes new investigations into health inequalities using longitudinal data. Carried out from a new angle – the life-course perspective, the studies adopt new methods including entropy measures, relative distributions and quantile regression to examine inequalities in the broader sense of health – mental health, psychological wellbeing and the related concept of happiness, in addition to physical health.

Robust and reliable measures of inequalities in health should first be established before any investigations of health inequalities being carried out and this research shows that new methods need to be applied in addition to the traditional methods in order to overcome the flaws of the old methods and provide new insights into the issue of health inequalities. The life-course approach reveals that parental income and birth weight play important roles in respondents' adulthood health inequality in addition to a range of socioeconomic factors, although parental income is only significant in wave 7 whereas birth weight is only significant and has more contribution in wave 4. With the application of the relative distributions method, the empirical study identifies that shape change rather than location change in the self-assessed health (SAH) distribution causes lower average SAH. Extending the analysis of inequalities in physical health to psychological wellbeing, women in England are found to be less happy than men mainly due to polarization occurring in the female population compared to men. Both the relative distributions method and quantile regression have confirmed the effects of some socioeconomic factors on psychological wellbeing and extended to happiness, however, the general trend of the psychological side of health or happiness over time cannot be concluded. Nevertheless, the relative distributions method is shown to perform well in understanding how the psychological health variable is distributed across the entire distribution over time. This research also contributes to a further examination of the relationship between income inequality and health, and the results continue to be mixed, although longstanding illness and Malaise Inventory appear to be more affected by income inequality than SAH and the choice of different indicators of income inequality seems to be important. Furthermore, a conceptual model is established in the thesis to provide a better understanding of the concepts involving health and happiness, which is believed to be the first attempt of its kind in the literature.

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Chapter One: Introduction

"The health of the people is really the foundation upon which all their happiness and all their powers as a state depend ...the health of the people is, in my view, the first duty of a statesman."

Benjamin Disraeli, Speech (1877)

1.1 Research background

Health is one of the most important issues in society. Good health is fundamental to all our lives as health is the bedrock on which we build our family lives, working lives and community lives. Good health is also central to the economy. Every year more than 20 million working days are lost due to illness, which is a large burden for business. A healthier workforce improves productivity and performance, and reduces health expenditure. As the foundation of all the other achievements in the life of any individual, health is productivity, health is prosperity, and health is one of the most valuable assets on which a nation is relying. The objective of good health is twofold: "the best attainable average level – goodness – and the smallest feasible differences among individuals and groups – fairness" (WHO report, 2000). In the pursuit of good health, various measures have been taken to improve the absolute level of population health, which at the national level is mostly observed by the increasing life expectancy and/or decreasing mortality rate. However, the relative level of health – the difference in health between individuals and groups, i.e. inequality in health – is often overlooked, despite the fact that the first recorded recognition of inequality in health between poor and rich people can date back to 1842 when Chadwick published his "Report into the Sanitary Conditions of the Labouring Population of Great Britain", describing the appalling conditions endured by poor people in Britain at the time. At the international level, the issue of health inequality was first addressed in the Declaration of Alma-Ata in 1978 (Crombie, 2005), which stated that "the existing gross inequality in the health status of the people … is politically, socially and economically unacceptable".

The fairness of health is at least as important as the overall level of health, which is reflected by the government's health action report where promoting equality in health is listed as one of the key aims of the Government's health strategy (Department of Health, 1999). It is, most important of all, a moral decision to reduce health inequality. Maguid (2002) has pointed out: “One of the most unfair inequalities is disclosed in the right to living”. As the starting point of Marmot’s recent review on health inequalities in England, he states health inequalities to be morally unacceptable and socially unjust because “inequalities are a matter of life and death, of health and sickness, of well-being and misery” (Marmot, 2010). Good health signifies the basic human rights of participating in society, maintaining human dignity and having the freedom of enjoying life. Thus, the existence of a social gradient in health is morally unacceptable, a view echoed by Asada (2006). Furthermore, reducing health inequalities is not only a matter of fairness and social justice, but promoting a fairer society (including fairness in health) is fundamental to improving the health of the entire population (Marmot, 2010), building a healthy society and contributing to the prosperity of the whole nation in the long run. Sick people on low income will depend on the society more broadly to pay for their health care costs, thus, tackling health inequalities and improving the health of the worst offs will help to reduce welfare spending – the money saved then can be used for better economic performance.

There are more serious consequences to health inequalities. Good health is essential to sustained economic and social development as it is the foundation for all the other economic and social activities; however, it has often been shown in the literature that ill health is more prevalent among the poor. The two adverse elements of poor health and lower social status are no doubt putting the disadvantaged groups into far worse situations, which may even cause social unrest. Unacceptable differences between individuals due to their social background can shake the foundation of a society. Poor health coupled with the lack of access to housing, health care, education and employment opportunities, can lead to an unstable society as, when people are in extreme and desperate conditions, crime rates will increase, which will add more onto the societal burden. As a result, the consequences of health inequalities are not only borne by the poor but everyone pays for the health costs as well as for the diminished quality of civic institutions and the social environment (Kawachi and Kennedy, 1999). All of these will contribute to the worsening of social system and environment and reduced funding for the development of other sectors, such as education or science and technology, which will then affect the improvement of health and health care. These may all turn into a vicious circle.

However, in reality the two elements of goodness and fairness in health often do not improve at a similar rate among all social groups. In particular, people in disadvantaged groups tend to be less healthy and enjoy shorter lives than their counterparts in the better off groups, and this situation continues even after the improvement of the overall health. In order to appreciate the urgency of reducing health inequalities, it is necessary to look into the statistics of how extensive the differentials in health are. In the UK, the overall level of health has improved dramatically over the last 200 years. For instance, life expectancy at birth was well under 40 in 1800 and it had doubled by the end of the 20th century, to around 75 for men and 80 for women (Smith, et al., 2001). On the contrary, health differences among individuals and groups have widened since the 1950s to different degrees in different group comparisons. In a speech on 27 March 1977, the then Secretary of State for Social Services stated:

> *"..... the crude differences in mortality rates between the various social classes are worrying. To take the extreme example, in 1971 the death rate for adult men in social class V (unskilled workers) was nearly twice that of adult men in social class I (professional workers) even when account has been taken of the different age structure of the 2 classes. When you look at death rates for specific diseases the gap is even wider. For examples for tuberculosis the death rate in social class V is 10 times that for social class I; for bronchitis it was 5 times as high and for lung cancer and stomach cancer 3 times as high. Social class differences in mortality begin at birth. In 1971 neo-natal death rates - deaths within the first month of life - were twice as high for the children of fathers in social class V as they were in social class I. Death rates for the post-neo-natal period - from one month up to one year - were nearly 5 times higher in social class V than in social class I ... The first step towards remedial action is to put together what is already known about the problem ... it is a major challenge for the next 10 or more years to try to narrow the gap in health standards between different social classes." (Source: Black report 1982)*

Following the speech, a Working Group led by Sir Douglas Black was appointed to investigate the differences in health which then produced the Black Report (1977-1980). The Group found that there were marked differences in mortality rates and the utilisation of health services (particularly preventive services) between occupational classes for both sexes and all ages, and that there had been a lack of improvement, in some respects a deterioration, in the health of the unskilled and semi-skilled manual classes relative to the professional and managerial classes. In addition, gender, regional and race differences in health were also evident and inequalities in health had been widening since the 1950s, and this trend was principally related to inequalities of material sources (Shaw, et al 1999). For instance, for both men and women the risk of death before retirement was two-and-a-half times as great in class V (unskilled manua1 workers and their wives), as it was in class I (professional men and their wives), and for men of economically active age there was greater inequality of mortality between occupational classes I and V both in 1970-72 and 1959-63 than in 1949-53. The Group made recommendations to remedy particular features within and outside health services, but received a cold reception from the Government at the time of publication, principally on the grounds of cost. After the UK general election in 1997, an Independent Inquiry to examine inequalities in health was set up and their findings were reported in December 1998. The Independent Inquiry into Inequalities in Health report reconfirmed the existence of inequalities in health - "whether measured in terms of mortality, life expectancy or health status; whether categorised by socioeconomic measures or by ethnic group or gender", and also the widening gap - "over the last twenty years, … the difference in (death) rates between those at the top and bottom of the social scale has widened" (Sir Donald Acheson, et al, 1998). As a result of the Inquiry, reducing health inequalities became a key part of the Government's agenda (DoH, 1999), with a target of reducing inequalities in health outcomes by 10 per cent as measured by infant mortality and life expectancy at birth by 2010 (DoH, 2006). However, Marmot's recent research report (Marmot, 2010) has shown that inequalities today are still a dominant feature of health in England, but they are not inevitable and can be prevented; therefore, more investigations into this issue are required, which is the starting point of this research.

Investigating inequalities in health, in addition to the mostly discussed physical health, the psychological side of health is also addressed in this research. Fully enjoyment of life requires people to be both physically fit and mentally content, and recently some researchers and politicians even suggest using gross national happiness as a measure of a country's performance in addition to GDP if not replacing it (Oswald, 1997). Appreciating the importance of psychological health, this research not only investigates health inequalities in a narrow physical sense, but also examines how the psychological wellbeing of the population is distributed and what factors cause its uneven distribution.

Following this general case for examination of health inequalities, this thesis uses new research methods to investigate inequalities in health as well as psychological wellbeing in Britain, in particular, the research will examine and suggest appropriate measures of health inequalities, especially when dealing with categorical health outcomes and explore the roots to the problem, and by doing so more effective policies should be recommended to promote fairer and more equal health between individuals in society.

1.2 Study aims and originality

The aims of this thesis are to extend the investigation of health inequalities through introducing new methods to identify the source of health inequalities and the mechanism of how they are developed through individuals' life-courses and expand the analyses to a broader measure of wellbeing. More specifically, the thesis will enrich the current health economics research in four ways.

Firstly, the research applies new methods to measure health inequalities and the results will be compared to the methods which are commonly used in the literature. The new methods include entropy measures and relative distributions methods as well as new approaches which model initial health and they are chosen because of their appealing features in complementing and overcoming certain drawbacks of the traditional methods. Entropy measures provide summary statistics of overall level of health inequality similar to the Gini index but are more suitable for categorical measures of health. Relative distributions method is able to measure inequality across the entire distribution and distinguish causes for distributional differences of health inequalities between due to change in the shape of the distribution and due to location change in the distribution. When applying traditional methods, health inequalities are decomposed from the life-course perspective by adding initial health stock to the regressions of adulthood health in different stages. This may support an argument for a causal link from initial condition to later health state, which can help policy makers to design more effective interventions to reduce health inequalities.

Secondly, this research will further contribute to the existing debate on the relationship between income inequality and health. There have been many attempts to test the relative income hypothesis; however, they either suffer from problems caused by using aggregated data or not enough evidence generated from cross sectional data. This research, using a rich data set – longitudinal panel data covering more than 50 years with birth information, looks further into the issue by including initial health as well as initial parental income as determinants of the health outcomes. A key purpose of the study is also to test whether the impacts of relative income on health – if there is any – are different with regard to the specific domain of health: mental health, physical health or general health. Based on research that supports the relative income hypothesis and a general expectation that the effect of inequality in income may be mainly psychological if it exists, the study anticipates that relative income would have greater impact on mental health than physical or general health.

Thirdly, the research extends implications from findings in psychological wellbeing inequalities to a broader application in the economics of happiness, which is often argued to be the ultimate welfare of human wellbeing. In addition, some complex and confusing concepts in health and wellbeing are detangled through a conceptual model developed in this thesis. This may add fresh input into the health economics literature as well as the broader economics literature. Often in health economics research, when it comes to the non-physical side of health, in addition to “mental health”, people tend to be using different terms, such as “subjective wellbeing” or “psychological wellbeing” and in some instance “happiness”. However, there are rarely any clear clarifications in the literature about how these terms are related and how health reflects wellbeing and through what mechanism. This research will build a conceptual model of happiness and try for the first time to disentangle the mixing of these concepts in the literature.

Lastly, in addition to the investigation of inequalities in general physical health, this research also goes one step further to investigate inequalities in an aspect of health that has attracted growing attention in recent years – mental health and extend its implication to psychological wellbeing and happiness. With the help of a rich data set of yearly surveys from 1991 to 2005, the trend of psychological or mental health changes in England through time can be examined. Using an innovative non-parametric relative distributions method that provides robust results, changes in the location and shape of the entire distribution can be distinguished. Furthermore, counterfactual and compositional effects of chosen socioeconomic factors as covariates can also be separately discussed. The relative distributions findings are then compared with results from quantile regression method, which is parametric, yet also examines the entire distribution. This study is one of the first attempts to apply this new method in health economics and the first to use it in the area of psychological wellbeing.

1.3 Structure of the thesis

The thesis is divided into two parts: the first part is devoted to applying different measures of health inequalities to examine the development of such health inequalities from birth to adulthood with a representative birth cohort sample in Britain and investigating the relationship between income inequality and health through different modelling methods. The second part of the thesis extends the investigation of health inequalities further to a new dimension of health that has attracted growing attention in health economics literature - psychological wellbeing. With the application of our research method, the results on psychological wellbeing can be extended to another area of economics - the economics of happiness. This is examined across time over 15 years, although the data used in this part is not panel data.

There are four chapters in the first part entitled "Health, Health Inequalities and Income Inequality".

Chapter two presents an overview of literature on health inequalities and related areas. Avoidable and unavoidable health inequalities are firstly distinguished. Gathering evidence from both developed and developing countries, the issue of health inequalities is proven to be universal and requiring urgent attention. The background information on health inequalities, including the concepts of health production, determinants of health and the life-course approach introduced in this chapter, will be the basis of the investigation of this study.

Chapter three reviews various existing measures of health inequalities as well as introducing the new methods. The commonly used conventional measures are explained in details: 1) Gini and associated Lorenz curve, 2) concentration index and related concentration curve, and 3) decomposition of concentration index. The new methods include three entropy measures: 1) Theil's entropy; 2) H measure; 3) B measure and an innovative relative distributions method.

Chapter four reports empirical results from applying both conventional and new methods of measuring health inequalities. This chapter firstly provides the background information on the data set used, data collection, data structure, the health outcome variable, and the independent variables. The use of self-assessed health as an indicator of health is discussed here, following which descriptive analysis on the health variable is reported. Results from the calculations of the Gini and concentration indices are displayed as well as their related curves. The values of entropy measures are compared with Gini indices. Decomposition of the concentration indices with the inclusion of early life characteristics shows the impact of childhood conditions on adult health and gives a life-course view of the development of health and health inequalities. Relative distributions also provide some insight on how population health is shifting through the years when people age.

Chapter five presents an empirical investigation into the relationship between income inequality and health. Recent literature on this relationship is reviewed in this chapter as well as estimation strategies explained. The examination of the impact of inequality of both permanent parental income and individual's own income on their health status in different stages of life is carried out through applying different types of modelling methods. Pooled OLS model, panel data model and probit model are applied on health indicators of general health and longstanding illness, whereas pooled OLS model and Panel data model are used for the mental health indicator – Malaise Inventory.

There are two chapters in Part Two entitled "Health and Wellbeing".

Chapter six reviews existing literature on psychological wellbeing and builds up a conceptual model of related concepts. Psychological wellbeing has attracted growing attention in developed countries as it has become one of the major burdens of diseases. This chapter reviews studies on both the emerging psychological wellbeing problems and the persistence of mental health inequalities in Britain, linking it with the happiness of the nation. Following this, a conceptual model of health and happiness is then set up. There are so far no explicit explanations or classifications of the term happiness in relation to health, especially mental health. This research makes the first attempt to build up a conceptual framework in order to explain the relationship between concepts of health, psychological wellbeing and other influential factors. Definitions of health and happiness are also discussed in this chapter.

Chapter seven measures the changes of psychological wellbeing in England across 15 years of the data span and extends the findings to happiness. The general health questionnaire (GHQ) is introduced and discussed as a measure of mental health or psychological wellbeing. The application of relative distributions method ensures that as long as we can assume happiness is a monotonic transformation of psychological wellbeing, the results from GHQ measured psychological wellbeing can also be applied for happiness. The use of quantile regression provides full insights of the controlled variables on the whole distribution of GHQ, complementing the non-parametric results from the relative distributions method. Selected findings from the relative distributions method and the decompositions of the relative distributions by socioeconomic factors are presented as well as quantile regression results.

Chapter eight summarises the findings of the three empirical studies and discusses the implications and limitations of the research before suggestions are given for further investigation of health inequalities.

Part I Health, Health Inequalities and Income Inequality

Chapter Two: Concepts of health inequalities

2.1 Introduction

The role of this chapter is to review the literature on health inequality and explain relevant concepts that lay the foundation for this research. The chapter will first stress that not all health inequalities are avoidable or of moral concern; therefore, different types of differences in health are distinguished, so that policies can be made to only concentrate on dealing with the types of health inequalities that are regarded as unacceptable but avoidable – the types affected by socioeconomic status (SES). Following this, the chapter then goes on to show evidence from the health economics literature on the wide existence of socioeconomic-related health inequalities around the world as well as in the UK. Grossman's health production model is adopted to provide a framework of how health is produced, and as a basis on which the determinants of health are discussed. By doing so, covariates of health can be determined in the following chapter of empirical studies. Last but not least, the concept of the life-course approach is introduced as a new approach to tackle health inequalities. This approach is justified on the solid fact that health - regarded as a good that people obtain and consume - is varying across time, and health status in later life stages is affected by early life experiences.

2.2 Inevitable or unacceptable health inequalities

In theory, health inequality is a generic term used to designate differences, variations, and disparities in the health achievements of individuals and groups (Kawachi, Subramanian and Almeida-Filho, 2002). However, in practice there have been confusions when the term "health inequality" is used, as some use it to convey a sense of unfairness whereas others use it to purely mean mathematically unequal. For the purpose of this thesis, health inequality is defined as the unnecessary and avoidable systematic differences in health outcomes between social groups, which are unfair and unjust. In other words, this study is only focusing on avoidable but unacceptable differences in health among individuals – health variations due to inevitable factors that are not considered unjust are excluded in the range of health inequalities defined in this thesis.

To give a clear distinction of the two types of health differences, this research adopts a commonly agreed view as described in Whitehead (1991). Generally, health differences result from seven sources. The first three sources of health differences are normally not considered unjust or unfair, therefore are not health inequalities that we are concerned about and they are: (i) biological and genetic variation. Everyone is different and it is inevitable to have certain variations in health between individuals – it is not possible to achieve a situation where everyone has the same level of health, suffers from the same diseases and dies at the same age. Health disparities due to natural factors are not unfair, therefore, not considered as health inequalities. Such variations include health differences between age groups and between men and women as well as genetic diseases. For example, a 30 year old having better health than a 70 year old, but expected to experience the same infirmity 40 years on would not be unjust as it is purely a life stage difference. Certain gender-specific diseases that only occur among men or women are also not considered to be unfair. (ii) Health-damaging risky behaviours that are voluntarily chosen by the individuals, such as dangerous sports and pastimes. If it is one's own will to participate in high risk activities without being influenced by social and environmental factors, then the higher rate of health-damaging incidences occurred in this group of people is normally not considered unjust. The individuals who choose to take part in these activities will have to accept and bear the possible consequences. (iii) "The transient health advantage of one group over another when that group is first to adopt a health-promoting behaviour as long as other groups have the means to catch up fairly soon" (Whitehead, 1991). For example, the situation where health-promoting projects first exercised in pilot groups and then recommended to the entire society, causing differences in health in the short term and soon disappearing is normally acceptable, therefore, not considered unjust.

Health differences due to the last four reasons are normally preventable, thus, are health inequalities we need to target on: (iv) Socioeconomic status determined exposure to unhealthy conditions where people are born, grow up, live, work and age, such that disadvantaged people are more likely to have illnesses and disabilities and shorter lives than those who are more affluent. This is the main source of health inequalities. For instance, the fact that people with higher income have better health than people with low income is considered unfair, but can be prevented. It is also unacceptable that people born in the southwest of England are expected to live longer than their counterparts born in the northeast. These systematic and potentially remediable health differences are major concerns among researchers regarding health inequalities as the socially and environmentally determined health disparities are simply unfair. (v) Health-damaging behaviours that are caused by social environment, which are out of their own control. People in lower social groups are less likely to be on a healthy diet or do exercise and more likely to smoke, which then result in them having poorer health than people higher up in the social hierarchy. These types of health differences are not due to people's free choice but result from socioeconomic restrictions that are beyond their control, therefore, are unjust. (vi) Inadequate access to health care and public services. This essentially is the result of socioeconomic restrictions. People in disadvantaged groups are less likely to have private health insurance and less likely to take preventive measures. Leisure facilities are less likely to be enjoyed by disadvantaged groups due to either lack of time, income or other constrains. Health inequalities resulting from unequal opportunities in life due to socioeconomic factors are commonly agreed as unfair and unjust. (vii) Reverse effect of health to socioeconomic status where sick people move down in the social scale. People in sickness may have less chance in employment and earning opportunities, which in turn leads to them living in compromised conditions and causes more health damages. This is clearly not fair, but can be prevented through effective social policies.

Adopting the above view, it is also worth noting that these seven categories are not mutually exclusive and they interact with each other both horizontally and vertically. Horizontally, the last four categories are largely related and people with poor health resulting from the first three categories may also fall into the last four categories and vice versa. Vertically, the components in each category may also move across category through time - what is unavoidable in one cohort may be avoidable in another. As the health of people improves, we would hope that the range of unavoidable factors falls. Therefore, it is a far more complicated issue to clearly distinguish inevitable health inequalities and unacceptable but preventable health inequalities; although research evidence shows that socioeconomic factors are the major contributors to the overall health differences among individuals. Nevertheless, adopting good research methods can help identify different types of health inequalities as, for example, in this research a life-course approach is applied which separates the differences between individuals due to their initial health from other influential factors as health inequalities caused by their initial health are not necessarily avoidable at this stage.

The working definition of health inequality adopted in this research is, therefore, framed as the systematic and potentially remediable differences in one or more aspects of health across socially, economically, demographically, or geographically defined population groups or subgroups (Graham, 2004).

2.3 Health inequalities: the evidence

At the WHO conference in Alma Ata in 1978, a global health strategy was launched by the World Health Assembly with the goal of "Health for All" by the Year 2000. "Health for all" implicitly makes equality in health a priority, but in real life health inequalities are evident and widely existent in both developed and developing countries and the extent of which is even increasing in some countries (WHO, 1996).

In the literature numerous studies have revealed the magnitude of health inequalities and the existence of social gradients in health around the world. The WHO's regional report "Closing the Health Inequalities Gap: An International Perspective" (2005) states that inequalities in health are a problem in all developed countries. Adler et al. (1993) have concluded that SES is associated with health at all levels of the SES hierarchy, and access to health care accounts for little of this association based on the articles they reviewed. The report on health inequalities in Europe commissioned by the UK in 2005 has clearly showed that for many common indicators of SES, those in the worse circumstances face higher risks of adverse health outcomes than those who are better off (Judge, et al, 2005). Lahelma and colleagues (1997), using Finnish data, find that the socioeconomic pattern of health status in terms of educational attainment displays continuously clear differences when comparing the years 1986 and 1994. In Switzerland, a study investigating the evolution of health inequalities over 20 years has revealed similar patterns of the positive effects of income, education and employment on health (Leu and Schellhorn, 2006). Molarius et al. (2006) in Sweden have found that poor self-rated health is most common among people who have been belittled, experienced economic hardship, lacked social support, or retired early. While in the United States, Kennedy et al. (1998) have shown that lower income or educational achievement are strongly associated with fair or poor health when personal characteristics are controlled for. In Canada, significant inequalities in self-reported ill-health are also found to exist and favour the higher income groups (Humphries and van Doorslaer, 2000). Furthermore, there are cross country comparisons on health inequalities in industrialised countries. The study by van Doorslaer et al (1997) has shown evidence of income-related health inequalities in developed countries, among which income-related inequalities in self-assessed health are particularly high in the US and the UK compared with seven other European countries. A similar study examining education related inequalities in health among 11 western European countries confirms the existence of health inequalities with varying sizes across countries and the UK is still ranked just above average in the size of inequalities in health (Cavelaars, et al, 1998). Another comparison study (van Doorslaer and Koolman, 2004) has investigated the sources of the differences in the degree of income-related health inequalities across 13 European countries, and found income to be the most important factor, followed by education, labour force status and region. In this study, the UK is again ranked second highest in such inequalities. Household wealth also has been found to have a strong and consistent association with self-rated health as proportions of poor health decrease with increasing wealth (Aittomäki, et al., 2010). In more recent cross country comparisons, inequalities in health between higher and lower socioeconomic status are found to continue to exist in a study examining 22 European countries (Mackenbach, et al., 2008), and as the population ages, health is found to deteriorate more rapidly among people from the lower occupational grades among British civil servants (Chandola, et al., 2007). Evidence of health inequalities among SES groups between and within both developed and developing countries is also documented in international reports (WHO, 1996, 2008) and the persistence of the problem has been raised in the global context (WHO, 1999).

2.4 Production of health

Before carrying out any investigation of health inequalities, the first step is to understand how health is produced. Grossman's model is widely used to explain the production of health. The central proposition of Grossman's model is that health is viewed as a durable capital stock that produces an output of healthy time; thus, each individual is regarded as both a producer and a consumer of health. It is then assumed that individuals inherit an initial stock of health that depreciates with age and the stock of health can be increased by investment (Grossman, 1972). Based on this theory, any individual's health status at any point in time is determined by both his or her starting point of health (initial health stock) and how s/he has been investing on health. Therefore, the differences in health between individuals are considered as resulting from two different sources – difference in the initial health stock and difference caused by the different levels of investment. To investigate health inequalities, it is then crucial to examine both initial inherited health stock usually represented by birth weight and parental characteristics, and investments in health, such as health related behaviours, which are influenced by social class, income and education, etc.

2.5 Determinants of health

Health inequalities are the result of a complex and wide-ranging network of factors, which mainly includes two types of determinants of health: social (e.g. occupation, income, housing, education) and biological (e.g. nutrition level, genetic inheritance, capacity to enjoy life). They are different from each other but also interact with one another. Social determinants of health are the most discussed in the health economics literature. In the existing empirical studies, the role of SES in determining health conditional on initial health stock and income has been widely researched, although the relationship between SES and health continues to be an often debated topic. Among those, a substantial portion has investigated the effect of income and income distribution on health. The hypothesis suggesting that population health improves with average income but the effect of income on health decreases as income rises, is regarded as absolute income hypothesis. The theory that individual health also depends on the degree of income inequalities in the society is referred to as relative income hypothesis (Gravelle, et al, 2002, Deaton, 2003).

The absolute income hypothesis has been widely acknowledged (Ettner, 1996, van Doorslaer, et al, 1997). Based on pseudo-panels of regional British birth cohorts, Sutton (2004) has shown that both transitory and permanent income have significant effects on health and increases in income have a positive effect on health for all population groups. The effect of income on health (in terms of both objective physical measures and self-assessed measures) has been found comparable to that of the other socio-economic variables in combination, where the shape of this relationship is found to be approximately linear over the majority (between 10th and 90th percentile) of the log income distribution (Ecob and Smith, 1999). In another research the same relationship is revealed to be significant even after taking into account a range of confounders, but the association appears to be non-linear (Benzeval, et al., 2001). The correlation between income and health is not only found in general health but also in mental health. Wildman (2003) using panel data has investigated the relationship between income and mental health in Great Britain and shown that income has a large impact on mental health inequality. In another research on mental health in Britain, income-related inequality in psychiatric disorders is revealed to be even higher than for general health (Mangalore, et al., 2007). The work by Jones and Wildman (2008) has confirmed the effect of income on both general health (measured by self-assessed health) and mental health (measured by General Health Questionnaire) and the shape of the relationship between health and income is found to be non-linear.

Jones and Wildman (2008) have also gone one step further by examining the relationship between income distribution and health, which is the relative income hypothesis, using both parametric and semi-parametric models. The impact of relative deprivation of income on health is only found on men's mental health by use of robust semi-parametric techniques in their study. There are more studies in the literature testing the relative income hypothesis. Wildman (2001, 2003a) has developed theoretical models which allow individual health to be a function of both income and income inequality. There is also a considerable amount of empirical evidence which supports the relative income hypothesis (see for example, Deaton, 2003, Lynch, et al, 2004). Preston (1975) investigates the cross country relationship between life expectancy and income per head and finds that the concavity of this relationship is strong in poorest countries but very weak in richer countries. He therefore argues that individual health depends on the degree of income inequality in that society; thus, the negative effect of income inequality on health is more important in richer societies. Kennedy et al (1996) have proven Preston's argument by using the US data and found that the size of the gap between the wealthy and less well off - as distinct from the absolute standard of living enjoyed by the poor - seems to be related to mortality. In another of his studies, Kennedy and colleagues (1998) have shown that individuals living in states with the greatest inequalities in income are 30% more likely to report their health as fair or poor than individuals living in states with the smallest inequalities in income. Kaplan (1996) also suggests that in the US the inequality of the distribution of income is significantly associated with variations between states in a large number of health outcomes and social indicators and with mortality.

However, the evidence is mixed and no firm conclusion is drawn so far. Judge et al (1998) in their systematic review have found very little support for the view that income inequality is associated with variations in average levels of national health in rich industrial countries. Gravelle, et al. (2002), testing the relative income hypothesis by using income inequality data for 75 countries from the Deininger and Squire (1996)

World Tables for 1980–82 and 1989–90, have found that the estimated relationship between income inequality and population health is insignificant in all of their models and the results very much depend on the dataset used, the functional form estimated and the way in which the epidemiological transition is specified. They then argue that these results do not disprove the relationship between income inequality and health, but aggregate level studies have serious methodological problems in providing evidence for either the relative income hypothesis or the absolute income hypothesis due to their incapability of distinguishing between the direct effect of income inequality on individual health and nonlinearity in the individual health–income relationship. Wildman et al (2003) have complemented the above statements and strengthened the argument that the best method of testing relative income hypothesis is to use individual level data.

Few researchers would reject that income plays an important role on health, but how the mechanism works is still unknown. While one could argue that income directly affects health because it influences individuals' consumption of commodities that affect their health or cause malnutrition, many economists seem to be sceptical about the causal link from income to health but emphasise the reverse causal link from health to income (Power, et al, 1986), and some also suggest that some third factors may be operating, like education (Grossman, 1972, 2000). Indeed, the causes of inequalities in health are the complex interactions between personal, social, economic and environmental factors (Marmot, 1999, Wilkinson, 1999). First, there are non-modifiable factors, such as age, gender and heredity that influence inequalities in health, but many of these factors are beyond the control of the individual. To make it even worse, the most disadvantaged are most susceptible to poor health, which in turn leads to inequalities in health, as they have fewer opportunities to improve their physical and social environment, which is based on factors, such as, socioeconomic, cultural and environmental conditions. These conditions determine major factors such as levels of employment, salary scales and social welfare programmes, all of which in turn will determine individuals' living and working environment. This includes the individual's position in society, with occupation, income and education playing a pivotal role. These factors are moderated by the social and community networks available to the individual as feelings of insecurity and social exclusion have a detrimental effect on health. All the above factors influence the health behaviours at the individual level with lifestyle choices such as smoking, lack of physical activity and poor diet, all of which are contributing to poor health. These health behaviours, although modifiable by the individual, are heavily influenced by socioeconomic position and the social environment. The complexity of the interactions of these factors means that tackling inequalities in health requires actions at a number of different levels and across time span, and often require a multifaceted approach. The life-course approach to be used in this research is believed to be able to better untangle the complexity.

2.6 Life-course approach

Based on the concept of health production, the life-course approach is clearly the best method to adopt. Health inequalities start early in life and persist not only into old age but subsequent generations. There have been some attempts to explore health inequalities from a long time span point of view. Social factors in childhood influence the processes of biological development, and are the beginning of socially determined pathways to health in adult life. Smith (2003) shows that traditional use of single measures of adult social class will not adequately capture the full extent of socioeconomic differences between groups with different exposures and a life-course approach is needed to elucidate the contribution of socially distributed risk factors to the risk of disease in adulthood. A study by Jones and Lopez-Nicolas (2004) suggests that longitudinal data used in analysis of health inequalities can provide important features of income-related health inequality, which cannot be revealed by cross sectional data alone. Their analysis shows that longitudinal information permits the calculation of income-related inequality measure over a long time span, which differs from the picture made over a short time or a sequence of independent span shots.

The relationship between adverse events at different life stages and health in adult life is both complex and dynamic. A range of conceptual models have been proposed to capture these temporal relationships. Three models are commonly identified: critical period models, accumulation models and pathway models (Graham, 2002).

The critical period model, also known as a latency model (Power and Hertzman, 1997) suggests that the diseases which make a major contribution to the socioeconomic gradient in health have their origins in exposures occurring in sensitive or critical periods of development in early life. These models indicate that early life disadvantage play an important role in adult health independent of adult circumstances. For example, a systematic review by Galobardes et al (2006) confirms that those who have experienced worse socioeconomic conditions in their childhood, independently of their circumstances during adult life, generally are at greater risk for developing and dying of cardiovascular disease. Moreover, a review of the link between childhood adversities and adulthood psychosocial disorders shows that adverse childhood experiences which happen at critical periods in early life have effects on adulthood mental health (Maughan and McCarthy, 1997).

There is consistent evidence that inequality in economic resources follows a process of cumulative advantage, and recently, some researchers have applied the framework to health (Berney, et al, 2000, Davey Smith et al, 1997; Power et al, 1999). Accumulation models suggest that exposure to disadvantage at different life stages has a cumulative response effect on health. In other words, the relationship between SES and health that originates early in life becomes magnified over time, with advantaged individuals and groups retaining a permanent and increasing health advantage relative to others as they age (Willson, et al, 2007). Using longitudinal data from the Panel Study of Income Dynamics in the US, Willson and colleagues (2007) have found cautious support for path-dependent and duration-dependent processes of cumulative advantage in self-assessed health (SAH) using linear regression model with various indicators of SES.

The pathways model emphasises the role of early environment on subsequent life trajectories, which in turn affect health in adulthood (Power and Hertzman, 1997). The main feature that distinguishes the pathways model from the critical period model is that it assumes adversity and disadvantages in early life have indirect effects on adult health through third factors, such as educational opportunities. Pathway effects have been traced through the lives of the 1946 birth cohort study (Wadsworth & Kuh, 1997), as well as samples of the 1958 birth cohort study (Power and Hertzman, 1997). Furthermore, the pathways model can be viewed as complementary to the critical periods model as any early life adverse event which could induce a latent effect may also be the first stage along a life time pathway which might have implications for adult health (Power and Hertzman, 1997).

In addition to the ability to untangle the complexity of inequalities in health, another advantage of using a life-course approach is methodological. One of the concerns when using econometric methods to investigate inequalities in health is the existence of individual heterogeneity. By using life-course approach, a cohort will be followed from birth, which can help control for the heterogeneity through the application of genetic and parental information.

All of the three life-course conceptual models have their appealing reasoning; however, it is not possible to identify which model alone will fit best for this research. Adulthood health can be the result of accumulation of advantages and disadvantages along the life-course, or caused by some adversities at critical stages in early life, or by indirect effects from the person's childhood living or social environment, or any combination of these. This research may not be able to reveal the exact pathway of how health is determined in a life-course. Nevertheless, based on the core concept of the life-course approach that early life experiences will affect health in adulthood and later life through different ways, this research will be able to identify key factors that influence health and lead to health inequalities over the life-course through the application of a rich panel data set of over 50 years. However, it is worth noting that the life-course approach is not merely the application of longitudinal data to control for unobservable heterogeneity, it models health with the inclusion of initial health stock based on Grossman's model and through insight into the complex course of individual's health development from birth. There are more aspects to the life-course approach, such as modelling lagged effects and reveal dynamic relationships between health and influential factors, but these are beyond the scope of this research and will require further investigations.

2.7 Summary

The issue of health inequalities has received growing attention from a broad range of communities including health economists, social scientists and policy makers. Numerous studies have shown evidence of the existence and persistence of health inequalities, although the reason why the gaps between the better-off and worse-off are widening despite the dramatic improvement of overall health is still unclear. In the literature on health inequalities, a large body of studies are descriptive and mainly confirm the existence of the problem without further exploring the pathways of how health inequalities are developed, which does not provide the possibility to solve the problem.

Investigating inequalities generally revolves around the application of summary statistics to measure and describe differences and changes. Thus, applying robust and comprehensive measures of health inequalities is crucial to the search for the roots of this issue as a good measure can provide us with accurate information to start the investigation. Chapter three will provide more detailed critique for a range of current health inequalities measures. The review of literature suggests that better methods to measure health inequalities and improved modelling are required to elicit the unknown mechanisms driving the increasing gaps in health between groups.

In the health inequalities literature, there is a general consensus that health status is associated with socioeconomic status (social class, income and education, etc) irrespective of how health and socioeconomic status (SES) are measured, and the correlation between health and income inequality was also found in some studies covering wide range of societies (See review in Wilkinson and Pickett, 2006). Despite a general consensus that income is related to health found in numerous research evidence, much of the health economics literature does not accept the argument of *causal* effect running from income to health, except through the purchase of health care, arguing that the correlation between income and health is driven in part by a causality running from health to income, and in part by third factors, such as education, or rates of time preference (Deaton, 2003). Furthermore, reverse causality of health and socioeconomic status is also difficult to identify: SES might cause health, health might cause SES or both can be correlated with other factors, and all three possibilities might be operating simultaneously. In addition to the widely researched direct influence from material factors to health, some have suggested a psychological effect on health from inequalities of the material factors, in particular income inequality, which further complicates this issue. Among the socioeconomic factors, income is possibly the one that needs most attention as pointed out by Deaton (2003) – whether the effects of income on health come from income itself, or from correlations such as education, wealth, control or rank. There is so far no conclusion on the origin and mechanism of these relationships and the gradients of these relationships are inclusive. Without a thorough understanding of these relationships, no appropriate policy can be made to reduce, if not eradicate, health inequalities. This research will contribute to the literature by trying to establish the relationship between SES and health, and the extent to which health inequalities are attributable to socioeconomic factors and the widening income inequality.

According to Grossman's health production model (Grossman, 1972), health status is the result of the accumulation of health investments, starting from the initial health. In addition, the exploration of the relationship between health and SES, especially health and income, requires the use of longitudinal data which will help separate the reverse-causation and selection effects (Sutton, 2004). However, many of the existing current investigations into health inequalities have only used cross section data that can only examine health status at a single point in time. The lack of studies examining life-course data makes it impossible to assess the level of initial health and previous health investment. This research overcomes the problem by incorporating the characteristics that represent individual's initial health with the application of a cohort data set collecting information from birth.

Chapter Three: Measurements of health inequalities

3.1 Introduction

The purpose of this chapter is to review existing measures of health inequalities, especially the commonly used ones, and then compare them with new methods adopted in this research. The advantages and drawbacks of each existing measure are discussed and detailed illustrations of the commonly used methods are given as they form part of the investigation as well as new adopted methods. Evaluating the existing measures of health inequalities can help understand the issues and problems in the current practice of investigating health inequalities and appreciate the needs for new methods.

Following the review of existing methods, new methods to measure health inequalities are introduced. The B measure from the entropy family is specially designed for measuring categorical variables, which is particularly useful in this research as the health outcome indicator is self reported health categories. The innovative relative distributions method is able to distinguish different types of changes in the entire distribution of the research subject – whether it is a move in the average or a move in distributional shape and how the distribution has been shifting in the top or lower tails. This is especially useful in making effective and specific policies to target health inequalities.

3.2 Overview of conventional health inequalities measures

A large literature exists on the methodological issues of measuring health inequalities. When measuring health inequalities, choosing appropriate indicators of health and SES is very important for the result to be unbiased and valid and the choice of SES has been shown to contribute to consistently different results when measuring inequalities in health (Manor, et al, 1997).

Traditional indicators of health normally include a range of objective summary statistics, such as mortality, morbidity, infant mortality and life expectancy at birth. Being the only reliable data over time, death is a well-defined and recorded event, therefore, mortality rate is a commonly used statistic in the literature. However, it becomes dangerous when the limitations of using this kind of data are forgotten (Klein, et al, 1988). Mortality rates do not separate different causes of death, especially when the composition of diseases changes through time, so a lowering in the total mortality rate may mask an increase of mortality in, for example, chronic diseases. In addition, the investigation of health inequalities cannot be justified based on a simple mortality rate - one cannot equate a death from cardiovascular disease with a case of premature child death. Furthermore, mortality rates do not reflect quality of life, which is a very important part of health; and mortality rates are difficult to obtain in household surveys.

Recent literature has seen an increasing number of studies using self reported measures of health. This type of health index has gained popularity for a number of reasons: they are easy to obtain in general questionnaires; they manage to incorporate quality of life instead of a pure survival rate; and research has shown evidence of their predictive ability (Idler and Benyamini, 1997), despite their inherent subjectivity and heterogeneity, which is the main problem with any self reported health data. Self reported measures of health are like a double edged sword, they do suffer from subjectivity, but on the other hand, they give respondents the opportunity to express their own view on the state of their health, which may work as self weighted variable. Many studies have suggested that self reported health measures are a good indicator of individual health and powerful predictor of subsequent mortality and morbidity (see Idler and Benyamini (1997) for a review) and are highly correlated with functional limitations, minor health problems and work disability (McDonough and Amick, 2001). Whereas other measures of health (such as functional impairment or illness and disease) are useful measures of health in later years, the type of self reported health measures is one of the few measures that captures differences in health across populations regardless of age (Deaton and Paxson, 1998), and its predictive power does not appear to vary across socio-economic groups (see for example, Burstrom and Fredlund, 2001). One of the most frequently used self reported health indicators is self-assessed health (SAH), which simply asks respondents how they rate their general health with choices ranging from very poor to excellent. The number of categories varies across studies and the most commonly adopted ones are 4 or 5 categories, but 3-category ones can also be seen in the literature.

With regard to the methods used to quantify health inequalities, many indicators and indexes have been developed through the years, although methodological concerns and debates exist. The simplest way of measuring health inequalities, which compares the average health measured by some health indicators (for example, mortality ratio or percentage of individuals with ill health) between a number of predefined SES groups, is commonly used in descriptive studies (Vagerö and Lundberg, 1989, Lahelma and Valkonen, 1990). For example, one can compare the mortality rate in social class I to that in social class V. The comparison can be in both absolute terms and relative terms and the latter is normally presented as an odds ratio. This type of measure is easy to use and interpret, but has many flaws. It relies on the choice of SES groups, so the results are subject to the classification of different groups and reporting errors. Econometric modelling cannot be developed from this simple measure. It also has no control over the size of the groups being compared, which can be misleading (Wagstaff, et al, 1991). In addition to those, it ignores the information on the distribution of health across the whole population as it only focuses on some particular groups (Wagstaff, et al, 1991, Carr-Hill and Chalmers-Dixon, 2005). As pointed out by Wagstaff et al (1991), the gap between two comparison groups (usually the top and bottom ones) may remain unchanged, but the position of intermediate groups could have shifted which will lead to changes in inequality within intermediate groups or between intermediate groups and the top and/or bottom groups.

Because of the flaws with the simple measure, many other index-based measures are developed to measure health inequalities. The most common ones are developed from the Lorenz family of income inequality measurement. The Lorenz curve ranks individuals by health, and the cumulative proportions of the population are plotted against the cumulative proportions of health (Wagstaff, et al, 1991). If the Lorenz curve coincides with the diagonal, it means that health is equally distributed among the whole population, but in reality, it lies beneath (when the variable considered is beneficial to the population, for example, life expectancy) or above (when the variable considered is prejudicial, for example, mortality) the diagonal, which indicates the existence of health inequality. The Gini index, the mathematical form of the Lorenz curve, provides a measure of inequality in health. It is equal to twice the area between the Lorenz curve and the diagonal, or equivalently one minus the area under the Lorenz curve. Thus, the larger the distance of the Lorenz curve from the diagonal, the greater the inequality in health. Gini coefficient ranges from 0 to 1, with 0 representing perfect equality and 1 for perfect inequality. According to Wagstaff et al (1991), the attractions of Lorenz curve and Gini coefficient analyses are that: they present the health experience of all individuals instead of only in certain predefined groups; and they are based solely on the distribution of health without the need to require information on individuals' SES status, so that it is not subject to the problems associated with classifying people by SES groups. However, the exclusion of SES information, on the other hand, makes it inadequate to examine socioeconomic inequalities in health, which is a major drawback of these methods.

In order to get around this problem, some researchers have used a 'pseudo' Lorenz curve based on grouped data, where the groups are occupational classes or any other socioeconomic classifications. These groups are then ranked by their health, for example mortality, beginning with the group with the lowest mortality, against with the cumulative percentage of death (Leclerc, et al, 1990). Because the population is stratified into groups according to certain SES factors other than health, the curve plotted by this method is not actually a Lorenz curve even though the groups are ranked by their health. Although the SES dimension is incorporated into the method, the pseudo Lorenz curve and the derived pseudo Gini coefficient still fail to reflect the SES dimension in that it is unable to differentiate between situations where the sickest SES group is made up of very rich people versus poor people.

Another index developed from the pseudo Lorenz curve is the index of dissimilarity (ID) and it is based on the notion that under complete equality, everyone's share of health would be equal to their population share (Carr-Hill and Chalmers-Dixon, 2005). The index is calculated as half the sum of the absolute values of the differences. The ID suffers from the same defect as the pseudo Lorenz curve: it is insensitive to the SES dimension even if the data is aggregated into socioeconomic groups because "what matters in the ID is simply how each socioeconomic group's share of the population's health compares with its population share, not how this disparity compares with the socioeconomic group's SES" (Wagstaff, et al, 1991).

There are inequality measures that have overcome the shortcomings of the Lorenz curve, the pseudo Lorenz curve and the ID. Examples are the slope index of inequality and its relative difference counterpart – the relative index of inequality. Socioeconomic groups are ranked by their SES instead of health and these graphical presentations display both their mean health status and their share of the population. The slope index of inequality (SII) is then defined as the slope of the regression line showing the relationship between a group's health status and its relative rank in socioeconomic distribution (Pamuk, 1985). It reflects the absolute effect on mean health of moving up one unit in the socioeconomic scale. As the data are grouped data, it suffers from the problem that when estimating the regression model, the error term is heteroskedastic, and this will lead to OLS being inefficient. The solution to that problem is to use weighted least squares (WLS) and the appropriate weights are the group sizes or proportions (Wagstaff, et al, 1991). The advantages of using SII are obvious: it reflects the experience of the whole population and it is sensitive to the distribution of the population across SES groups. However, it involves the use of average health status, thus a proportional change of health in every SES group will result in a same proportional change in SII which means the relative differences remain the same while the absolute differences may have widened or narrowed, so it is unclear whether the inequalities in health have changed. To overcome this shortcoming, Pamuk (1985) suggests to divide the SII by the mean level of health to measure the relative differences and this derived index is called the relative index of inequality (RII). RII makes the comparisons over time easy to operate.

Another way of overcoming the problems of the Lorenz curve family is the Concentration Index (CI). It is based on a curve plotting the cumulative proportions of the population (beginning with the most disadvantaged and ending with the least disadvantaged SES) against the cumulative proportion of health. Equally distributed health will result in the curve coinciding with the diagonal while a curve below (above) diagonal shows pro-rich (poor) health distribution – health is concentrated in the higher (lower) SES groups when positive health is measured (when ill-health indicator is used, the result will be the opposite). The CI is then defined as twice the area between the concentration curve and the diagonal. The CI varies from -1 to +1 with 0 indicating a perfect equal distribution of health and 1 or -1 representing complete inequality. A negative CI value appears when the concentration curve lies above the diagonal and positive when the concentration curve lies below the diagonal. If the order from ranking by SES is the same as the ranking of units of analysis by health, the CI will give the same absolute value as the Gini coefficient. However, health ranking and SES ranking being identical rarely happens even with fewer socioeconomic groups (Wagstaff, et al, 1991). The use of CI has been very popular in recent years in the health inequality literature (Humphries and van Doorslaer, 2000, Van Doorslaer, et al, 2001, van Doorslaer and Koolman, 2004). There are many attractive features of the CI: it reflects the experiences of the entire population and the socioeconomic dimension to the inequality in health, and it is sensitive to the distribution of the population across socioeconomic groups. As the CI uses cumulative proportions of health, it is insensitive to changes in the mean level of health. The generalised concentration curve, which is simply the concentration curve multiplied by the mean level of health, is introduced for those who wish to emphasise absolute differences between people or groups rather than relative differences (Wagstaff, et al, 1991). It is generated by graphing the cumulative percentage of population ranked by SES against the cumulative amount of health rather than the share of health. Therefore, the generalised CI is defined as twice the area between the generalised concentration curve and the diagonal. In fact, the SII, RII, CI and generalised CI are closely related with each other. The reason is explained by the following equations.

The conventional equation of calculating CI is:

$$C = 2\operatorname{cov}(x,h)/\mu \qquad (3.1)$$

where $\operatorname{cov}(x,h)$ is the covariance between the relative rank x and health *h,* and μ is the mean level of health. The covariance $\operatorname{cov}(x,h)$ can be computed by running a regression of *h* on *x* (Lerman and Yitzhaki, 1984), and the slope coefficient β, which is SII, is equal to:

$$\beta = \operatorname{cov}(x,h)/\operatorname{var}(x), \qquad (3.2)$$

where $\operatorname{var}(x)$ is the variance of the rank variable x. Thus, both the formulae for C and β yield:

$$SII/\mu = C/[2\operatorname{var}(x)] \qquad (3.3)$$

We also know that $SII/\mu = RII$ and $C\mu =$ Generalised CI, therefore,

$$RII = C/[2\operatorname{var}(x)] \qquad (3.4)$$

and

$$SII = GeneralisedCI/[2\operatorname{var}(x)] \qquad (3.5)$$

This relationship between SII and C also makes the calculation of CI easier and a convenient regression method is introduced as an alternative to (but equivalent to) the conventional method of calculating CI (Kakwani, Wagstaff and Van Doorslaer, 1997).

The convenient regression runs as:

$$2\operatorname{var}(x)(h/\mu) = \alpha + Cx + u_i \qquad (3.6)$$

The coefficient of x is the CI. It also gives rise to an alternative interpretation of the concentration index as the slope of a line passing through the heads of a parade of people, ranked by their consumption or SES, and their height proportional to the value of their health variable, expressed as a fraction of the mean. This alternative interpretation also reflects the interpretation of SII.

Those rank-dependent measures of inequalities in health, mainly the Gini family, are often criticised for only focusing on the middle of the distribution and only providing a summary measure of inequality (Contoyannis and Wildman, 2007). Sometimes what concerns policy makers is the tails of the health outcome distribution. Recently the relative distribution method has been used to investigate inequalities in health which considers the change of the whole distribution (see for example, Contoyannis and Wildman, 2007). The relative distribution is a statistical tool for fully representing differences between distributions (Handcock and Morris, 1999). The method provides the set of percentile ranks that the observations from a comparison would have if they were placed in another reference distribution (Contoyannis and Wildman, 2007). It has two important features: firstly, the principle of strong scale invariance: the relative distribution is invariant to the scale of the distribution up to a monotone transformation (Handcock and Morris, 1999). Thus, for instance, one can obtain the same relative distribution from a comparison of log-attributes as from the comparison of the attributes since a log-attribute is a monotonic transform of the attribute. This is not like Lorenz curves which are only invariant to proportional transformations. Secondly, under appropriate technical conditions the relative distribution has the maximal invariant: any other comparison between two distributions that contains more information does not satisfy the principle of strong scale invariance, in other words, it summarises all the information in the comparison between the two distributions that is independent of the measurement scale (Holmgren, 1995, Handcock and Morris, 1999).

Mackenbach and Kunst (1997) provide an overview of twelve available measures of health inequalities with focus on one generalised dimension: SES. Analysis of these measures shows that each of them has its merits; choices of these measures depend partly on technical considerations, partly on one's perspective on social-economic inequalities in health. Therefore, they suggest that, in practice, it would be useful to compare the results of several measures.

3.3 Commonly used methods to measure health inequalities

Adopted by numerous studies on inequalities, the Gini (and associated Lorenz curve) and concentration index (and associated concentration curve) are among the most commonly used methods to measuring health inequalities. They are essentially both based on the Lorenz curve with Gini measuring pure health inequality and concentration with an incorporated income factor measuring income-related health inequality.

3.3.1 Gini and Lorenz curve

The Gini index developed by the Italian statistician Corrado Gini is a summary measure of inequality. It was originally used as a measure of income inequality, and later introduced to other subject disciplines including health economics. The Gini index of inequality is perhaps the most widely used method to quantify inequality (Lai, et al, 2008), with its applications in health related studies as early as in the 80's (Le Grand and Rabin, 1986; Le Grand, 1989).

Gini is defined as the mean of absolute differences between all pairs of individuals for some measure. Based on the Lorenz curve as shown in Figure 3.1, mathematically, the Gini index is the ratio of the area A that lies between the line of equality and the Lorenz curve over the total area under the line of equality (area 'A' and 'B'); i.e., Gini=A/(A+B). The Lorenz curve (Figure 3.1) is plotted as the cumulative proportion of the variable in question – health status, against the cumulative proportion of the sample.

The formula for the calculation of Gini index is:

$$Gini = 1 - 2\int_0^1 L(x)dX \qquad (3.7)$$

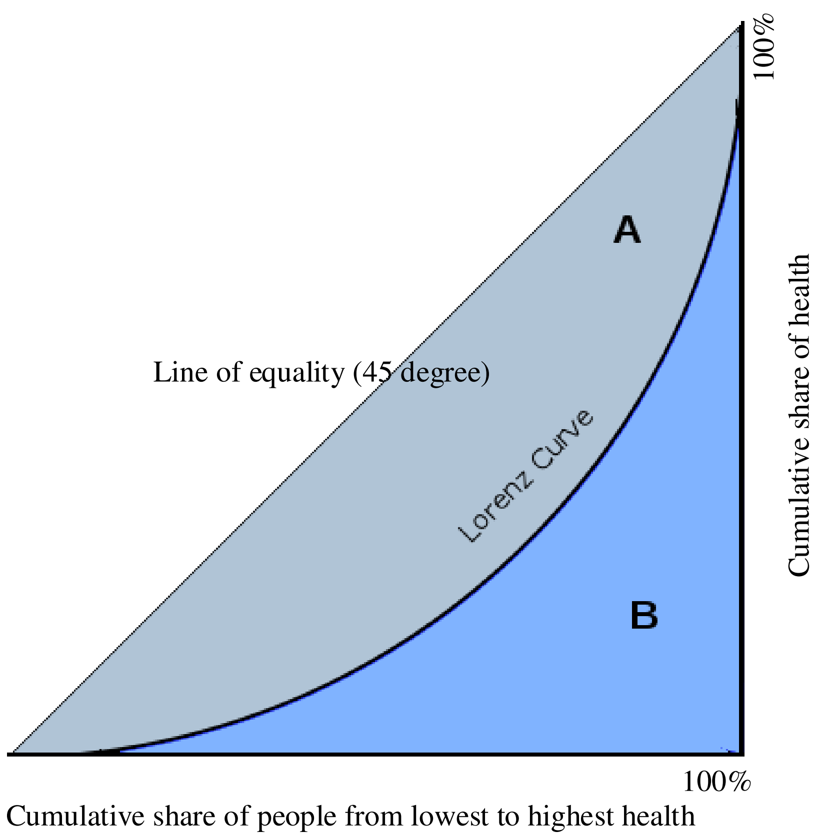
When the probability function is discrete, where y_i, i=1 to n, Gini can be calculated by the points with non-zero probabilities that are indexed in increasing order ($y_i < y_{i+1}$) through the following:

$$Gini = 1 - \frac{\sum_{i=1}^{n} f(y_i)(S_{i-1} + S_i)}{S_n} \tag{3.8}$$

Where $S_i = \sum_{j=1}^{i} f(y_j) y_j$ and $S_0 = 0$

Gini ranges from 0 to 1: a lower Gini indicates a more equal distribution, with 0 corresponding to perfect equality, while a higher Gini indicate more unequal distribution, with 1 corresponding to perfect inequality.

Figure 3.1, Lorenz curve



The properties of Gini include the anonymity and transfer principle: the former ensures that the Gini index does not consider who has excellent or poor health; while the latter indicates that if we assume health can be transferred from a healthy person to an unhealthy person, then the resulting population is more equal. Gini also does not consider the size of the population. However, we should be cautious when comparing the Gini index from different samples as the same Gini indices can result from two different distributions of health and the opposite is also true. This is because the Lorenz curves can have very different shapes and still yield the same Gini index.

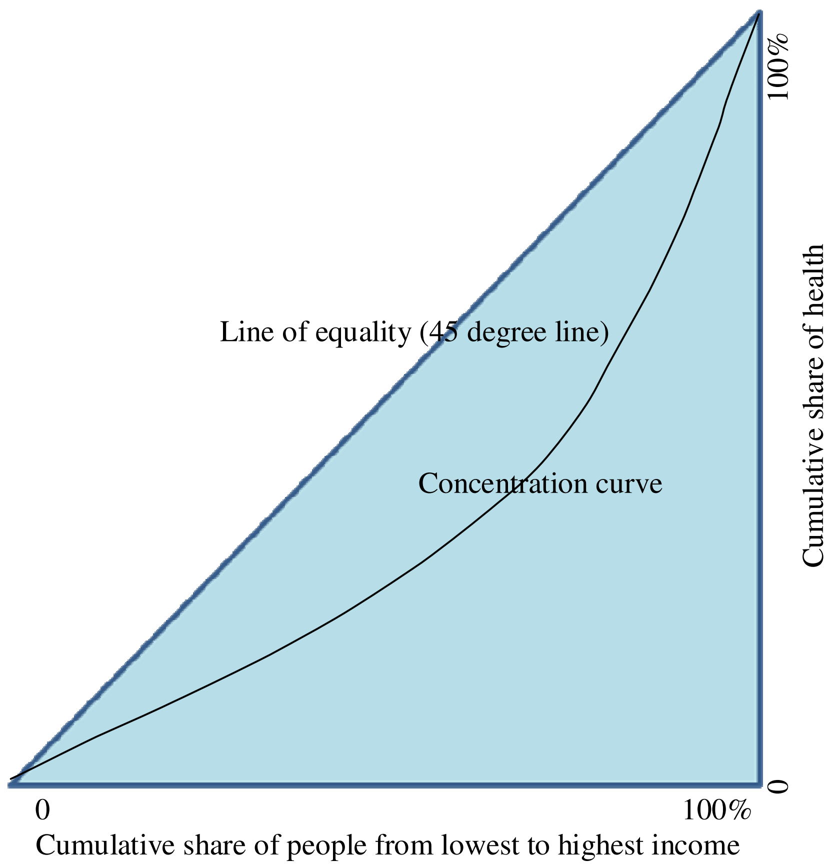
3.3.2 Concentration index and concentration curve

Developed by Kakwani (1977) to measure the progressivity in taxation and public expenditure, the concentration index (CI) was then first introduced by Wagstaff et al (1989) into the health economics literature. It is now one of the standard methods to measure equity and inequality in health (Van Doorslaer, et al, 1997) and health care (Wagstaff and van Doorslaer, 2000, Koolman and van Doorslaer, 2004), such as health care financing (Wagstaff, 1998) or utilisation (Van Doorslaer, 2000).

Similar to the Gini index, CI is defined with reference to the concentration curve (L), which graphs on the *x*-axis the cumulative percentage of the sample, ranked by living standards (such as income), beginning with the poorest, and on the *y*-axis the cumulative percentage of the health variable corresponding to each cumulative percentage of the distribution of the living standard variable. If L lies above the diagonal, the health variable is typically larger amongst the worse-offs. The further L lies from the diagonal, the greater the degree of inequality in health (*y*) across the income distribution. CI, like the Gini coefficient, is a measure of relative inequality, so that a doubling of everyone's health leaves CI unchanged. In contrast to Gini index as measuring pure health inequality, CI is a measure of income-related health inequality.

Graphically, CI is twice the area between the health concentration curve (which represents the cumulative proportion of the population ranked by living standard, such as income, starting with the lowest income group against cumulative proportions of a measure of health as shown in Figure 3.2) and the diagonal. CI ranges from -1 to +1 with a positive value representing inequality favouring the higher income groups and negative values indicating inequality favouring the poor, provided that the measure of health monotonically increases with improvements in health status. The CI value of 0 stands for perfect equality when L coincides with the diagonal, and is negative (positive) when L lies above (below) the diagonal.

Figure 3.2, Concentration curve



CI can be written in various ways, one (Kakwani et al., 1997) being

$$CI = \frac{2}{n\mu}\sum_{i=1}^{n} y_i R_i - 1 \tag{3.9}$$

where n is the sample size, μ is the mean of the health variable y, and R_i [1]is the fractional rank of the *ith* person in the income distribution.

3.3.3 Decomposition of concentration index

CI can be decomposed in two different ways: by components and by population subgroups. The first way decomposes the overall concentration index into its determining factors, such that CI is essentially a weighted average of the concentration indices of each

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[1] R_i is defined as $R_i = \sum_{\gamma=1}^{i-1} f_\gamma + \frac{1}{2} f_i$ which indicates the cumulative proportion of the population up to the midpoint of each group interval.

component. The last way reveals both the between-group health inequality and the within-group health inequality, so the overall concentration is the sum of the between-group concentration index and the within-group concentration index. This research only focuses on component decomposition of CI.

Applying a linear model of the health variable against a set of SES, one can decompose CI into the contributions of individual factors to income-related health inequality, in which each contribution is the product of the sensitivity of health with respect to that factor and the degree of income-related inequality in that factor (Wagstaff, van Doorslaer, and Watanabe, 2003).

So for a given linear function of health (y) with a set of k determinants x_k:

$$y = \alpha + \sum_k \beta_k x_k + \varepsilon, \tag{3.10}$$

CI for *y*, can be written as follows:

$$CI = \sum_k (\beta_k \bar{x}_k / \mu) C_k + GC_\varepsilon / \mu, \tag{3.11}$$

where μ is the mean of the health variable *y*, $\bar{x}_k$ is the mean of x_k, C_k is CI for x_k (defined analogously to *C*), and GC_ε is the generalized concentration index for the error term (ε).

The rewritten equation of CI indicates that the overall CI can be regarded as the sum of two elements. The first element is referred to as the deterministic component by Wagstaff et al (2003) and it is equal to a weighted sum of the concentration indices of the k regressors, where the weight for each x_k is simply the elasticity of the health variable *y* with respect to x_k (evaluated at the sample mean: $\eta_k = \frac{\beta_k \bar{x}_k}{\mu}$). The second element is the residual component which reflects the income-related inequality in health that is not explained by systematic variations in the regressors (x_k) by income, and this should approach zero for a well-specified model.

The decomposition of CI is a useful tool to capture the linear associations between the health variable and a range of socioeconomic characteristics and in turn, detangle the complex issues around the contributions of different SES factors to the income-related health inequalities; however, it is worth noting that the decomposition should not be considered as a structural model or used to infer a direction of causality.

3.4 New methods to measure health inequalities

Entropy measures and the relative distributions method are introduced as new methods to measure health inequalities. Three of the entropy measures are presented here: Theil's entropy, H measure and B measure.

3.4.1 Entropy measures

The entropy or information measure of inequality (Theil, 1967, 1971) has often been used in biology and physics. Entropy measure of inequality is of particular interest in this research because the measure of health status is a categorical variable and the entropy measure has been proven as a reliable tool to examine inequality among categorical variables (Darcy and Aigner, 1980). Originally developed in physics, entropy is defined as the level of disorder (lack of structure) in a given system or distribution. In other words, entropy is the expected amount of information needed to exactly specify the state of the system. It has then been introduced to other science subjects and social sciences. Maximum entropy is complete randomness (complete disorder). Minimum entropy represents complete order. There are a few different forms of entropy measures and the ones used in this research are: Theil's entropy, H measure and B measure.

All of the three entropy measures meet the three criteria of a good inequality measure set by Allison (1978). They are all scale invariant - the measured degree of inequality will not change when the subject in question is measured in different units. All of them also satisfy the principle of transfers – transferring, for example income from a poorer to a richer person, will increase the value of the inequality measure. The third criterion concerns the upper and lower bounds of the measure. Theil's entropy (T measure) and H measure both have a lower bound of 0, but their upper bounds depend on the population size or the number of categories, respectively. The upper bound of the T measure is $\log n$ and the upper bound of the H measure is $\log K$. This means that a variable with a larger population size (n) for T or with a larger number of categories (K) for H may have a higher measured degree of inequality than a variable with a smaller sample or number of categories. The non-standard upper bounds make it difficult to compare across results.

However, this can be justified on the ground that it is less unacceptable to have inequality in a smaller population or with less number of categories than in a large population or with large number of categories (Theil, 1967). It is rather intuitive that inequality does not exist in a one-person community or a one-category situation. Nevertheless, a standardised measure which is independent of sample size or number of categories is more desirable for comparison purposes. This can be achieved by dividing the H measure by $\log K$, which yields the B measure. The T measure can also be divided by $\log n$ to be standardised, although this is rarely applied (Allison, 1978).

3.4.1.1 Theil's entropy

Based on the information theory, Theil (1967) proposed the measure of inequality as follows:

$$T = \frac{1}{n}\sum_{i=1}^{n}\left(\frac{x_i}{\mu}\right)\log\left(\frac{x_i}{\mu}\right) \tag{3.12}$$

Allison (1978) then presented an alternative formula of Theil's entropy in a more intuitive way:

$$T = \frac{\frac{1}{n}\sum_{i=1}^{n}(x_i \log x_i - \mu \log \mu)}{\mu}, \tag{3.13}$$

which shows that Theil's entropy is simply a measure of dispersion divided by the mean.

In infinite populations, Theil's measure varies between 0 and infinity while in finite populations or samples, Theil's measure has an upper bound of $\log n$ (Allison, 1978). The higher the T value is, the greater the inequality is in the sample. The upper bound of Theil's entropy is reached when one individual has everything and everyone else has nothing. Although the range of Theil's measure varies with sample size, this dependence on the sample size n can also be desirable since a two-person society in which one person has everything is, intuitively, less unequal than a million-person society in which one person has everything (Theil, 1967).

3.4.1.2 H measure

Developed by Shannon and Weaver (1949), an entropy measure for categorical variables is defined as follows:

$$H = -\sum_{i=1}^{k} p_i \log p_i \ , \qquad (3.14)$$

where p_i is the proportion of observations in the variable's *ith* category and K is the number of categories.

The choice of the logarithms base is flexible. Some studies use logarithms to the base 2 since binary mathematics was used in the development of the H measure, others use natural logarithms (base e) or base 10. Studies show the base utilized does not make any real difference inasmuch as one can easily translate from one base to another (McFarland, 1969, cited in Bailey 1985) as long as different logarithms bases are not mixed in a single analysis (Bailey, 1985).

Bailey (1985) argues that the H measure is more of a measure of equality than inequality as the H value is ***maximum*** when inequality is ***minimum*,** and is ***minimum*** when inequality is ***maximum.*** And same as the Theil's entropy, the upper bound of H depends on the number of categories, so for any given number of categories K, maximum H is equal to *logK*.

3.4.1.3 B measure

Another form of entropy measure – the B measure – was derived to measure inequality with a more direct interpretation by Bailey (1985). It is defined with relationship to the H measure as follows:

$$B = 1 - H / \log K \ , \qquad (3.15)$$

where H is the entropy measure and K is the number of categories in the variable of interest. The formula shows that as an index of inequality, the B measure eliminates the effect of the varying maximum value of H measure and also transforms H from a measure of equality to a measure of inequality. Therefore, the B measure standardised the H measure, so that it will vary between a value of 0 (when entropy is maximum) and 1 (when entropy is minimum). Thus, maximum B is maximum inequality, and will always be 1, regardless of the number of categories K.

The B measure also satisfies the criteria set by Allison (1978) for measure of inequality: it is scale invariance, it is sensitive to transfers, and it has standard upper and lower bounds. All of those make the B measure a desirable choice for inequality measure.

3.4.2 Relative distributions method

The literature on the relationship between health and socioeconomic factors has mostly adopted a regression approach and the studies on health inequalities often apply Gini and CI. These traditional methods can only explain the matters for the median of the health outcome distributions and provide summary measures, resulting from which the analysis may overlook serious issues that are associated with the tails of the distributions where it can affect both the most disadvantaged groups and advantaged groups. Therefore, a method which is able to examine the full distribution is needed; the relative distributions method not only has the desired feature, but is also able to detangle the complex issues involved in the differences and changes between two distributions. The relative distributions method is a nonparametric statistical approach to the comparison of distributions. It combines the graphical tools of exploratory data analysis with statistical summaries, decomposition, and inference. While statistics analogous to the Gini index can be constructed based on the relative distributions, important characteristics of changes in the distribution of health – changes in location and changes in shape – can also be distinguished and measured, so that the health outcome variable is more naturally handled using measures of relative polarization.

Handcock and Morris (1999) have given a detailed explanation of the relative distributions method and its applications in social research. Consider a variable Y_0 observed for a baseline population, called the reference population and the same variable Y observed for a different population, called the comparison population. Typically Y is the measurement for a separate group or the same group in a later time period. In this research, when comparing SAH between the earliest wave and the latest wave, wave 4 is chosen as the reference group and wave 7 is chosen as the comparison group in chapter four, and in chapter seven every previous year is chosen as the reference group for year by year comparisons and the male population as reference group when compared with female population within each year. The cumulative distribution function (CDF) of the outcome attribute for the reference group is denoted by F_0 (y) and by F(y) for the comparison group. If the variable Y is continuous, then F_0 (y) and F (y) are assumed to be absolutely continuous. To study the differences in distributions of the outcome attribute between the reference and comparison groups, the relative distribution is defined as the distribution of the random variable R, where $R = F_0$ (y), is the *grade transformation* of Y to Y_0. R is obtained from Y through transforming it by F_0. R indicates the percentile position of Y if it were placed in the distribution of Y_0, in other words, the relative rank of Y compared to Y_0. R is continuous on the outcome space [0, 1] and has both a CDF and a PDF.

The CDF of R is defined as:

$$G(\mathrm{r}) = F\,(F_0^{-1}(r)) = F(Q_0(r)) \qquad 0 \le r \le 1, \tag{3.16}$$

where Q_0(r) is the quantile function of F_0 and r represents the proportion of values. A point on the relative CDF is then given by the proportion of the comparison distribution that falls below the *rth* percentile point in the reference distribution consistent with a given value of Y.

The PDF of R is obtained from the derivative of G(r) as:

$$g(r) = \frac{f(Q_0(r))}{f_0(Q_0(r))} \qquad 0 \le r \le 1, \tag{3.17}$$

g(r) is also called the relative density and can be interpreted as a density ratio. If we express Q_0(r) using the original measurement scale y, with y_r denoting the *rth* quantile of R, then $y_r = Q_0$(r). The relative PDF can be written as:

$$g(r) = \frac{f(y_r)}{f_0(y_r)} \qquad y_r = Q_0(r) \ge 0 \tag{3.18}$$

The relative distributions method has another desirable feature – it is a proper PDF as it integrates to 1 over the unit interval. A density ratio over the scale of the original unit of measurement would not generally have this property; this is achieved by rescaling through the quantile function and converting the denominator to a uniform density. Being a proper PDF ensures the relative distributions to be a robust analysis basis for estimation, inference and interpretation.

If the study subject - variable Y_0 (or Y) - is discrete, the transformation into relative distributions needs to be modified. The CDF for discrete variable Y_0 with the health outcome set $\{ x_i \}_{i=1}^{Q}$ is:

$$F_0(x) = \sum_{i:x_i \le x} p_{0_i} \qquad x \in IR \tag{3.19}$$

Performing a random transformation which maps x to a random value in the interval from $F_0(x_{i-1})$ to $F_0(x_i)$,

$$F_0^d(Y) = U[F_0(x_{i-1}), F_0(x_i)] \qquad \text{for } x_{i-1} \le x \le x_i,\ i = 1, 2, \ldots, Q. \tag{3.20}$$

Therefore, the discrete grade transformation of Y_0 to Y is defined to be the random variable: $R = F_0^d(Y)$. R is obtained from Y by transforming it using the function F_0^d, so it is continuous with the outcome space [0, 1]. The distribution of R is the relative distributions for discrete variables Y_0 and Y.

The CDF of R is defined as:

$$G(r) = (r - F_0(x_{i-1}))g(i) + F\ (x_{i-1}), \tag{3.21}$$

where $F_0(x_{i-1}) < r \le F_0(x_i)$ and $g(i) = \dfrac{p_i}{p_{0_i}}$ $\qquad i = 1, 2, \ldots, Q.$

The discrete relative density function PDF is then the right-continuous derivative of G(r) - g(i), for $F_0(x_{i-1}) < r \leq F_0(x_i)$ and $0 \leq r \leq 1$. Although still confined within the space [0, 1], the discrete PDF is not continuous.

If the two distributions being compared are identical, the relative CDF is a 45 degree line from (0, 0) to (1, 1) and the relative PDF is a uniform probability distribution on [0, 1]. The relative CDF directly compares the two distributions, so that a curve below the 45 degree line shows larger values in the comparison distribution, while a curve above the 45 degree line indicates larger values in the reference distribution – the curve can cross the 45 degree line. Compared with the relative CDF, the relative PDF provides a more intuitive display: values above 1 represent more density in the recent distribution, while values below 1 represent less.

The relative distributions method has a number of advantages over traditional measures of inequality. The method compares entire distributions while some commonly used summary measures only focus on the means. Relative distributions are maximal invariant and scale invariant, which are the key advantages of the relative distributions methods. For example, the Lorenz curve (and associated summary measures) is multiplicatively scale invariant, that is, two distributions will have the same Lorenz curves if, and only if, they differ by a simple multiplicative constant. The relative distributions, by contrast, are invariant to *all monotonic* transformations of the original measurement scale - relative distributions of the raw attribute, the log-attribute, or any other monotonic transformation of the attribute are equivalent, so that the results are independent from monotone transformations of the outcome variable. With this feature, the relative distributions method makes less restrictive assumptions about the underlying utility functions in the inequality context, requiring only that they be monotonic. Whenever this principle holds, the relative distributions play the primary role in comparisons, in the sense that the method contains all the information necessary for comparing distributions, making the minimal assumptions necessary for a valid comparison. The property of maximal invariant ensures that any comparisons with the scale invariant property obtained from the relative distributions generate the strongest conclusions.

A number of summary statistics can also be obtained, among which entropy and polarization indices are two of the most important to formalize quantitative comparisons. Entropy is a widely used measure of the dispersion of a distribution (Theil and Laitinen

1980). The entropy measure used in the relative distributions context is based on the Kullback–Leibler divergence measure:

$$D(F;F_0)=\int_{-\infty}^{\infty}(\frac{f(x)}{f_0(x)})dF(x)=\int_0^1 \log(g(r))g(r)dr \tag{3.22}$$

It is decomposable into location and shape components, which can answer the question: "How much does the location or shape shift contribute to the overall difference between the two distributions?' The expression on the right-hand side of the equation is the (differential) negative entropy of the relative density (Shannon 1948). $D(F;F_0)$ can be interpreted as the expected information for discriminating g from a uniform distribution based on a single observation from R.

There are three entropy measures that we can calculate: (i) the overall entropy $D(F;F_0)$: the overall divergence between the comparison and reference groups; (ii) entropy summarises the location shift $D(F_A;F_0)$: the divergence between the shape-adjusted reference group and the reference group; (iii) entropy summarises the shape shift $D(F;F_A)$: examines the divergence between the comparison distribution and the location-adjusted reference distribution. If $D(F_A;F_0)$ is zero, then it suggests that the divergence of the overall distributions is due to shape differences. If $D(F;F_A)$ is zero, then the change in location is the reason for the divergence in the distributions.

Differences between distributions due to changes in shape may indicate the occurring of polarization, therefore, distributional polarization captures a discrepancy in outcomes that is hidden when only trends in location are examined. The polarization index measures relative density in the centre or tails of the distribution, which is analogous to the difference in Gini coefficients in measuring inter-distributional inequality (Handcock and Morris, 1998). Suggested by Handcock and Morris (1999), we also use the median-relative polarization (MRP) index, which is location adjusted, and provides an important link to the location and shape decompositions.

The MRP of Y relative to Y_0 is defined as

$$MRP(F;F_0)=4\int_0^1\left|r-\frac{1}{2}\right|g_0^A(x)dr-1 \tag{3.23}$$

The median relative polarization index is the mean absolute deviation around the median of the location-matched relative distribution (g_0^A), weighted by $\left|r-\frac{1}{2}\right|$ to emphasize deviations in the tails, and is rescaled to produce an index ranging from -1 to 1. Positive values represent more polarization meaning that the distribution has moved towards the tails, negative values represent less polarization indicating the comparison distribution has more weight near the centre (less polarized) than the location-adjusted reference distribution, and zero represents no differences in distributional shape

Representing a proportional shift of mass in the distribution from more central to less central values, the MRP has a few useful characteristics: (i) it is symmetric: $MRP(F;F_0) = -MRP(F_0;F)$; (ii) it is invariant to monotone transformations of the distributions: If $h(.)$ is a monotone function of Y_0, then the median relative polarization index of $h(Y)$ to $h(Y_0)$ is equal to the median relative polarization index of Y to Y_0; (iii) it is additively decomposable allowing us to distinguish the contributions made by polarizations occurring because of movements towards the lower or the upper tail. The lower and upper relative polarization indices (LRP and URP) are defined as:

$$LRP(F;F_0) = 8\int_0^{\frac{1}{2}}\left|r-\frac{1}{2}\right|g_o^A(x)dr - 1 \qquad (3.24)$$

$$URP(F;F_0) = 8\int_{\frac{1}{2}}^{1}\left|r-\frac{1}{2}\right|g_0^A(x)dr - 1 \qquad (3.25)$$

respectively. The LRP and URP have properties similar to the median relative polarization index. As well as the MRP, they are both median matched, so the measures indicate whether the polarizing shape change is larger above or below the median rather than whether the median of the distribution has changed (Handcock and Morris, 1999).

With these properties, complex hypotheses regarding the origins of distributional changes within and between groups can be examined by decomposition of distributions into changes in location and changes in shape. These results can be decomposed further to allow for the impact of socioeconomic factors. This can be done by adjusting the relative distributions for changes in the distribution of other covariates, which allows one to separate the impacts of changes in population composition from changes in the covariate-outcome relationship.

3.5 Summary

In this chapter, the existing methods of measuring health inequalities are reviewed and detailed descriptions of the commonly used measures are presented. Following these, the chapter demonstrates the needs for new measures of health inequalities after discussing the drawbacks of the conventional methods. The new methods include entropy measures and the relative distributions methods. Three types of entropy measures are presented – Theil's entropy, H measure and B measure. Theil's entropy derived by econometrician Henri Theil, is a statistic used to measure economic inequality of continuous variables, whereas H measure and B measure are inequality measures developed from Theil's entropy to cater for discrete variables. It will be interesting to compare whether the new measures and the conventional methods produce consistent results, as the health outcome variable SAH to be studied in the following empirical studies is a categorical variable. The relative distributions method is a nonparametric measure to compare distributions and provides robust results in measuring inequality. This method has been used in sociology and economics but is quite new in health economics research. The advantages of the relative distributions method over traditional methods include the ability to measure the entire distribution, distinguish different types of changes in inequality, provide polarization index and entropy measures, and decompose the distributional differences by co-variants. With the application of these new methods, a better and thorough understanding of the distribution of individuals' health can be obtained, so that more effective policies can be made to target specific groups. This chapter is the foundation of the empirical studies in chapter four.

Chapter Four: Comparing different measures of health inequalities

4.1 Introduction

Following the review of conventional health inequality measures and the introduction of new methods, this chapter applies both traditional and new measures of health inequalities in the empirical studies. The results from the conventional inequality measures will be compared with the outcomes of the new methods. When using the traditional methods, new elements – birth weight and parental income – are also added to model health in a life-course perspective.

4.2 Data

To investigate the issue from a life-course perspective, the National Child Development Study (NCDS), which is a continuing longitudinal study that seeks to follow the lives of all those living in Great Britain who were born between 3rd and 9th of March 1958, is used. The aim of the NCDS is to improve the understanding of the factors that affect human development over the whole life-course. The NCDS has gathered data from respondents on child development from birth to early adolescence, child care, medical care, health, physical statistics, school readiness, home environment, educational progress, parental involvement, cognitive and social growth, family relationships, economic activity, income, training and housing. The detailed information on family circumstances and health status at each wave of the survey makes it invaluable for the study of health inequalities from a life-course perspective. To date there have been eight attempts to trace all members of the birth cohort since their age of 7 in addition to the original prenatal mortality survey. The eight waves of survey were carried out in 1965 (wave 1: age 7), 1969 (wave 2: age 11), 1974 (wave 3: age 16), 1981 (wave 4: age 23), 1991 (wave 5: age 33), 1999-2000 (wave 6: age 41-42), 2004-2005 (wave 7: age 46-47) and 2008-2009 (wave 8: age 50-51). The data on wave 8 is only released as an interim dataset and, therefore, is not included in the analysis. The birth cohort was augmented for the first three follow-ups (NCDS1, NCDS2 and NCDS3) by including immigrants born in the relevant week in the target sample, which were identified from school registers during tracing.

The NCDS has its origins in the Prenatal Mortality Survey (PMS), which is designed to examine the social and obstetric factors associated with stillbirth and death in early infancy among the 17,000 children born in England, Scotland and Wales in that one week. Selected data from the PMS form NCDS sweep 0. Therefore, we also have information on respondents' original health reflected by their birth weight and parental information. Self-assessed health variable is only available from wave 4 when the cohort members were 23. In this study, health inequalities of individuals in their adulthood from wave 4 to 7 are examined while controlling for factors from wave 0 to 3 as parental background and initial health.

In the birth PMS survey, information was obtained from the mother and from medical records by the midwife; and in the first three NCDS surveys, information was obtained from parents (who were interviewed by health visitors), head teachers and class teachers (who completed questionnaires), the schools health service (who carried out medical examinations) and the subjects themselves (who completed tests of ability and, latterly, questionnaires) through face-to-face interview, postal survey, self-completion, psychological measurements, educational measurements, observation, clinical measurements, physical measurements. In the adulthood surveys, cohort members were directly interviewed: in wave 4 data were collected through face-to-face interview, self-completion and educational measurements; in wave 5, data were collected by face-to-face interview, telephone interview, postal survey, self-completion, psychological measurements and educational measurements; in wave 6 by face-to-face interview, self-completion and in wave 7 by telephone.

In addition, in order to examine the effect of parental income on child health, the analysis includes the Permanent Parental Income Dataset, 1958-1974, derived from childhood waves of NCDS during the course of a project funded by the ESRC's Health Variations Programme, entitled 'Income Dynamics and Health Inequalities'. It is a prediction of permanent total parental income obtained using information on parental characteristics, in an attempt to capture average living standards in childhood as the NCDS only collects family income information when respondents were aged 16, which might not be an accurate reflection of living standards in earlier childhood. The explanatory variables used to predict permanent parental income include: mother's and father's years of education (derived from information on age left full-time education collected in wave 3 of the survey); mother's and father's occupational class dummies (reference group is skilled manual for men, not working for women); dummy variables for whether or not a mother or father figure was ever absent during childhood; mother's and father's age (and age squared); region dummies (reference group is London and the South East). The parental income variable is a derived variable which has already exclued extreme or abnormal values in its construction whereas cohort members' own income is self-reported with some outliners, therefore, observations with top 1% of income are excluded in the analysis.

4.3 Self-assessed health as health outcome indicator

The investigation of health inequalities requires the measurement of both living standard factors (such as SES) and health outcome and often the latter is only available at an ordinal level. The most used health outcome indicator in the health economics literature is self-assessed health (SAH). In the NCDS dataset, this information is obtained by asking the following question: "I would now like to ask you a few questions about your health. Firstly, how would you describe your health generally?" The response categories range from poor or fair to good or excellent. It is often the key health variable available in the largest number of surveys and over the longest period of time, and it is the case in the NCDS. Despite its simplicity and its subjective nature, SAH has been proven to be a very good predictor of health outcome. The first clear demonstration of a link between SAH and mortality is documented in the early 1980s (Mossey, 1982), following which numerous studies have demonstrated similar findings in different cultures (Idler and Kasl, 1991, Idler and Benyamini, 1997, Appels et al, 1996, Franks, 2003), ages and genders (Mossey, 1982, Wannamethee, 1991, Larsson, 2002, Grant, 1995, Singh-Manoux, et al, 2007, Jylha, 1998, Benyamini, 2003, Spiers, 2003), as well as SAH being a strong predictor for disability (Kaplan, et al, 1993) and health care utilization (Miilunpalo, et al, 1997). SAH is also proven to be increasing with income up to a threshold, but might change its direction in very high income due to a larger proportion of people with lower education in the extreme high income group (Mantzavinis, 2006). Although a study on the reliability of SAH has indicated that respondents may switch their answers depending on whether it is self-completing or interview, this effect has a relatively minor impact on measures of inequality due to a large proportion of the movement not being related to income and hence does not systematically impact on the cumulative distribution of health across socio-economic status (Clark and Ryan, 2006). Based on those findings, it is safe to assume that SAH is a good indicator of health, justifying the application of SAH in this study.

4. 4 Results

4.4.1 Descriptive analysis of self-assessed health

The SAH question is only included in the NCDS survey from wave 4 onwards when the cohort members are in their adulthood. This study looks at the four adulthood waves 4 to 7. The distributions of the four SAH categories in each of the 4 waves of adulthood are displayed in Figure 4.1, Figure 4.2, Figure 4.3 and Figure 4.4 for wave 4, wave 5, wave 6 and wave 7, respectively. The labels on the x-axis indicate the four SAH categories – poor, fair, good and excellent. The values on the y-axis display the proportion of the population belonging to each category. The curved line across the four categories plots the Kernel density.

Overall, all of the four waves have similar left-skewed patterns with the majority of the people reporting good or excellent health, although the degrees of skewness are different in each wave. In wave 4, there are less than 10% of the sampled population reporting fair or poor health. This figure increases to nearly 14% in wave 5, almost 18% in wave 6 and eventually more than 25% in wave 7. The increase in the proportion of reporting less good health may mainly be the result of ageing effect as the sampled population has advanced in age from 23 in wave 4 to 46/47 in wave 7. The reduction in the skewness of the left hand side tail is accompanied by a decrease in the right hand side of people reporting excellent health through wave 4 to wave 6, although surprisingly, a slight increase in wave 7 is observed compared with wave 6. This may be due to adaptation that when people are used to the fact that their health has deteriorated through ageing, their health expectation may eventually drop and then consider themselves to be healthier than they previously (in wave 6) thought. Research results show that adaptation effects do exist and display an inverse U-shaped form, more common in the median of the health distribution (Costa-Font and Costa-Font, 2009). Thus, the increase in the proportion of people reporting excellent health in wave 7 may echo the research findings in the literature. A better understanding of how the distribution of SAH categories change over years can be obtained when the relative distributions method is applied later in this section.

Figure 4.1, Distribution of SAH in wave 4

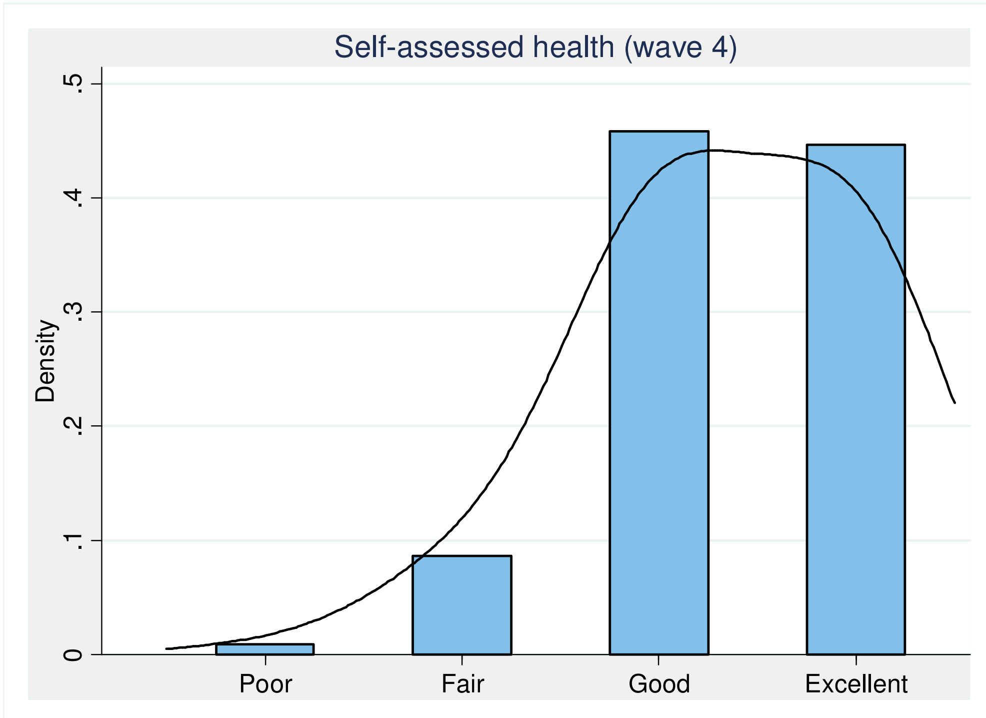


Figure 4.2, Distribution of SAH in wave 5

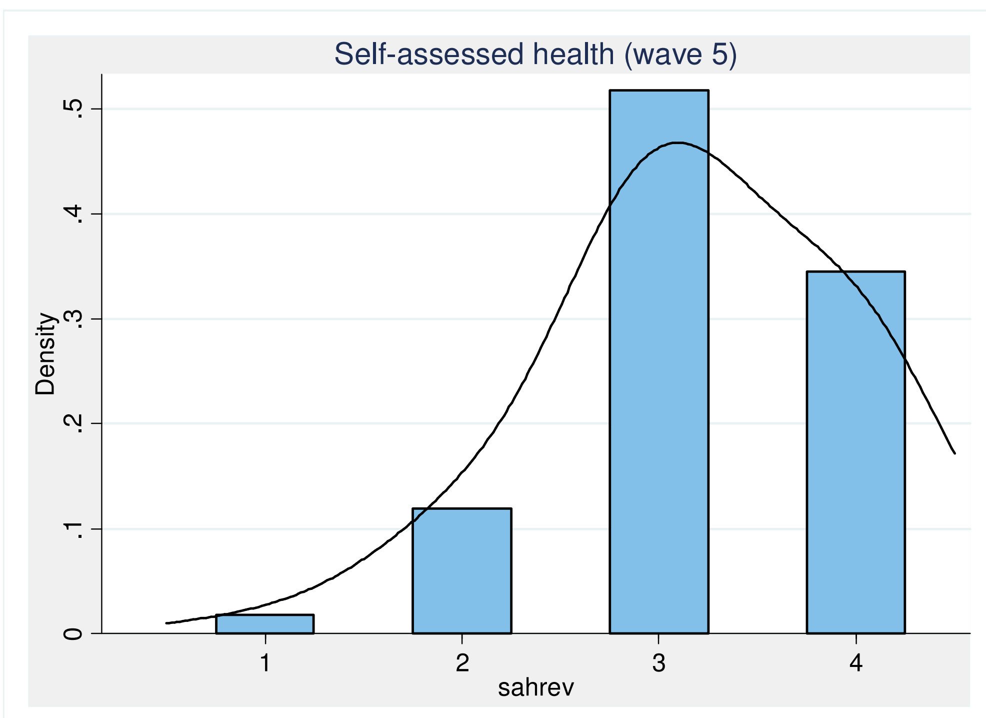


Figure 4.3, Distribution of SAH in wave 6

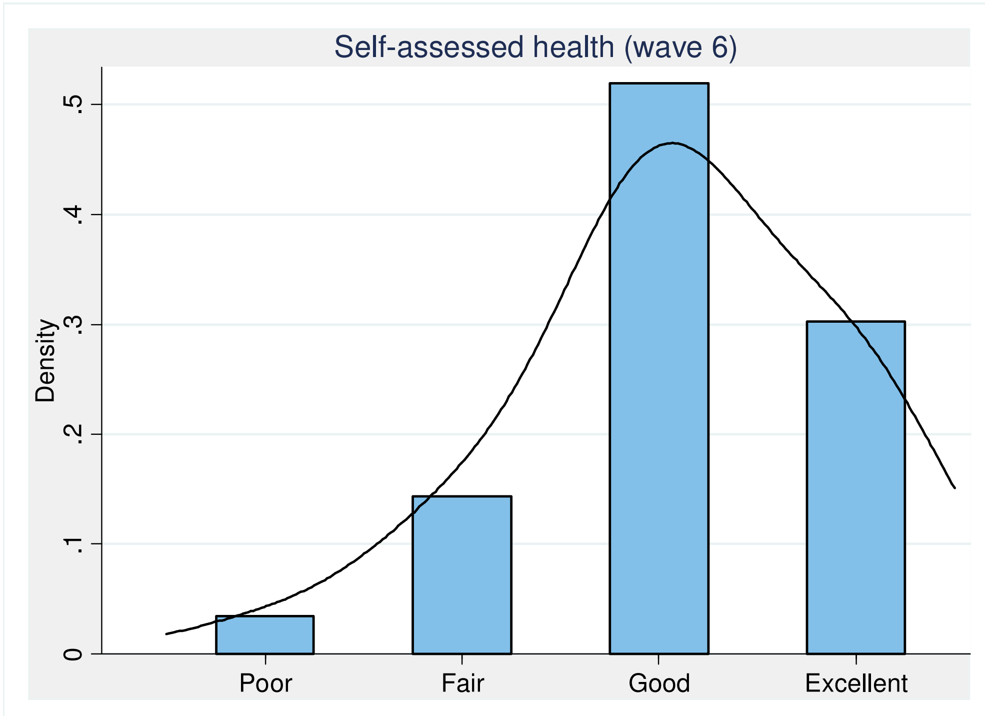
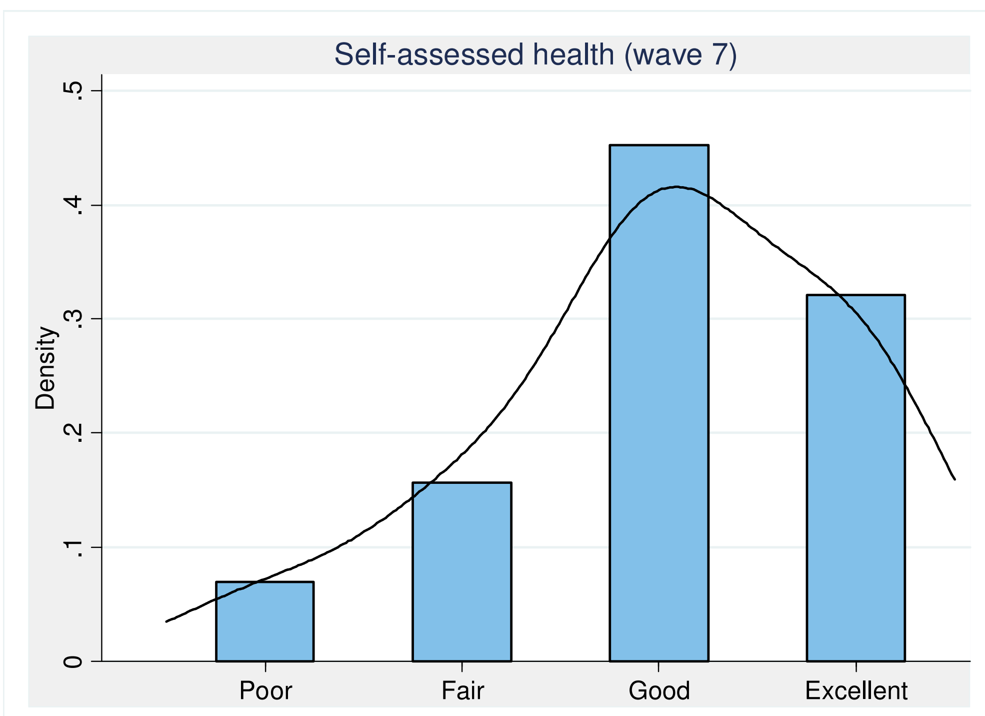


Figure 4.4, Distribution of SAH in wave 7



4.4.2 Gini and Lorenz curves

Figure 4.5 displays Lorenz curves for the four adulthood waves, which indicate pure health inequality. The 45 degree line indicates complete equality while the four other coloured lines represent the Lorenz curve for each wave. The further away the Lorenz curve is from the 45 degree line, the more unequal the distribution is. So it is clear from the graph that wave 4 has least inequality and wave 7 is the most unequal distribution indicating an increase in pure health inequality through the years. This is reflected by the Gini index as well (Table 4.1), as an increasing trend in its value is observed. With the same increasing pattern through wave 4 to wave 7, the Theil's entropy index is also in agreement with the Gini. On the contrary, the B measure is displaying an opposite trend. This is a very interesting finding because it provides us with a good comparison of applying measures of health inequality when the variable in question is categorical.

As mentioned previously the B measure is created for measuring inequalities of categorical variables so that its value indicates how unevenly health is distributed among the 4 predetermined categories without assigning a value to each category. According to table 2 showing proportions of each SAH category in the 4 waves, health is more spreading across the 4 categories in later waves compared with early waves; therefore, the B measure is indicating a decrease in inequality. However, both Gini and Theil's entropy are measuring how divergent each individual is from the mean. The mean SAH is always close to higher health status (as the majority of the population consider themselves to be in good or excellent health) across all waves. However, more people have switched to SAH categories 1 or 2 in later waves, which means that there are more people away from the mean; thus, the Gini and Theil's entropy are both showing an increase in inequality.

Table 4.1, Gini, Theil's entropy and B measure

Waves	Gini	Theil's entropy	B measure
4 (age 23)	**0.103**	**0.022**	**0.298**
5 (age 33)	**0.113**	**0.027**	**0.254**
6 (age 42)	**0.126**	**0.033**	**0.209**
7 (age 46)	**0.154**	**0.048**	**0.128**

The comparison of the three indices sends a clear message that special attention should be given when using Gini and Theil's entropy and the variable in question is categorical. This is because when using a categorical variable an artificial ordinal scale has to be assigned to each of the categories and different scales may result in contradictory outcomes. The B measure, however, does not rely on any ordinal scales as it simply looks at how the variable in question is distributed among the predetermined categories. Without applying an ordinal scale, the B measure considers each category as an equal state whereas other inequality measures assign judgement on each of the categories with most and least preferred states. From Table 4.2 of the distribution of SAH categories in each wave, one can conclude that population have become more evenly distributed across the four categories from wave 4 to wave 7. Therefore, according to the B measure, wave 7 is more equal than wave 6, wave 6 is more equal than wave 5, and wave 5 is more equal than wave 4. The B measure, on one hand, gives a robust result, but on the other hand may not be very suitable to be applied to health outcomes. We may like to think the ultimate goal of health intervention is to improve every individual's health status, so in a perfect world everyone should be in the category of excellent health with no one in the other categories. If applying the B measure for this situation, it will show complete inequality although it is the most desirable state. Therefore, researchers should investigate the results thoroughly before reaching the final conclusion.

Figure 4.5, Lorenz curve of each wave

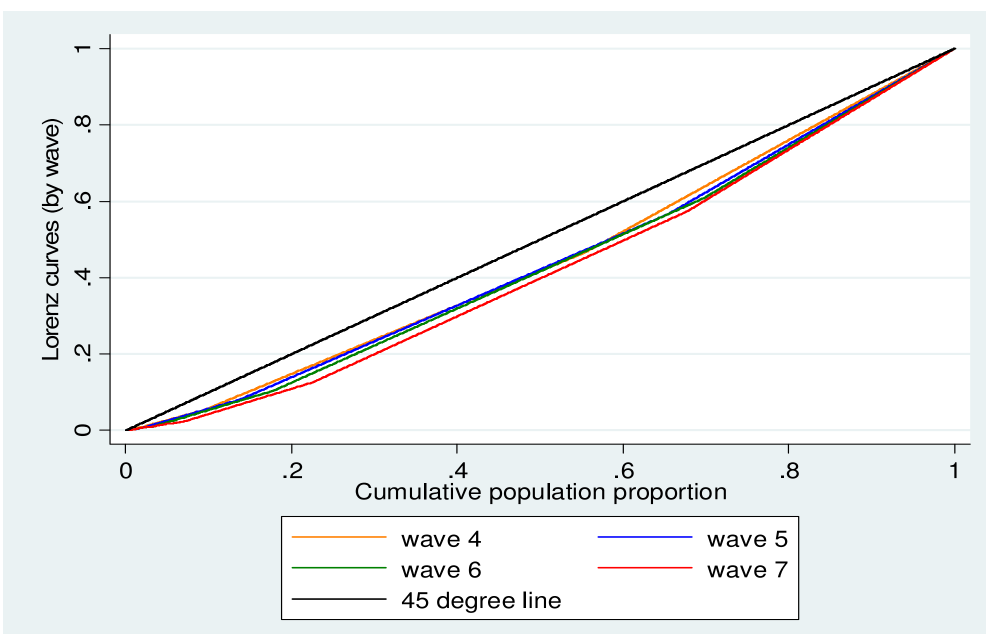


Table 4.2, Distribution of SAH categories in each wave

SAH	Wave 4 (%)	Wave 5 (%)	Wave 6 (%)	Wave 7 (%)
Poor	0.92	1.78	3.43	7.38
Fair	8.65	11.95	14.38	16.02
Good	45.82	51.76	51.87	45.15
Excellent	44.64	34.50	30.28	31.46

4.4.3 Concentration index and curves

The Gini coefficient and the two entropy measures are informative, but they only demonstrate a degree of pure health inequality, which is not enough to inform policy makers and provide guidance for effective interventions to reduce health inequalities. More information is needed to understand how health inequalities are related to different socioeconomic factors. One of the most important and commonly investigated socioeconomic factors is income. CI and associated concentration curves measuring income-related health inequalities are presented in this section.

The types of income used to compute CI include permanent parental income and wave specific cohort members' own income. The latter one is commonly used to measure income-related health inequalities as cross sectional data are usually easily obtained. Permanent parental income is a derived income measure from the panel data set that reflects the living standard of cohort members' entire childhood. This is used because it is safe to assume childhood living conditions may have an impact on adulthood health, based on the life-course approach. Using the permanent parental income, rather than a single year measure, provides a better understanding of the relationship between reported family income in childhood and later health outcomes because there is good reason to believe that persistent poverty is likely to have more impact on health outcomes than if parents' experience of low income was only temporary. With a summary of parental income observed at different time points it is possible to distinguish between transitory and permanent poverty. Moreover, any measure of income reported at a single point in time will be subject to measurement error and a derived permanent income measure based on information observed at different time points will provide more robust results. For all the above reasons, CI is calculated using both types of income for each wave. T test has been carried out for each of the paired combinations and the results show that they are all significantly different from each other indicating the level of income-related health inequality change significantly across waves regardless of which income is used. The t statistics are displayed in Table 4.4 and they are all significant at 95% level.

Table 4.3, Concentration indices of each wave

Waves	CI (permanent parental income)	95% Confidence intervals	CI (wave specific cohort member's	95% Confidence intervals
4 (age 23)	**0.007**	**0.0037 - 0.0099**	**0.011**	**0.0082 - 0.0143**
5 (age 33)	**0.013**	**0.0092 - 0.0163**	**0.015**	**0.0113 - 0.0184**
6 (age 42)	**0.015**	**0.0115 - 0.0186**	**0.021**	**0.0178 - 0.0249**
7 (age 46)	**0.011**	**0.0054 - 0.0158**	**0.033**	**0.0276 - 0.0378**

Table 4.4, T test results for paired comparisons of CI

Paired comparisons	Parental income T test	Own income T test
Wave 4 vs. Wave 5	175.78	106.56
Wave 4 vs. Wave 6	252.92	308.3
Wave 4 vs. Wave 7	84.95	483.07
Wave 5 vs. Wave 6	66.02	183.76
Wave 5 vs. Wave 7	-44.61	375.85
Wave 6 vs. Wave 7	-98.28	253.56

All test statistics are significant at 95% level

Table 4.3 displays CI calculated by using permanent parental income and wave specific cohort members' own income. The permanent parental income variable is the same in each wave. It is clear that both sets of results show an increase in income-related inequalities, although the absolute values of concentration indices are relatively small. This is not surprising as CI is derived from the Gini coefficient, but with the incorporation of the income variable it seems that there is less income-related inequality in health compared with pure health inequality. It is worth noting that when using wave specific cohort member's own income, the increasing trend is not consistent in wave 5 and the reason for that, we suspect, is that there might be some measurement error in cohort members' own income in wave 5. It is also worth noting the large difference of concentration index in wave 7 when using different sources of income. When applying wave specific cohort member's own income, there is a slight jump from wave 6 to wave 7 while when permanent parental income is used, the inequality in wave 7 is even slightly smaller than wave 6. This may indicate that the combination of the deterioration of the average health of the population and wave specific income inequality from age 42 to age 46 has worsened the income-related inequality in health. Whereas when suing permanent parental income – stays the same in each wave – a slight increase in excellent health reduces health inequality measured by CI.

Concentration indices calculated using wave specific cohort member's own income is significantly higher than using permanent parental income. Both calculations of concentration indices display an increase in income-related inequality in health, with wave specific cohort member's own income displaying a higher degree of health inequality. The concentration indices using permanent parental income suggest that as people age, parental income related health inequality have a U shaped relationship with health. It would be interesting to see if it is still the case if we may examine wave 8 in the future.

Figure 4.6, Concentration curves using permanent parental income

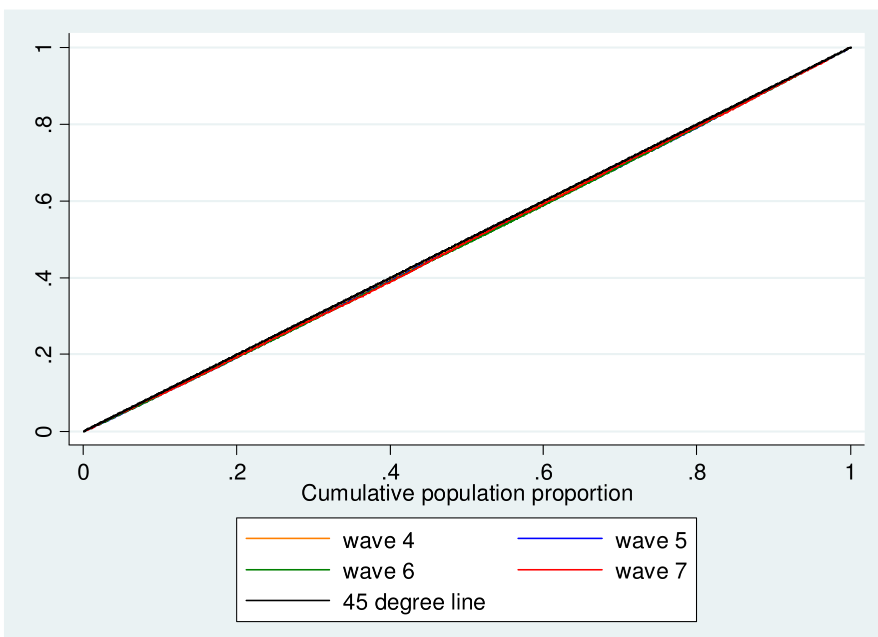
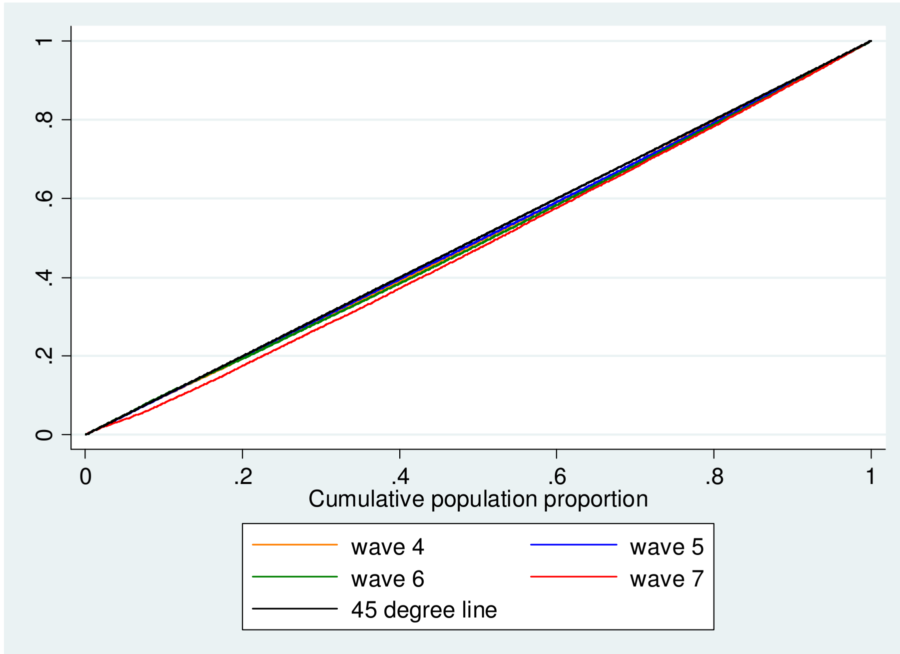


Figure 4.7, Concentration curves using wave specific cohort members' own income



4.4.4 Concentration index of dichotomized SAH

The calculation of CIs normally requires information on health in the form of either a continuous variable or dichotomous variable (Wagstaff and van Doorslaer, 1994). In order to obtain a continuous variable for SAH, van Doorslaer and Jones have suggested a method mapping the Health Utility Index (HUI) score into SAH categories, so that interval regression can be applied to the SAH categories (van Doorslaer and Jones, 2003). However, it is not possible to adopt this approach with the NCDS data as there is no similar scoring system of health status like the HUI in the data. Therefore, this study applies the approach of dichotomising the four-category SAH into two categories with good and very good health coded as 1 and fair and poor health coded as 0. Although there are drawbacks of dichotomising SAH as Wagstaff and van Doorslaer have pointed out that it may make comparisons of inequality over time unreliable (Wagstaff and van Doorslaer, 1994), dichotomisation of multi-category variable into binary has been commonly adopted by researchers and this study will also demonstrate that the boundaries of CI changes with the mean of SAH when it is binary.

Judging by the absolute sizes of the CI – the larger in absolute size, the greater the degree of inequality – conclusions can be drawn on the degree of income-related health inequalities. When the health variable being examined is unbounded, CI lies in the interval [-1, 1]. However, when the variable under consideration is binary, the mean of the distribution places bounds on the possible values of CI can obtain: as the mean increases, the range of possible values of CI shrinks (Wagstaff, 2005). In this case, when the mean of the health variable is μ, CI lies in the interval [μ-1, 1-μ]. Since the population's mean health is different in each wave, it is impossible to judge the degree of inequality by the unadjusted CI as they will have different boundaries depending on the mean in each case. So it is fairer to compare concentration index across waves when express CI as a fraction of the relevant bound which puts the concentration indices across 4 waves on the same scale to compare, therefore, mean-adjusted concentration indices are calculated.

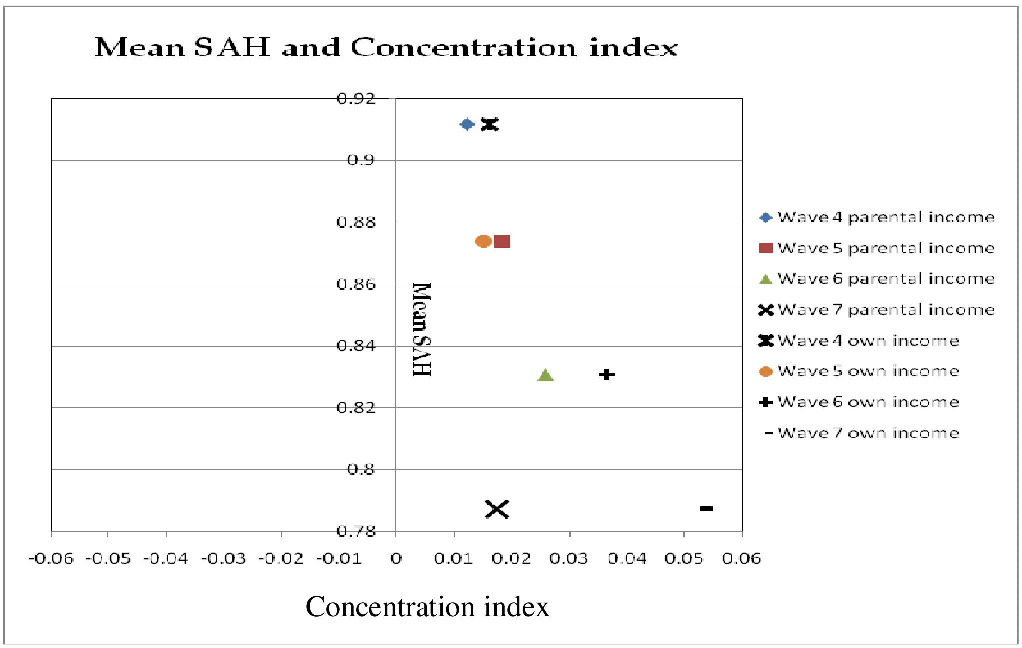
Table 4.5, CI on dichotomized SAH

Wave	Mean SAH	Boundary	CI using parental income	CI using own income	Boundary-adjusted CI using parental income	Boundary-adjusted CI using own income
4 (age 23)	0.912	-0.088 – 0.088	0.012	0.016	0.013	0.018
5 (age 33)	0.874	-0.126 – 0.126	0.018	0.015	0.021	0.017
6 (age 42)	0.831	-0.169 – 0.169	0.026	0.036	0.031	0.044
7 (age 46)	0.787	-0.212 – 0.212	0.017	0.053	0.022	0.067

Concentration indices of dichotomised SAH are calculated using both permanent parental income and wave specific cohort members' own income. Table 4.4 shows the boundary placed on CI and boundary-adjusted CI for both parental income and cohort members' own income. When using permanent parental income, there is a steady increase in income-related inequality in health until wave 6, and then wave 7 shows a decrease in inequality, which may result from the adjustment of health expectation. When using cohort members' own income, an increase of income-related health inequality is observed across the years with the exception of wave 5, although there is a very small difference between wave 5 and wave 4. Except in wave 5, cohort member's own income-related inequality in health seems to be higher than permanent parental income-related health inequality. This coincides with the comparisons of the two sets of CI when SAH have four categories. The finding indicates that the effect of parental income on health is relatively smaller than their own income, although both income-related inequalities are increasing through time. We can also observe that the gap between the two is increasing over time.

Figure 4.8 depict mean SAH and unadjusted concentration index in each wave depending on which type of income is used. The x axis represents the raw value of concentration index and the y axis denotes the mean value of SAH. Given that the bounds on CI are narrower for higher means, the most preferred scenario is higher mean SAH and lower concentration index in absolute value – the top middle of the graph. The graph clearly shows a trend of moving away from the desired situation as mean health is worsening and income-related inequality in health is increasing. It is also worth noting that the distance between CI calculated from parental income and CI calculated from own income is widening over time with wave 4 and 5 having the smallest gap and wave 7 showing a very large gap.

Figure 4.8, Mean SAH and CI



4.4.5 Decomposition of concentration index

CI of each wave is decomposed by socioeconomic factors. This is essentially a linear regression exploring the association between those factors and health and their individual contributions to the overall income-related inequalities in health. The regression results for wave 4 and wave 7 are presented in Table 4.6. Regressions are estimated using robust standard error to control for heteroscedasticity, providing the Huber/White/sandwich estimator of variance. Cohort members' own income in wave 4 is equivalised for household size and composition, but wave 7 data does not have sufficient information to do so, therefore cohort members' own income in wave 7 is not equivalised. The income measures include earnings from paid work and any social benefit cohort members or their partner received. The "Other" category of social class refers to those who are out of the labour market.

Table 4.6, Regression results for wave 4 and wave 7 (unbalanced sample)

SAH	Wave 4 Coef.	Wave 4 Robust Std. Err.	Wave 7 Coef.	Wave 7 Robust Std. Err.
Birth weight	0.009**	0.004	0.007	0.006
Birth weight squared (rescaled to 1/100)	-0.004**	0.002	-0.030	0.003
Log parental income	0.053	0.054	0.151**	0.075
Log own income	0.046***	0.015	0.080***	0.021
Male	0.078***	0.021	0.003	0.030
CSE	0.171***	0.042	0.066	0.051
OGCSE	0.220***	0.038	0.122***	0.046
A level	0.277***	0.041	0.231***	0.060
Diploma	0.283***	0.044	0.133	0.082
Degree	0.311***	0.047	0.193***	0.056
Single	-0.066***	0.020	-0.100*	0.053
Separated	-0.212***	0.075	0.087	0.075
Divorced	0.099	0.074	-0.107*	0.055
Widowed	-0.477*	0.264	0.132	0.140
Social class II	0.010	0.050	-0.011	0.058
Social class III non-manual	-0.064	0.052	-0.004	0.067
Social class III manual	-0.071	0.052	0.007	0.067
Social class IV	-0.067	0.056	-0.064	0.075
Social class V	-0.092	0.078	-0.131	0.120
Social class other	-0.005	0.067	-0.619***	0.082
_cons	2.302***	0.346	0.996*	0.572
N	5096		3782	
R squared	0.0403		0.0866	
Linktest _hat	0.104		0.003***	
Linktest _hatsq	0.226		0.077*	

*denotes significance level of 90%, **denotes significance level of 95%, ***denotes significance level of 99%

Education levels appear to be consistently significant in both waves. Compared with the reference group of people without any qualification, people with any form of qualification are more likely to report better SAH and the gradient increases with the education level (except in wave 7 where CSE and diploma are not significant and degree's impact seems to be less than the lower category – A level). Cohort member's own income is another consistently significant influential factor – the higher income, the better SAH. Birth weight is significant in wave 4 but not in wave 6, whereas parental income is significant in wave 7 but not in wave 4. Birth weight in general is displaying a U shaped relationship with health, which is expected as both low and very high birth weight are related with worse health.

It is worth noting that a number of covariates have changed their sign between wave 4 and wave 7. These include being separated, divorced, widowed, and social class II and social class III manual, although neither of the social class variables is significant. Being separated or widowed were significantly negative towards SAH in wave 4, but positive in wave 7 although not significant. This may be interpreted that at a younger age (23 in wave 4) having experienced separation or loss of a spouse can have a damaging impact on health, which may then be easier to deal with at an older stage in life. The very small number of people who are widowed in wave 4 can also explain the instability in the sign. Being divorced has positive insignificant effect on SAH in wave 4, however, is significantly negative in wave 7. Considering divorce at a later age may be more complicated than at a younger age and can be very stressful, it is not surprising that being divorced is bad for health in wave 7.

Link test has been performed to check the model specification, which is based on the idea that if a regression is properly specified, one should not be able to find any additional independent variables that are significant except by chance (Chen, et al, 2003). With the Link test two new variables are created, the predicted value (_hat) and the predicted value squared (_hatsq). The model is then re-estimated using these two variables as predictors. The prediction should be significant and the prediction squared should not, because if the model is specified correctly, the squared predictions should not have much explanatory power. That is we would not expect the prediction squared to be a significant predictor if our model is specified correctly. The coefficients for hat and hat squared are presented in the results Table 4.6. The significance of _hat in wave 7 (_hatsq is only significant at 10%, which may not be sufficient given the large sample size, therefore, it is not considered to be a predictor.) indicate that the model for wave 7 is correctly specified. However, in wave 4 both _hat and _hatsqu are insignificant – _hatsq should be insignificant which indicates the model is correctly specified whereas _hat should be significant and this may be that the variables in wave 4 do not have enough explaining powers as also reflected by the R squared. Further tests and research are needed to investigate whether there are any other factors at play.

4.4.5.1 Attrition and robustness check

The study sample size has dropped by 1/4 from wave 4 to wave 7, which may indicate the existence of attrition. A balanced sample is therefore constructed across waves to assess whether there is strong evidence of attrition. Table 4.7 shows the regression results for the balanced sample across waves.

Table 4.7, Regression results for wave 4 and wave 7 (balanced sample)

SAH	Wave 4 Coef.	Wave 4 Robust Std. Err.	Wave 7 Coef.	Wave 7 Robust Std. Err.
Birth weight	0.009*	0.005	0.007	0.007
Birth weight squared (rescaled to 1/100)	-0.004	0.002	-0.003	0.003
Log parental income	0.038	0.070	0.093	0.088
Log own income	0.072***	0.022	0.079***	0.023
Male	0.069**	0.028	0.009	0.034
CSE	0.136**	0.060	0.109*	0.064
OGCSE	0.127**	0.055	0.173***	0.060
A level	0.205***	0.059	0.299***	0.074
Diploma	0.196***	0.062	0.183*	0.098
Degree	0.231***	0.065	0.258***	0.071
Single	-0.070***	0.025	-0.120*	0.062
Separated	-0.179*	0.102	0.102	0.089
Divorced	0.099	0.087	-0.110*	0.060
Widowed	-0.324***	0.027	0.071	0.165
Social class II	0.004	0.065	-0.031	0.066
Social class III non-manual	-0.074	0.068	-0.012	0.075
Social class III manual	-0.079	0.069	0.003	0.076
Social class IV	-0.067	0.075	-0.100	0.085
Social class V	-0.119	0.106	-0.021	0.134
Social class other	0.010	0.087	-0.561***	0.093
_cons	2.151***	0.489	1.294*	0.655
N	2894		2894	
R squared	0.0305		0.0758	

*denotes significance level of 90%, **denotes significance level of 95%, ***denotes significance level of 99%

The sample size is largely reduced compared with the unbalanced sample due to missing observations in any of the four waves. Compared with unbalanced sample results, it seems that there are no major changes in terms of signs and magnitude of the coefficients.

R squared is smaller for both waves in the balanced sample which may be due to reduced sample size. The only major change is the coefficient for cohort member's own income, which has increased in magnitude and the coefficient is similar for both wave 4 and wave 7, suggesting that some of the more unhealthy people had dropped. So if attrition does have an effect it seems to be on this coefficient. However, given how similar the other results are it is not necessary to use balanced sample, thus unbalanced sample is used for the decomposition in the following section.

In addition, in order to test the robustness of the life course approach, regressions without the initial health stock variables of birth weight and parental income are performed. Table 4.8 shows the regression results after removing initial health stock variables for unbalanced sample and Table 4.9 displays the results for balanced sample.

Table 4.8, Regression results for wave 4 and wave 7 without initial health stock indicators (unbalanced sample)

SAH	Wave 4		Wave 7	
	Coef.	**Robust Std. Err.**	**Coef.**	**Robust Std. Err.**
Log own income	0.047***	0.015	0.083***	0.021
Male	0.082***	0.021	0.004	0.030
CSE	0.171***	0.042	0.067	0.051
OGCSE	0.226***	0.038	0.129***	0.046
A level	0.285***	0.042	0.247***	0.060
Diploma	0.291***	0.044	0.149*	0.082
Degree	0.326***	0.046	0.213***	0.055
Single	-0.066***	0.020	-0.096*	0.053
Separated	-0.212***	0.075	0.085	0.075
Divorced	0.093	0.075	-0.103*	0.055
Widowed	-0.472*	0.264	0.128	0.143
Social class II	0.010	0.050	-0.020	0.058
Social class III non-manual	-0.065	0.052	-0.015	0.066
Social class III manual	-0.075	0.052	-0.004	0.066
Social class IV	-0.071	0.056	-0.077	0.075
Social class V	-0.103	0.079	-0.146	0.119
Social class other	-0.009	0.067	-0.627***	0.081
_cons	2.970***	0.091	2.152***	0.236
N	5096		3782	
R squared	0.0386		0.0853	

*denotes significance level of 90%, **denotes significance level of 95%, ***denotes significance level of 99%

It appears that for both wave 4 and wave 7 and in both balanced and unbalanced samples, removing initial health stock variables reduces the size of R squared. The main difference in the regressions is the change of signs for social class III manual in wave 7 and the variable is not significant in any case. The comparisons between regressions with and without initial health stock variables for both balanced and unbalanced samples reveal that the inclusion of initial health stock variables provides better fit for the regression as reflected by the R squared statistics and no other major statistical differences are detected.

Table 4.9, Regression results for wave 4 and wave 7 without initial health stock indicators (balanced sample)

SAH	Wave 4		Wave 7	
	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
Log own income	0.073***	0.022	0.081***	0.023
Male	0.075***	0.028	0.009	0.034
CSE	0.131**	0.061	0.109*	0.064
OGCSE	0.128**	0.055	0.176***	0.060
A level	0.206***	0.059	0.308***	0.073
Diploma	0.200***	0.061	0.190*	0.098
Degree	0.240***	0.064	0.269***	0.070
Single	-0.069***	0.025	-0.118*	0.062
Separated	-0.180*	0.103	0.100	0.088
Divorced	0.092	0.089	-0.107*	0.060
Widowed	-0.328***	0.030	0.067	0.168
Social class II	0.007	0.065	-0.036	0.066
Social class III non-manual	-0.073	0.068	-0.019	0.074
Social class III manual	-0.079	0.068	-0.004	0.075
Social class IV	-0.070	0.075	-0.108	0.085
Social class V	-0.124	0.106	-0.032	0.134
Social class other	0.009	0.087	-0.566***	0.092
_cons	2.939***	0.129	2.128***	0.258
N	2894		2894	
R squared	0.0287		0.0752	

*denotes significance level of 90%, **denotes significance level of 95%, ***denotes significance level of 99%

Table 4.10 shows the joint significance tests performed on birth weight and permanent parental income. It seems that only the test performed for unblanced sample in wave 4 can reject the null hypothesis that the coefficients for birth weight and permanent parental income are both 0. The test results may be due to attrition effect that those with the worst early life outcomes are the ones most likely to drop out over time. The permanent parental income variable is derived from a number of parental characteristics variables, therefore, a considerable amount of observations are lost due to missing values in any of the parental characteristics variables, which means the permanent parental income variable may not have a large degree of variation. The test results may therefore also indicate that the variables used to detect life-course factors need to be more varied. All of these issues need to be accounted for and tested, but it may be more difficult to identify these effects independently with panel data. However, we need to keep in mind that we are concerned with both economics and statistical significance. This is particularly important in the case of initial health stock variables which may have an economic significance even if they do not have a statistical significance.

Table 4.10, Joint significance Wald test

Moldes	Wave 4	Wave 7
Unbalanced sample	F(3, 5075) = 2.76 Prob > F = 0.0407	F(3, 3761) = 1.77 Prob > F = 0.1507
Balanced sample	F(3, 2873) = 1.76 Prob > F = 0.1529	F(3, 2873) = 0.64 Prob > F = 0.5899

The comparisons have shown a rather similar pattern of different models tested, so it seems appropriate to continue using the unbalanced sample with the life-course approach in the following analysis of decomposition of income-related health inequalities. Therefore, the decomposition and relative distribution results presented in the following sections are obtained using unbalanced sample.

4.4.5.2 Decomposition of concentration index calculated using permanent parental income

The column under the heading "Elasticity" shows how sensitive and in what direction SAH is responding to the change of each of the individual factors, reflected by the magnitude and sign of the values. The column under the heading "Concentration Index" provides the CI value for each of the influential variables. The column under the heading "Contribution" combines the elasticity with the individual concentration index to signify each of the covariates' contribution to the overall CI, and the last column is the percentage contribution based on their contribution scores. The contribution from residual indicates the percentage of the overall income-related health inequality that cannot be explained by the variables in the regression.

Table 4.11, Decomposition of CI using permanent parental income (wave 4)

Variables	Elasticity	Concentration index	Contribution	Percentage contribution
Birth weight	0.3324	0.0028	0.0009	13.68%
Birth weight squared	-0.1552	0.0050	-0.0008	-11.38%
Parental income	0.0785	0.0199	0.0016	23.01%
CM income	0.0630	0.0084	0.0005	7.82%
Male	0.0115	0.0055	0.0001	0.94%
Qualification: CSE	0.0064	-0.1538	-0.0010	-14.56%
Qualification: OGCSE	0.0227	-0.0254	-0.0006	-8.52%
Qualification: A level	0.0117	0.0611	0.0007	10.51%
Qualification: diploma	0.0119	0.1058	0.0013	18.53%
Qualification: degree	0.0111	0.3307	0.0037	54.20%
Marital status: single	-0.0100	0.0489	-0.0005	-7.21%
Marital status: separated	-0.0014	-0.0945	0.0001	1.91%
Marital status: divorced	0.0004	-0.1494	-0.0001	-0.92%
Marital status: widowed	-0.0001	-0.0992	0.0000	0.17%
Social class II	0.0005	0.1834	0.0001	1.37%
Social class III.i	-0.0061	0.0316	-0.0002	-2.85%
Social class III.ii	-0.0050	-0.0835	0.0004	6.21%
Social class IV	-0.0033	-0.1673	0.0006	8.14%
Social class V	-0.0010	-0.1344	0.0001	1.99%
Social class other	-0.0001	0.0241	0.0000	-0.02%
Residual			-0.0002	-3.02%
CI			0.0068	100.00%

Table 4.11 displays the decomposition results for wave 4 when CI is calculated using permanent parental income. Birth weight seems to have the highest elasticity compared with all the other components indicating a change in birth weight will lead to lager change in SAH than any other factors. As the elasticity of birth weight squared is negative, the relationship between SAH and birth weight is, therefore, quadratic. Having higher birth weight has a positive effect on SAH, but only to a certain degree – extremely high birth weight has a negative impact on health. Being single, separated or widowed are all contributing negatively to cohort members' assessment of SAH compared with married, except being divorced. Belonging to social class III to V has a negative effect on health compared with being in social class I, with the exception of social class II. Education seems to also have a positive impact on SAH regardless of the level of education, although the two lower levels of education have pro poor income-related health inequality whereas the top three education levels are clearly pro rich. This is reasonable as higher education level is normally associated with higher income; therefore, there are larger concentrations of low income in the lower education groups and high income in the higher education groups, which result in the difference in the contributions from different education levels. When examining the percentage contribution of each of the variables, Table 4.10 shows that the different education levels appear to be the largest contributors for the inequalities in health, with education level above (and include) A-level disfavoring the poor and below A-level disfavoring the rich. Education alone amounts to more than half of the health inequalities followed by birth weight and parental income. Parental income and birth weight are both disfavoring the poor.

Table 4.12, Decomposition of CI using permanent parental income (wave 7)

Variables	Elasticity	Concentration index	Contribution	Percentage contribution
Birth weight	0.2802	0.0020	0.0006	5.25%
Birth weight squared	-0.1381	0.0035	-0.0005	-4.59%
Parental income	0.2489	0.0202	0.0050	47.50%
CM income	0.2701	0.0075	0.0020	19.03%
Male	0.0005	-0.0023	0.0000	-0.01%
Qualification: CSE	0.0032	-0.1531	-0.0005	-4.60%
Qualification: OGCSE	0.0141	-0.0368	-0.0005	-4.90%
Qualification: A level	0.0068	0.1431	0.0010	9.12%
Qualification: diploma	0.0020	0.1796	0.0004	3.31%
Qualification: degree	0.0118	0.2411	0.0029	26.92%
Marital status: single	-0.0024	0.0603	-0.0001	-1.35%
Marital status: separated	0.0008	-0.1044	-0.0001	-0.77%
Marital status: divorced	-0.0031	0.0038	0.0000	-0.11%
Marital status: widowed	0.0004	-0.0761	0.0000	-0.26%
Social class II	-0.0013	0.0899	-0.0001	-1.10%
Social class III.i	-0.0002	-0.0505	0.0000	0.11%
Social class III.ii	0.0004	-0.1399	-0.0001	-0.50%
Social class IV	-0.0020	-0.1055	0.0002	1.98%
Social class V	-0.0009	-0.2172	0.0002	1.76%
Social class other	-0.0270	-0.0224	0.0006	5.70%
Residual			-0.0003	-2.48%
CI			0.0106	100.00%

Table 4.12 shows the decomposition results for wave 7 using permanent parental income. Birth weight continues to have the largest elasticity whereas cohort members' own income and their parental income also seem to have very high elasticity compared with wave 4. This indicates that in the later wave individual's health is more responsive to income than at a young age. Parental income becomes the single largest contributor to parental income-related inequality in health followed by education and cohort members' own income. The reason for the large contribution of parental income is self-evident. Cohort members' own income has increased its contribution is due to larger diversity of income distribution in wave 7 than in wave 4. Compared with people without any education, educated cohort members all tend to have better health regardless of what education level they have obtained. However, different education levels have different impacts on their contributions to income-related health inequality. All the categories of education above (and including) A-level contribute positively to income-related health inequality whereas lower education levels tend to favour the poor. Birth weight continues to be an important factor contributing to income-related health inequalities displaying a quadratic relationship with SAH, but its contribution has reduced compared to wave 4. Wave specific cohort member's own income is positive towards SAH and favouring the rich as expected. The elasticities of different social class categories indicate that compared with being in the social class I, being in other social class categories is bad for health except for social class III manual. The contributions of social class categories are relatively small and insignificant, which is the same for marital status. Compared with the married category, being single or divorced seem to have an adverse effect on health whereas being separated or widowed appears to be the opposite. The four marital status categories are all favouring the poor.

Comparing the two tables of decomposition results when concentration index is calculated using permanent parental income, some notable changes are observed. Contributions from parental income and cohort members' own income have increased significantly whereas the contributions of birth weight and education have dropped from wave 4 to wave 7. The observation suggests the existence of accumulation effects of parental income whereas the impact of birth weight may have faded away. The reason to this observation may be that parental income has a long term impact on individual's health that is reflected not merely by birth weight but other factors. It is possible that birth weight is mainly determined by parental income, and as people age, the impact of their birth weight may diminish due to later life events which they have control of, but the effect of parental income may continue or even grow larger. The increase in the contribution in their own income may be related to the association between individual income and their parental income. Although the absolute contributions of education variables have decreased, it remains to be the largest contributor following the income variables. The longitudinal comparisons of the socioeconomic factors provide an interesting insight to the development of health inequalities through the life-course.

4.4.5.3 Decomposition of concentration index calculated using wave specific cohort member's own income

Similarly, decomposition is also conducted for cohort members' own income-related inequality in health. Table 4.13 shows the decomposition results in wave 4. In this case, the population is ranked by their current income in each wave instead of their parental income during their childhood. When cohort member's own income is used to calculate CI, this income then takes the place of parental income as the largest contributor of income-related health inequality in wave 4, and the contribution from their parental income becomes very small. Education amounts to the second largest contributor to the overall CI. Except for having education of CSE or equivalent, all the other categories of education contribute to pro-rich health inequality. Birth weight again has considerable impact on the income-related health inequality – higher birth weight leads to better health, although the relationship is quadratic reflected by the negative sign of birth weight squared in the regression. Being single has the largest contribution among marital status variables with pro poor impact and is more likely to report worse health compared with being married as reflected by its negative elasticity. Compared with in social class I, being in social class III and lower is more likely to report worse SAH.

Table 4.13, Decomposition of CI using wave specific cohort member's own income (wave 4)

Variables	Elasticity	Concentration index	Contribution	Percentage contribution
Birth weight	0.3324	0.0055	0.0018	16.40%
Birth weight squared	-0.1552	0.0102	-0.0016	-14.07%
Parental income	0.0785	0.0022	0.0002	1.57%
CM income	0.0630	0.0728	0.0046	40.80%
Male	0.0115	0.0989	0.0011	10.12%
Qualification: CSE	0.0064	-0.1937	-0.0012	-11.05%
Qualification: OGCSE	0.0227	0.0171	0.0004	3.47%
Qualification: A level	0.0117	0.1872	0.0022	19.40%
Qualification: diploma	0.0119	0.1432	0.0017	15.11%
Qualification: degree	0.0111	0.0783	0.0009	7.73%
Marital status: single	-0.0100	0.1085	-0.0011	-9.65%
Marital status: separated	-0.0014	-0.1324	0.0002	1.61%
Marital status: divorced	0.0004	-0.4058	-0.0002	-1.50%
Marital status: widowed	-0.0001	-0.9768	0.0001	1.00%
Social class II	0.0005	0.1664	0.0001	0.75%
Social class III.i	-0.0061	0.0183	-0.0001	-0.99%
Social class III.ii	-0.0050	0.0761	-0.0004	-3.41%
Social class IV	-0.0033	-0.2313	0.0008	6.78%
Social class V	-0.0010	-0.3190	0.0003	2.84%
Social class other	-0.0001	-0.2689	0.0000	0.14%
Residual			0.0015	12.95%
CI			0.0112	100.00%

Table 4.14, Decomposition of CI using wave specific cohort member's own income (wave 7)

Variables	Elasticity	Concentration index	Contribution	Percentage contribution
Birth weight	0.2802	0.0076	0.0021	6.54%
Birth weight squared	-0.1381	0.0142	-0.0020	-5.98%
Parental income	0.2489	0.0043	0.0011	3.24%
CM income	0.2701	0.0405	0.0109	33.43%
Male	0.0005	0.0532	0.0000	0.08%
Qualification: CSE	0.0032	-0.1915	-0.0006	-1.87%
Qualification: OGCSE	0.0141	-0.0471	-0.0007	-2.03%
Qualification: A level	0.0068	0.1477	0.0010	3.05%
Qualification: diploma	0.0020	0.1709	0.0003	1.02%
Qualification: degree	0.0118	0.3692	0.0044	13.36%
Marital status: single	-0.0024	-0.4950	0.0012	3.60%
Marital status: separated	0.0008	-0.4991	-0.0004	-1.20%
Marital status: divorced	-0.0031	-0.5492	0.0017	5.17%
Marital status: widowed	0.0004	-0.5198	-0.0002	-0.58%
Social class II	-0.0013	0.2576	-0.0003	-1.02%
Social class III.i	-0.0002	-0.0885	0.0000	0.06%
Social class III.ii	0.0004	-0.1600	-0.0001	-0.18%
Social class IV	-0.0020	-0.2875	0.0006	1.75%
Social class V	-0.0009	-0.4300	0.0004	1.13%
Social class other	-0.0270	-0.3005	0.0081	24.83%
Residual			0.0051	15.61%
CI			0.0327	100.00%

Table 4.14 displays the decomposition results of cohort members' own income-related health inequality in wave 7. Cohort member's own income continues to be the dominant contributor to income-related health inequality. A noticeably large contributor in wave 7 is social class-other, which is negatively related with SAH compared with in the top social class and its contribution is pro poor. This may indicate that at a later age, people with no work (hence not assigned in any social class category) tend to have much worse health and are contributing significantly to income-related health inequality.

Education continues to have a relatively large contribution and in this later wave, another lower education category – OGCSE – has become pro-poor in addition to CSE. In this research, maximum education level is used across waves for attained final education level which reflects a person's unobservable characteristics, and is a better indicator of education than the education level measured at an early point in time. Therefore, each cohort member's education level in wave 4 is the same as it is in wave 7. Although the overall contribution of education from different categories has decreased, the degree level's contribution has increased. The main reason causing this change is that degree's own concentration index is much smaller in wave 4 than in wave 7 – degree level education is much more evenly distributed across people with different income levels in wave 4 than in wave 7. As this comparison is based on concentration index calculated by cohort member's own income, and in wave 4 when cohort members were at age 23 the income distribution was less widely spread, whereas in wave 7 when cohort members were 46-47 years old and had established their stable income status, thus, degree level education became much more widely distributed across different income levels in wave 7 and could demonstrate its pro-rich effect.

Similarly to decomposition conducted for parental income-related health inequality, the effect of birth weight has decreased in the later wave. The effect of birth weight is positive, pro-rich and quadratic. On the other hand, parental income's contribution, although remains small, has increased in wave 7 which shows the same pattern as when CI was calculated using parental income. The contributions of residual in wave 4 and wave 7 are both a bit over 10% when examining cohort members' own income-related health inequality, and are only around 3% when examining cohort members' own income-related health inequality. This suggests that there are more unexplained factors to own income-related inequality in health than parental income-related health inequality. There may be other factors in life that we have not realised yet.

4.4.6 Relative distributions

Figure 4.9 shows the relative distributions of wave 7 compared to wave 4 with wave 4 being the reference group. The first panel is the overall comparison of the two cohorts. The middle panel represents the location change and the right hand side panel shows the shape change. It is obvious that there is no location change between the two distributions reflected by the uniform distribution shown in the middle panel, therefore, the overall differences between the two waves are completely due to the differences in the shape of the distributions. The dotted line in each panel shows the uniform distribution – being above the line indicates more density in the comparison cohort (wave 7) and being below the line means there is more density in the reference cohort (wave 4). In this case, a larger proportion of the population is concentrated in SAH of 1 or 2 (health is poor or fair) in wave 7 and in wave 4 there are more people in the upper tail of the SAH distribution reporting excellent health. The fraction of people reporting poor health is more than 8 times higher in wave 7 than in wave 4 in the SAH distribution defined by the reference cohort wave 4, and twice as high for people reporting fair health. On the other hand, the proportion of respondents reporting excellent health is almost 100% lower in wave 7 in the SAH distribution defined by the reference cohort wave 4. There seems to be no change in the proportion of people reporting good health between the two waves. The right hand side panel showing the effect of shape change is exactly the same as the overall relative distributions in the left hand side panel as the differences between SAH distributions of the two waves entirely come from the change in the shape of the distributions.

The polarisation indices provide an insight on the movement at median, lower tail and upper tail of the distributions. Table 4.15 shows that there is polarization occurring at the median and lower tail reflected by the positive values and in the upper tail of the distribution people seem to be moving towards convergence. This indicates an interesting finding suggesting that as people age, they seem to be shifting to the two extremes of the distribution instead of all moving to a worse health status.

Figure 4.9, Relative distributions of SAH between wave 4 and wave 7

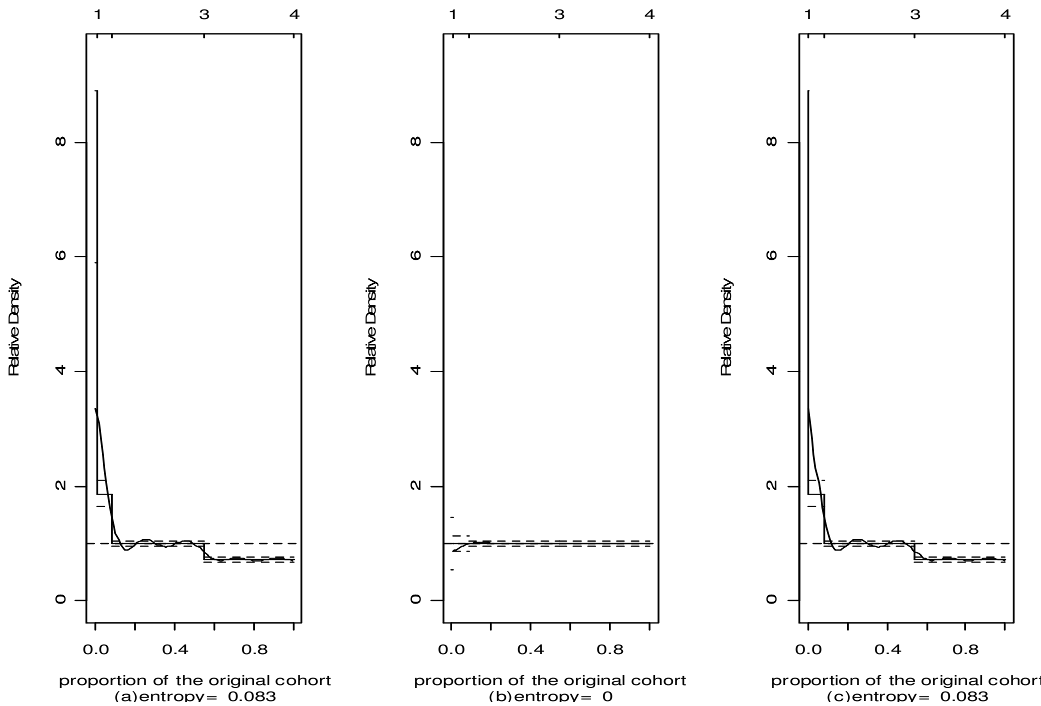


Table 4.15, Polarization indices: wave 4 – wave 7

Polarization Index	Estimate	95% CI	P-value
Median Index	0.113	0.080 – 0.145	0.000
Lower Index	0.755	0.742 – 0.768	0.000
Upper Index	-0.061	-0.128 – 0.007	0.039

4.5 Summary and discussion

This chapter provides the empirical evidence of how health inequalities are developed from a life-course perspective and by applying different measures of health inequalities, both traditional and new methods are compared and assessed, which may help suggest good practice in the research of health inequalities.

Firstly, health as measured by SAH is examined for its pure inequality and income-related inequality. Pure inequality is measured by the Gini coefficient – a simple measure of how health is unequally distributed among the population by ranking the entire population according to their health status and comparing from bottom up the percentage of population against their accumulated health as the percentage of total population health. CI then measures health inequality in the same way as Gini, but incorporates the income covariate. Theil's entropy and the B measure are calculated as new methods to measure pure health inequality in addition to the traditional approaches. In general, Gini, CI and Theil's entropy all indicate that health inequalities are increasing with the aging population across the four waves; however, B measure shows a decreasing trend from wave 4 to wave 7. This result provides an interesting example of how different measures of health inequality should be applied and interpreted on the categorical health variable – SAH. SAH, as mentioned previously, is a good indicator of health and has been used in many population surveys for its simplicity and ability to predict morbidity and mortality (see for example, Idler and Benyamini, 1997). However, there is one particular concern regarding SAH's categorical nature that it may create problems when being used with some health inequality measures. Both Gini and CI require the variable in question to be continuous – that the health variable has cardinal scale, or dichotomous. In order to apply Gini and CI on SAH, in this case, 1, 2, 3 and 4 are assigned to poor, fair, good and excellent health of the SAH categories, respectively. This, in a way, makes it possible to apply Gini and CI on SAH, which is a commonly used practice; however, it does make assumptions that excellent health is four times better than poor health, and good health is three times better than poor health and so on. The scoring of each category obviously has an impact on the calculated inequality results. Although a number of other approaches to deal with the problem has been proposed, none of them can be universally applied or without flaws.

In this research, a new method which is specially designed to measure inequality among categorical variables is used. Applying the B measure on SAH, one can notice a different trend as compared to Gini or CI. The reason is that the B measure considers different categories of health as being equally preferable; therefore, an equal distribution of health into all the categories is regarded as equality. The B measure does provide an unbiased inequality measure; however, attention needs to be paid to the interpretation of the results in the case of SAH. As it is clear that SAH is a highly skewed distribution with more people in the good health category than in the poor health group, and from the population's perspective the best scenario is that everyone is in the excellent health category. Therefore, a result of B measure showing more inequality is desired with the condition that the population is indeed shifting to the good or excellent health category. On the other hand, the more equal the B measure shows, the more extensive the population is spread across all the categories of SAH, which means more people are having poor health. A combination of both Gini and the B measure can help to identify the situation.

CI is also performed on dichotomised SAH. For binary health variables, the boundaries of CI are affected by the respective mean population's health. Simply comparing CIs from different waves could lead to biased conclusions; thus, CIs on the dichotomised SAH are adjusted by each of their respective population means. For each wave, CI is calculated using both permanent parental income and wave specific cohort member's own income. The magnitude of the health inequality is larger when using wave specific income than parental income, except in wave 5. For wave specific income after adjusting the mean, CIs are, in general, increasing through waves as the older the cohort members are, the more income-related health inequality there is. However, when parental income is applied, the income-related health inequality seems to increase slowly up to wave 6 and then decrease in wave 7. The effect of parental income on health may have faded away through time and replaced by their own income. The adaptation of their health expectation from wave 6 to wave 7 with increased proportion of reporting excellent health may also explain the reduction of parental income calculated CI as parental income remains the same throughout the waves.

A range of covariates are used to explain inequalities in SAH and their contributions to CI. According to the regression results, education categories are significant for both wave 4 and wave 7, as well as cohort members' own income. Birth weight is significant in wave 4 whereas parental income is significant in wave 7. Birth weight has a quadratic relationship with health indicating that health increases with birth weight but to a certain degree and very high birth weight has a negative effect on health. Being single or separated (compared with married) seem to be only significant in wave 4. None of the social class categories are significant in either wave, except social class –other which has significant negative association with SAH. Gender no longer plays a role in wave 7 as it does in wave 4

Decompositions of the CIs calculated by both permanent parental income and wave specific cohort member's own income have demonstrated a strong effect of education in addition to income. Birth weight is also playing an important role in determining adulthood health.

Horizontally, comparing the two decompositions of CIs for wave 4 – one is parental income-related health inequality and one is cohort member's own income-related health inequality, some interesting trends are observed. The most noticeable difference between these two decompositions is the contribution of education. When parental income is concerned, degree level education alone is accounting for more than half of the total income-related health inequality, whereas with cohort member's own income the contribution drops to only 7.73%. The same trend is also observed for wave 7, although the difference in degree level contribution is smaller between the two kinds of decomposition for wave 7 – with parental income calculated CI, degree level education's contribution is almost 26.92% and for cohort member's own income-related health inequality, the contribution from degree level education is 13.36%. The considerable difference of degree level education's contribution between two types of income-related health inequality indicates there is more pro rich health inequality when parental income is concerned. As permanent parental income is constructed to take into account parental education and social class, this finding meets the expectation that people with better educated and wealthier parents are more likely to pursue university education. The education variable is measured *ex post*, therefore, in wave 4 cohort member's own income may not be strongly related with education level as they were only 23 years old then whereas in wave 7 when cohort members are 46, the contribution of education to cohort member's own income-related health inequality becomes considerably large, although it is still smaller than when parental income is concerned.

Another notable difference is the contribution of the gender variable in wave 4. Being male contributes significantly more to own income-related health inequality than parental income-related health inequality. This may confirm the inequality in male-female wage gap, whereas the child gender is irrelevant to parental income. In wave 7, the difference still exists, but becomes smaller.

Both parental income and cohort member's own income are included in the decomposition and it is unsurprising that the contribution of parental income is higher than cohort member's own income in the decomposition of parental income-related health inequality and the cohort member's own income is higher in the decomposition of cohort member's own income-related health inequality and this is the case in both wave 4 and wave 7. However, cohort member's own income does seem to have a relatively large contribution even in the parental income-related health inequality. The small contribution from parental income is due to its very low concentration index in relation to cohort member's own income – there is low cohort member's own income-related parental income inequality. In other words, the concentration index of parental income ranked by cohort members' own income is smaller than the concentration index of cohort members' own income ranked by their parental income. This is because the parental income distribution is far more equal than cohort members' own income distribution, thus the size of parental income's concentration index is much smaller than that of the cohort members' own income.

Birth weight is consistently an important contributor of income-related inequality in health regardless of which income is used. Its effect is quadratic in both wave 4 and wave 7. The contribution of birth weight is relatively larger in wave 4 than in wave 7, which may be the result of it being significant in wave 4 and insignificant in wave 7 in the regression. Marital status appears to be consistent in each wave whether the decomposition is performed for CI using parental income or cohort members' own income. Comparing other social class categories with social class I in wave 4, being in social class II is always more likely to have better SAH and less likely to report good SAH for social class III to V and none classified reflected by the negative sign of their elasticity. Although none of these are significant in the regression. In wave 7, social class III non-manual replaced social class II as the only category with positive sign, however, only social class other is significant in the regression.

Vertically, comparing wave 7 with wave 4, the effect of ageing through each of the covariates is observed. Birth weight has reduced its contribution whereas parental income has increased its contribution in decomposition of both parental income and own income derived CI. The observations suggest the existence of accumulation effects of parental income whereas the impact of birth weight may have faded away. The reason may be that parental income has a long term impact on individual's health through not merely birth weight but other factors. It is possible that birth weight is mainly determined by parental income, and as people age, the impact of their birth weight may diminish due to later life events which they have control of, but the effect of parental income may continue or even grow larger. Another notable difference in contribution from wave 4 to wave 7 is from social class – other, which increases drastically across the waves. This phenomenon suggests that the fact that people with no occupation (hence classified in the "social class other" category) at a later life stage contributes more to their income related health inequality. The contribution of each of the education categories has decreased from wave 4 to wave 7 in the decomposition of parental income-related health inequality, and a similar trend is found for the decomposition of own income-related health inequality except degree level education which has increased its contribution over time. However, education's relative contribution is still important as it continues to be the largest contributor following income.

The investigation of the relative distributions of between wave 4 and wave 7 indicate the distributional differences of SAH are mainly due to the change in the shape of the two distributions. It suggests that the medians of the two waves stay the same whereas the distribution of SAH in wave 7 has become flatter than it is in wave 4. The median and lower polarisation indices are clearly showing the presence of polarisation and in the upper tail of the distribution people seem to be moving towards convergence. This result is expected because as people age, there is more and more self reported poor health which diverge people into poor and fair health groups while there are less people reporting excellent health pushing this group of people to converge towards the mean. The relative distributions method helps to identify the changes of SAH distributions for the entire population.

The adaptation of the life-course approach and the inclusion of initial health stock have proven useful in investigating the pathways of health inequalities. However, further examinations are needed due to the limitations of this study. The panel data has only included the first 7 waves of the NCDS survey covering from birth to 47 years of age, and among which only around 25 years of adulthood is examined on their SAH; therefore, this panel may not be long enough to detect potential links from socioeconomic factors to health and when people grow older, the trends of SES's contributions to health and health inequalities may also change. Wave 8 of the NCDS has just become available and wave 9 is being planned, so it would be very interesting to carry out future research by including the later waves. Furthermore, some behaviour variables, such as smoking, drinking and eating habits, may be included in the models, although many of them are strongly related with income, education and social class. The possibility of attrition in the data may also be further tested and corrected in the future research. In addition, as the B measure and the relative distributions method are new in the health economics research, further tests and evaluations on the measures of health inequalities are required.

Chapter Five: Income inequality and health

5.1 Introduction

The relationship between income, income inequality and health has, in recent years, been one of the most researched topics in the area of health inequalities (see review from Lynch et al, 2004, Wilkinson and Pickett, 2006), especially following the well known relative income hypothesis advocated by Wilkinson (1996). The relative income hypothesis states that individual health depends on the degree of income inequalities in the society in addition to absolute income. The origin of the relative income hypothesis can date back to Preston's paper (1976) where he found that after achieving a certain level of development, additional increases in income had little effect on increasing national life expectancy. The relative income hypothesis has been tested extensively in numerous studies; however, the results have been mixed and no conclusion has been drawn. In this chapter, a new attempt is made to add fresh input to the literature of this issue from a life-course perspective. In addition to the existing literature of using current income as source of income inequality, this research also tests whether inequality in parental income has any influence on adulthood health, which is new in the research of the relative income hypothesis. The relative income hypothesis is tested on three health measures – self-assessed health, longstanding limiting illness and the Malaise Inventory. A number of relative income measures are adopted to allow for different formulations of the relative income hypothesis (Wagstaff and van Doorslaer, 2000), which include – the Gini coefficient, to measure overall income inequality; the relative deprivation measure of Hey and Lambert (1980) to measure individual deprivation; and the ratio of income to mean income to detect variations to the mean. A range of modelling strategies are also explored and compared. These include a pooled OLS model, a probit model and a panel data model.

5.2 Recent development of income inequality and health

Initially strong support for the effect of relative income on health was provided by aggregate data studies (Wilkinson, 1996) and many practitioners have been following this approach (Walberg, 1998, Chiang, 1999, Ross et al., 2000, Wilkinson and Pickett, 2006, Babones, 2008). As the usefulness of aggregate data studies was questioned (Gravelle et al., 2002) there has been an increasing reliance on individual level studies (Wildman, 2001, 2003b, Gravelle, et al., 2002). The results from these studies have been mixed, although a recent meta-analysis consisting of 59 509 857 subjects in nine cohort studies and 1 280 211 subjects in 19 cross sectional studies has suggested that overall there is a modest but significant adverse effect of income inequality on health (Kondo, 2009).

In recent years, studies on this topic continue to be carried out around the world in the search to uncover this relationship with evidence both for and against this hypothesis. Investigating this issue from the macro level, Babones's research (2008) has confirmed that there is an unambiguous, strong, consistent and statistically significant correlation between income inequality and population health at the country level by using a continuous time series of national inequality estimates for a total of 134 countries for the period 1970-1995. The study has also gone one step further to test the causality of this relationship. The finding reveals some evidence of causal effect of income inequality on health, although the relative stability of income inequality over time in most countries makes causality difficult to test. In the US a similar study (Wilkinson and Pickett, 2008) is carried out by comparing mortality rates and state income inequality, conditional on county median incomes across all 3139 counties within 10 states using a multilevel regression approach. Their research concludes that despite the compositional effects of narrower income differences on reducing health inequalities, the contextual benefits extend to a large majority of the population and therefore do little to reduce relative differences in mortality between income groups. Wilkinson and Pickett's findings have been supported by a cross country comparison study (Mansyura et al, 2008) applying multilevel regression with a sample of 70,493 respondents nested in 45 countries. Through testing the compositional effects and contextual effects of income inequality on self-assessed health (treated as continuous variable), the study reveals that for a large number of diverse countries, commonly used measures of social capital and income inequality have strong compositional effects on self-rated health, but inconsistent contextual effects, depending on the countries included. Using longitudinal Norwegian register data focusing on mortality in men and women aged 30-79 sometime during 1980-2002, Kravdal (2008) finds significantly adverse effects of income inequality (net of the persons' individual income) for all age groups and both sexes in the model without municipality dummies. The municipality dummies were employed to separate confounding factors to the relationship between income inequality and health. The effects were sharpest among the youngest and the effects of income inequality among the youngest survived also with the addition of municipality dummies. The results from models that included such dummies are mixed as there even seemed to be beneficial effects of income inequality among older men. All the above studies seem to be strongly supporting the relative income hypothesis; however, a common feature among these studies is the application of aggregate data, which could give misleading results if the relationship between income inequality and health is nonlinear.

Nonetheless, individual level studies that support the relative income hypothesis also exist. Using longitudinal data from the General Social Survey and the U.S. Census Bureau from 1972 to 2004, Zheng's research (2009) applying hierarchical generalized linear models suggests that income inequality has a significant association with self assessed health.

Some researchers have tested the relative income hypothesis as a pathway between relative deprivation and health. Using a logistic multilevel modelling approach with random effects specified for households and counties, relative deprivation in income measured by Yitzhaki index as well as position in the income hierarchy is found to be independently associated with poor health in the US in addition to the absolute health effect (Subramanyam, et al, 2009). Not knowing the actual reference group that individuals use in making social comparisons is one of the limitations in their research. Their approach to overcome this problem is to create reference groups based on all the possible combinations of social economic factors, which is rather artificial and subject to measurement error and selection of these factors. The health variable used is dichotomised self assessed health, which loses a considerable amount of information that might have an effect on the results. Also, through the use of cross sectional data, it is not possible to detect a causal link between income inequality and health. A similar study has also been conducted in Japan. Modelling a large national sample of men and women aged 25–64 in Japan, Kondo et al (2008) find that relative income deprivation as measured by the Yitzhaki index is associated with poor self-rated health (dichotomised) and is independent of absolute income, so they conclude that relative deprivation may be one of the pathways accounting for the link between income inequality and health. The choice of reference groups and the loss of information due to dichotomising self assessed health again compromise the robustness of the results.

Several studies have also examined the relationship between income inequality and other health indicators rather than the commonly used self reported health measures and mortality. Dietze et al (2009) have examined the association between income inequality measured by Gini index and alcohol caused harm. Conducting a cross sectional regression analysis, a curvilinear relationship between income inequality and the rates of some types of alcohol-attributable hospitalisation and death at a local area level in Australia is found. As commented by the authors, the curvilinear patterns are incompatible with many monotonic trends shown in the existing literature. In the area of oral health, an attempt has been made in Brazil to evaluate the effect of income inequality measured by the Gini index (Celeste, et al, 2009). An oral health survey in Brazil in 2002–2003 containing 23,568 15–19 year-olds and 22,839 35–44 year-olds nested in 330 municipalities is adopted. The study found greater municipal income inequality was associated with worse oral health even after controlling for individual level variables. Analyzing the cross-national relations between income inequality and a number of cardiovascular diseases (CVD) and risk factors, Kim et al (2008) have found that income inequality has significant harmful effect at the national scale on CVD morbidity, mortality, and selected risk factors, particularly BMI/obesity. Multilevel modelling a representative nationwide survey of 645,835 individuals nested within 51 regions in the US, Fuller-Thomson and Gadalla's study (2008) reveals that state-level income inequality and individual income levels were significant independent predictors of activities of daily living limitations, even after controlling for individual characteristics such as adjusted income, education, age and race. In another study with a sample of Chinese adults interviewed in four waves over 9 years, Chen and Meltzer (2008) find in rural areas relative income and income inequality affect obesity and hypertension, but no evidence that the effects on hypertension operated through effects on obesity. The association is not supported among urban residents.

There are also studies that do not support the relative income hypothesis. After comparing 171,264 individuals across 69 countries by using random-coefficient, multilevel modelling, Jen, Jones and Johnston (2009) conclude that the Wilkinson's income inequality hypothesis regarding variations in health status is not supported, although logic regression analysis reveals that there are substantial differences between countries in self assessed health after taking account of age and gender, and individual income plays an important role. Investigating the relationship between neighbourhood income inequality and self assessed health in a high and growing Gini setting, Wong et al (2009) found no association between neighbourhood income inequality, median household income or household-level income and self assessed health in Hong Kong. Multilevel regression analysis is used to untangle the relationship. Their research suggests that the association of income inequality with self-assessed health may be largely attributable to confounding factors such as individual-level socio-economic and demographic characteristics. In Britain attempts to untangle the relationship between income inequality and health at the individual, regional and national level have been made using the British Householе Panle Survey data. Applying pooled, random and fixed effects ordered probit models, absolute income hypothesis was supported but not the relative income hypothesis, therefore, Lorgelly and Lindley (2008) argue that there is limited evidence of an effect of income inequality on health within Britain.

To summarise, the research findings are mixed and inconclusive with strong support of the relative income hypothesis mainly generated from using aggregate data, although both aggregate and individual data studies rely primarily on cross sectional data. In this chapter it is suggested that there are further insights to be made into the relationship between health, income and income inequality. More can be done using longitudinal data which can overcome many shortcomings inherited in cross sectional data and the availability of birth cohort data means that investigations across the life-course are possible.

5.3 Income inequality over time

Previous investigations into the relationship between income, income inequality and health have mostly considered contemporaneous relationships. This type of specification may not be detecting the true nature of the influence of income inequality on health. It is possible that using contemporaneous relationships raises an identification problem which has not been adequately dealt with previously. For example, Jones and Wildman (2008) investigate the relationship between income, income inequality and health using eleven waves of the British Household Panel Survey (BHPS). The modelling includes current self-assessed income and a measure of relative deprivation which is derived from current self-reported income.

If one considers the mechanisms through which income inequality may affect health then a contemporaneous relationship may not be valid. If the relative deprivation measure is detecting status then it may be that the impact on health takes time to develop. Being of low status may have a cumulative detrimental impact as time goes on. So the impact on health may be higher for older individuals than for younger individuals. Using longitudinal data, this study examines whether income inequality continues to have an effect in later waves when the cohort members grow older and if the impact also becomes severe. If the relationship is due to social cohesion, again it may take time for the impact on health to emerge – especially if it is believed that income inequality affects everybody negatively and the negative effects are possibly mitigated by high absolute income for those who are wealthiest. If the mechanism functions through the purchase of status goods, creating stress and hardship it would again be expected for the detrimental impact on health to take time to appear. The use of longitudinal data in the form of the BHPS has helped to mitigate these factors (Jones and Wildman, 2008). The observation of individuals over time allows some flexibility in the modelling but it still does not allow for the impact of inequality over the life-course. This may be especially important when health measures such as longstanding illness or self-assessed health are used as the outcome of interest. If income inequality initially affects mental health it may take time for these impacts to reveal themselves in more general health. If this is the case, a longitudinal survey with a good measure of mental health is required to detect such pathway. A commonly used mental health measures – Malaise Inventory collected in the NCDS provide the opportunity to examine this mechanism.

This research intends to investigate whether the impact of income inequality (and relative deprivation) during childhood affects the health of individuals during adulthood. The National Child Development Survey which is a cohort survey of individuals born during one week in March 1958, originating in the Perinatal Mortality Survey, is the best available data source to investigate this issue. Details of the data have been presented in chapter four. Nonetheless, it is worth noting that the investigation of income inequality in this chapter applies both permanent parental income and income data from each of the available waves to measure income inequality in both childhood and each stage of adulthood. Derived from a range of available parental characteristics, the permanent parental income data (Taylor, 2008) provides the best estimate of average income level during the entire childhood. There is good reason to believe that persistent poverty, rather than a single year measure, has the most impact on the child's health outcomes, for transitory deprivation may have less impact on the child than permanent deprivation. For adulthood income, equivalent household income is adopted for wave 4, 5 and 6. As these data are reported at a single point in time, they are inevitably subject to measurement error. However, the magnitude of the data size may eliminate the effect of measurement error if it does exist.

5.4 Estimation strategy

Income inequality is measured using a number of methods to allow for different formulations of the relative income hypothesis (Wagstaff and van Doorslaer, 2000). Three measures are used – the Gini coefficient, to measure overall income inequality; the relative deprivation measure of Hey and Lambert (1980) to measure individual deprivation; and the ratio of income to mean income to detect variations to the mean.

The Gini coefficient as a common income inequality measure can be found in numerous studies, therefore, will not be described here.

The Hey and Lambert (1980) measure suggests that the level of deprivation felt by an individual *i* gaining income y with respect to someone with income q is:

$$D(y;q) = \begin{cases} q - y : if & y < q \\ 0 \quad : if & y \geq q \end{cases} \tag{5.1}$$

The individual feels more deprived as the number of individuals in society with income q increases, so an overall measure of deprivation for the individual is given by weighting the measure by $dF(q)$ – the proportion of society with income q, and this gives:

$$D_i(y) = \int_0^{q^*} D(y;q)dF(q) \tag{5.2}$$

where q^* represents the highest income in society, and where its first derivative $D_i^{'}(y) < 0$ and its second derivative $D_i^{''}(y) \geq 0$. When this measure is normalised using mean income, then the sum of Di across those individuals being measured gives the Gini coefficient for that group. This measure of relative deprivation has been used previously to investigate the impact of deprivation on health, see Wildman (2003b) and Jones and Wildman (2008) for examples.

The use of a deprivation measure related to mean income has been used previously in a wide range of literature (Clark, 2003, Blanchflower and Oswald, 2004, Lindley and

Lorgelly, 2003). Here this research uses the ratio of a cohort member's own income to their regional mean income. This deprivation from the mean measure is increasing in cohort members' own income and greater than one for individuals with income greater than mean income.

When examining the impact of income inequality or deprivation it is important to have stated which reference group is being used. For the purposes of this work, regions, as defined in the data set, have been used as the reference group. There is no clear way to assign individuals to reference groups and the use of regions or other local aggregations is common practice in the literature.

5.5 Data

5.5.1 Health measures

The NCDS dataset has been described in the previous chapter. This study focuses on using a range of OLS, probit and panel data models to investigate the impact of income inequality on individual health. A range of health variables are considered, which are all self-reported but cover a range of general health, physical health and mental health outcomes. The self-assessed health (SAH) question was asked in a consistent format in waves 4, 5 and 6 of the NCDS. The question asked "how would you describe your health generally? Would you say it is: 1) excellent; (2) good; (3) fair; (4) poor". Measures of self-assessed health are correlated with mortality and morbidity and are widely used in the determinants of health literature (Idler and Kasl, 1991, Idler and Benyamini, 1997, Appels et al, 1996, Franks, 2003, Mossey, 1982, Wannamethee, 1991, Larsson, 2002, Grant, 1995, Singh-Manoux, et al, 2007, Jylha, 1998, Benyamini, 2003, Spiers, 2003, Kaplan, et al, 1993). Self-assessed health is dichotomised into an indicator of good health.

In addition to SAH, longstanding illness is also used as an indicator of health as well as the mental health measure – Malaise Inventory. Longstanding illness is a binary choice question asking respondents whether or not they suffer from chronic conditions. This indicator is commonly used in the health economics literature (see example, Macintyre, Ford and Hunt, 1999, Manor, Matthews and Power, 2001, Soskolne, and Manor, 2010, Jordan, Ong, and Croft, 2000). Studies show that longstanding illness is highly correlated with SAH (Manor, Matthews and Power, 2001). Malaise Inventory is designed by the

Institute of Psychiatry from the Cornell Medical Index developed by Rutter, Tizard and Whitmore (1970). It is a self completion scale for assessing psychiatric morbidity and includes a 24-item list of symptoms such as anxiety, irritability, depressed mood and psychosomatic illness. Each question requires a yes/no answer assigned with a score of 1 or 0, respectively. Thus, the total score of the inventory range from 0 to 24. High scores are associated with poor mental health and scores above 7 indicate those individuals at risk of depression (some suggests 5 or 6 as the critical value).

5.5.2 Region variables

Region variables indicating where the respondents were living are used to construct the basis of the relative income indicators – Gini index, relative deprivation, and deprivation from the mean. This research, therefore, assumes that individuals compare themselves with people of the same age (due to thefact that they are from the same cohort) living in the same region. Different relative income indicators create variations among individuals from different sources. When the Gini index is constructed, the variation in the variable is coming from the income distribution in each region – meaning people will have the same Gini variable in the same region. When relative deprivation is formed, the variation in the variable is due to the respondents' own income compared with the number of people with income above his or her income. When deprivation from the mean is constructed, the variation in the variable is the result of respondents' own income compared with the mean income in each region.

5.6 Results

Three different modelling approaches – pooled OLS model, random effect panel data model and probit model are applied on general health indicator SAH and longstanding limiting illness, whereas pooled OLS model and panel data model are used for the mental health indicator – Malaise Inventory. For each combination of models and indicators, three different measures of the relative income are tested: Gini, relative deprivation and deprivation from the mean. In addition, entire sample as well as male and female-only samples are estimated. Seventy-two types of models were estimated and for each model, the relative income measures for both cohort members own income and their parental income are added one at a time to examine their individual effect. Therefore, there are in total 216 models – 81 for the estimation of SAH, 81 for the longstanding illness regressions and 54 for the Malaise Inventory estimations.

As the main interest of this chapter is to investigate the relative income hypothesis, this section only presents the effects of income variables (both wave specific cohort members' own income and parental income). The complete results can be found in the appendix 3. Each health variable is organised into a table for all types of models tested. In each table, the first row specifies which income variables are included. Model 1 represents regressions with only the wave specific cohort member's own income variable, Model 2 are regressions that have added a wave specific cohort member's own relative income measure in addition to Model 1, and Model 3 has another two more variables than Model 2: parental income and a parental relative income measure. The first column explains which type of model and which type of relative income measure are used. The sign (+) indicates the relevant variable has a positive sign whereas (-) indicates the opposite. Relative income variables that are significant are highlighted in *Italic*. The relationship between income and health has been discussed widely and it is often argued to be non-linear (Jones and Wildman, 2008). The models have adopted the view of a non-linear relationship with absolute income all measured in log form.

Table 5.1 presents the impact of income-related variables on SAH for all the three models using three different income inequality measures. Wave specific cohort members' own income is almost always significant when it is the only income variable included in the regression (Model 1) with the only exception on female model in panel data model. Parental income is significant in all the models when Gini is used as the relative income measure, and for models of entire sample and male-only sample when the relative income variable is calculated by deprivation from the mean.

In the models on SAH (Table 5.1) when relative deprivation is tested as the relative income variable, almost none of the income-related variables are significant in model 2 and model 3. Relative income variables are not significant in most of the models and among the only few significant ones, some of them are even displaying an unexpected sign: Gini measured wave specific cohort member's own relative income for female-only sample using panel data and probit models shows the relationship between Gini wave specific cohort member's own income and SAH is positive. In model 3 when examining relative parental income, significant results are found in models of the entire sample using pooled OLS of Gini index (in this model, male-only sample is also significant) and deprivation from the mean, and panel data modelling of deprivation from the mean.

Table 5.1, Summary results of income inequality models on SAH

SAH			Model 1	Model 2		Model 3			
			Wave specific cohort member's own income	Wave specific cohort member's own income	Relative Wave specific cohort member's own income	Wave specific cohort member's own income	Relative Wave specific cohort member's own income	Parental Income	Relative Parental Income
Gini	Pooled OLS Model	Entire Sample	(+)***	(+)***	(+)	(+)***	(+)	(+)***	(-)*
		Male-only	(+)***	(+)***	(-)	(+)*	(-)	(+)**	(-)*
		Female-only	(+)*	(+)*	(+)	(+)*	(+)	(+)***	(-)
	Panel Data Model	Entire Sample	(+)***	(+)***	(+)	(+)**	(+)	(+)***	(-)
		Male-only	(+)**	(+)**	(-)	(+)	(+)	(+)*	(-)
		Female-only	(+)	(+)	(+)**	(+)	(+)	(+)**	(-)
	Probit Model	Entire Sample	(+)***	(+)***	(+)	(+)**	(+)	(+)***	(+)
		Male-only	(+)**	(+)**	(-)	(+)	(-)	(+)**	(-)
		Female-only	(+)*	(+)*	(+)*	(+)*	(+)	(+)***	(-)
Relative Deprivation	Pooled OLS Model	Entire Sample	(+)***	(-)	(-)	(-)	(-)	(+)	(-)
		Male-only	(+)***	(-)	(-)*	(-)	(-)	(-)	(-)
		Female-only	(+)**	(-)	(-)	(+)	(-)	(+)	(-)
	Panel Data Model	Entire Sample	(+)***	(+)	(-)	(+)	(-)	(+)	(-)
		Male-only	(+)**	(+)	(-)	(+)	(-)	(-)	(-)
		Female-only	(+)	(+)	(-)	(+)	(+)	(+)	(-)
	Probit Model	Entire Sample	(+)***	(+)	(-)	(+)	(-)	(+)	(-)
		Male-only	(+)**	(-)	(-)	(+)	(-)	(-)	(-)
		Female-only	(+)*	(+)	(-)	(+)	(-)	(+)	(+)
Deprivation From The Mean	Pooled OLS Model	Entire Sample	(+)***	(+)***	(+)	(+)**	(+)	(+)**	(-)**
		Male-only	(+)***	(+)*	(+)	(+)	(+)*	(+)*	(-)
		Female-only	(+)**	(+)*	(-)	(+)*	(-)	(+)	(-)
	Panel Data Model	Entire Sample	(+)***	(+)*	(+)	(+)	(+)	(+)**	(-)*
		Male-only	(+)**	(+)	(+)	(-)	(+)	(+)*	(-)
		Female-only	(+)	(+)	(-)	(+)	(-)	(+)	(-)
	Probit Model	Entire Sample	(+)***	(+)***	(-)	(+)**	(+)	(+)**	(-)
		Male-only	(+)**	(+)	(+)	(+)	(+)	(+)*	(-)
		Female-only	(+)*	(+)**	(-)	(+)*	(-)	(+)	(-)

*denotes significance level of 10%; **denotes significance level of 5%; ***denotes significance level of 1%
Italic indicates significant income inequality results

Table 5.2 presents the impact of income-related variables on longstanding illness for all the three models using three different income inequality measures. When examining longstanding illness as the health indicator, wave specific cohort member's own income shows a similar pattern in model 1 – they are significant in all the whole samples and male only samples, but not in female only samples. In model 2, deprivation from the mean as indicator of relative income seems to have the most impact: it is significant for the entire sample in both pooled OLS model and panel data model and for all three types of sample in the probit model. In model 3, relative parental income seems to take effect instead of relative wave specific cohort member's own income when measuring relative income by relative deprivation or deprivation from the mean. However, the sign seems to be mixed – positive for men and negative for women. It is expected that the higher income inequality, the more likely to suffer from longstanding illness, which is reflected by the sign for men. The negative sign for women is somehow unexpected. Wave specific relative income is only significant in some models of model 3 applying deprivation from the mean.

Table 5.3 presents the impact of income-related variables on Malaise Inventory for all the three models using three different income inequality measures. When examining Malaise Inventory as the psychological health indicator, probit model is not applicable. Wave specific cohort member's own income is significant in most of the models except in model 2 and model 3 when relative deprivation is used as the relative income measure. Relative wave specific cohort member's own income, on the other hand, is significant in model 2 when using relative deprivation and deprivation from the mean in the entire sample (although also significant in a pooled OLS model using relative deprivation for female-only sample). In model 3, the relative income measures are again only significant in a few models when using relative deprivation and deprivation from the mean.

Table 5.2, Summary results of income inequality models on longstanding illness

Longstanding illness			Model 1	Model 2		Model 3			
			Wave specific cohort member's own income	Wave specific cohort member's own income	Relative Wave specific cohort member's own income	Wave specific cohort member's own income	Relative Wave specific cohort member's own income	Parental Income	Relative Parental Income
Gini	Pooled OLS Model	Entire Sample	(-)**	(-)**	(-)	(-)**	(-)	(-)	(+)
		Male-only	(-)***	(-)***	(+)	(-)***	(+)	(-)	(+)
		Female-only	(-)	(-)	(-)	(-)	(-)	(-)	(+)
	Panel Data Model	Entire Sample	(-)*	(-)*	(-)	(-)**	(+)	(-)	(+)
		Male-only	(-)**	(-)**	(+)	(-)***	(+)	(-)	(+)
		Female-only	(-)	(-)	(-)	(-)	(-)	(-)	(+)
	Probit Model	Entire Sample	(-)*	(-)*	(-)	(-)*	(+)	(-)	(+)
		Male-only	(-)	(-)	(-)	(-)*	(+)	(-)	(+)
		Female-only	(-)	(-)	(-)	(-)	(-)	(-)	(+)
Relative Deprivation	Pooled OLS Model	Entire Sample	(-)**	(-)	(+)	(-)	(-)	(+)	(+)
		Male-only	(-)***	(+)	(+)	(-)	(-)	(+)**	(+)***
		Female-only	(-)	(-)	(+)	(-)	(+)	(-)**	(-)**
	Panel Data Model	Entire Sample	(-)*	(-)	(+)	(-)	(-)	(+)	(+)
		Male-only	(-)**	(-)	(+)	(-)	(-)	(+)**	(+)**
		Female-only	(-)	(+)	(+)	(-)	(+)	(-)**	(-)*
	Probit Model	Entire Sample	(-)*	(-)	(+)	(-)	(-)	(+)	(+)
		Male-only	(-)**	(+)	(+)	(-)	(-)	(+)**	(+)***
		Female-only	(-)	(+)	(+)	(-)	(+)	(-)*	(-)
Deprivation From The Mean	Pooled OLS Model	Entire Sample	(-)**	(-)*	(+)**	(-)***	(+)**	(-)	(-)
		Male-only	(-)***	(-)***	(+)	(-)***	(+)	(-)**	(+)**
		Female-only	(-)	(-)**	(+)	(-)*	(+)	(+)***	(-)***
	Panel Data Model	Entire Sample	(-)*	(-)***	(+)*	(-)***	(+)*	(-)	(+)
		Male-only	(-)**	(-)**	(+)	(-)***	(+)	(-)**	(+)**
		Female-only	(-)	(-)*	(+)	(-)	(+)	(+)**	(-)***
	Probit Model	Entire Sample	(-)*	(-)**	(+)***	(-)***	(+)***	(-)	(+)
		Male-only	(-)**	(-)***	(+)**	(-)***	(+)**	(-)**	(+)**
		Female-only	(-)	(-)**	(+)*	(-)*	(+)	(+)**	(-)**

*denotes significance level of 10%; **denotes significance level of 5%; ***denotes significance level of 1%
Italic indicates significant income inequality results

Table 5.3, Summary results of income inequality models on Malaise Inventory

Malaise Inventory			Model 1	Model 2		Model 3			
			Wave specific cohort member's own income	Wave specific cohort member's own income	Relative Wave specific cohort member's own income	Wave specific cohort member's own income	Relative Wave specific cohort member's own income	Parental Income	Relative Parental Income
Gini	Pooled OLS Model	Entire Sample	(-)***	(-)***	(+)	(-)***	(+)	(-)***	(-)
		Male-only	(-)***	(-)***	(+)	(-)***	(+)	(-)	(-)
		Female-only	(-)***	(-)***	(-)	(-)***	(-)	(-)**	(-)
	Panel Data Model	Entire Sample	(-)**	(-)**	(+)	(-)**	(+)	(-)**	(-)
		Male-only	(-)***	(-)***	(+)	(-)***	(+)	(-)	(-)
		Female-only	(-)	(-)	(-)	(-)	(-)	(-)**	(-)
Relative Deprivation	Pooled OLS Model	Entire Sample	(-)***	(+)	_(+)***_	(+)	_(+)**_	(+)	_(+)**_
		Male-only	(-)***	(+)	(+)	(+)	_(+)*_	(+)	(+)
		Female-only	(-)***	(+)	_(+)***_	(+)	_(+)**_	(+)	(+)
	Panel Data Model	Entire Sample	(-)**	(+)	(+)	(-)	(+)	(+)	(+)
		Male-only	(-)***	(+)	_(+)**_	(+)	(+)	(+)	(+)
		Female-only	(-)	(+)	(+)	(+)	(+)	(+)	(+)
Deprivation From The Mean	Pooled OLS Model	Entire Sample	(-)***	(-)***	_(+)***_	(-)***	(+)	(-)***	_(+)**_
		Male-only	(-)***	(-)***	(+)	(-)**	(-)	(-)	(+)
		Female-only	(-)***	(-)***	(+)	(-)***	(+)	(-)**	_(+)**_
	Panel Data Model	Entire Sample	(-)**	(-)***	_(+)***_	(-)***	_(+)**_	(-)**	_(+)**_
		Male-only	(-)***	(-)***	(+)	(-)*	(-)	(-)	(+)
		Female-only	(-)	(-)	(+)	(-)	(+)	(-)**	_(+)***_

*denotes significance level of 10%; **denotes significance level of 5%; ***denotes significance level of 1%
Italic indicates significant income inequality results

An example is chosen to give an indepth demonstration of the modelling of health and relative income. The model presented is the panel data model of Malaise Inventory using the deprivation from the mean as the relative income measure for the entire sample (Table 5.4). The dependent variable is Malaise and both own income and parental income are included together with their relative forms measured by the deprivation from the mean. All of the three models include the same set of socio-demographic variables for each individual. In addition, Model 1 include only the individual's own absolute income measured in log form, Model 2 adds individual's own relative income measured by deprivation from the mean in addition to Model 1, and Model 3 adds two more forms of income to Model 2 – parental absolute log income and parental relative income measured by deprivation from the mean. The reference group is married female in social class III manual with no education, reside in the southeast of England and was born in London or southeast of England.

Table 5.4 Panel data model of Malaise Inventory using deprivation from the mean

	Model 1		Model 2		Model 3	
Malaise Inventory	Coef.	Robust	Coef.	Robust	Coef.	Robust
Social class I – professional	-0.161	0.102	-0.175*	0.102	-0.180	0.125
Social class II – intermediate	-0.146**	0.069	-0.164**	0.069	-0.128	0.087
Social class III – skilled non-	-0.155**	0.066	-0.153**	0.066	-0.227***	0.083
Social class IV – skilled manual	0.013	0.069	0.017	0.069	0.008	0.086
Social class V – unskilled	-0.008	0.122	0.005	0.122	-0.063	0.161
Have child	0.153***	0.049	0.126***	0.049	0.112*	0.062
Marital status – single	0.129**	0.051	0.147***	0.051	0.068	0.062
Marital status – separated	0.731***	0.135	0.729***	0.135	0.771***	0.172
Marital status – divorced	0.479***	0.089	0.486***	0.088	0.455***	0.114
Marital status – widowed	1.015**	0.411	1.009**	0.410	0.744*	0.452
Education – cse	-0.926***	0.131	-0.926***	0.131	-1.023***	0.175
Education – ogcse	-1.512***	0.113	-1.511***	0.113	-1.633***	0.151
Education – alevel	-1.744***	0.122	-1.744***	0.122	-1.923***	0.160
Education – diploma	-1.868***	0.124	-1.870***	0.124	-1.939***	0.165
Education – degree	-2.008***	0.127	-2.032***	0.127	-2.074***	0.169
North	-0.059	0.145	-0.067	0.145	-0.048	0.175
Yorkshire&Humberside	-0.140	0.090	-0.154*	0.090	-0.178	0.114
East midlands	-0.062	0.098	-0.071	0.098	-0.113	0.124
East Anglia	-0.158*	0.093	-0.166*	0.093	-0.168	0.114
Southwest	-0.149*	0.084	-0.161*	0.084	-0.208**	0.106
West midlands	-0.012	0.052	-0.012	0.052	0.036	0.064
North west	0.051	0.114	0.045	0.114	0.036	0.147
Wales	0.103	0.165	0.087	0.165	0.189	0.208
Scotland	-0.170	0.155	-0.171	0.156	-0.208	0.183
North west at birth	-0.089	0.127	-0.095	0.127	-0.183	0.177
North at birth	0.157	0.149	0.152	0.149	-0.075	0.213
East&west Riding at birth	-0.005	0.119	-0.007	0.119	-0.165	0.161
North midlands at birth	-0.164	0.123	-0.161	0.123	-0.199	0.159
East at birth	-0.248*	0.112	-0.243**	0.112	-0.268*	0.137
South at birth	-0.002	0.131	-0.001	0.131	0.015	0.163
South west at birth	-0.009	0.139	-0.008	0.139	-0.020	0.178
Midlands at birth	-0.078	0.107	-0.086	0.107	-0.250*	0.143
Wales at birth	-0.127	0.180	-0.128	0.180	-0.320	0.238
Scotland at birth	-0.036	0.164	-0.042	0.164	-0.216	0.209
Male	-0.946***	0.058	-0.964***	0.058	-0.985***	0.071
Waved 5	-0.340***	0.046	-0.511***	0.066	-0.451***	0.083
Waved 6	0.669***	0.061	0.605***	0.064	0.634***	0.079
Own income	-0.069**	0.027	-0.165***	0.037	-0.150***	0.047
Deprivation from the mean -			0.187***	0.047	0.145**	0.059
Parental income					-3.287**	1.327
Deprivation from the mean -					2.583**	1.232
_cons	5.230***	0.266	6.062***	0.349	20.054***	5.495
R square	within = 0.0629 between = 0.1000 overall = 0.0896		within = 0.0638 between = 0.1003 overall = 0.0899		within = 0.0651 between = 0.1138 overall = 0.1008	
Prob > chi2	Wald chi2(38) = 0.000		Wald chi2(39) = 0.000		Wald chi2(41) = 0.000	

***denotes significance level of 90%, **denotes significance level of 95%, ***denotes significance level of 99%**

It appears that the inclusion of parental income and relative income variables increases the R squared as seen from Model 1 to Model 3. The absolute form of individual's own income is significant in all three models. The magnitude of the effect of individual's own income on mental health increases when adding other forms of income – its relative form and the parental absolute and relative income. All the other forms of income are also significant at 95%. The negative sign of absolute income indicates people with lower income tend to be more likely to have mental disorder whereas the positive sign of relative income suggests a higher level of income inequality leads to more possibilities of having mental disorders. The application of individual level data from a longitudinal point of view has overcome the potential bias from using aggregate cross-sectional data, which provides more robust results, and the finding in this example provides evidence supporting the relative income hypothesis. It seems that the effect of income inequality on individual's mental health exists for their own income as well as their parental income. The empirical study suggests that using individual level panel data may help capture the impact of income inequality, especially for mental health that is generally considered more likely to be influenced by unequal income distribution.

The two wave indicators are significant in all three models. Compared with being in wave 4, cohort members in wave 5 are significantly less likely to suffer from mental problems whereas being in wave 6 significantly increases the chance of having a mental disorder. This finding indicates cohort members' mental health has a U-shaped relationship with their age – being in their 30's is mentally healthier than in their 20's and as they move into their 40's their mental status is then worse than in the 20's. There may be a number of reasons for this. It may suggest that people in their 30's are generally in better mental health as they probably have less burden in life than people in other age groups (for example, people in the 20's are more likely to be in the transition period which causes more mental distress) whereas people in the 40's are more likely to have a family to support and more work loads. The U-shaped relationship can also be that the income of the cohort members in their 30's is more equally distributed, which is the case from the examination of the data, so they are less likely to suffer from mental disorders as suggested by the relative income theory.

There are also a number of other significant predicators of mental disorder. Education appears to be significant in all models and the negative sign suggests people with any level of education are less likely to suffer from mental disorder. The magnitude of the education effect increases with the level of education indicating the higher education an individual achieves the less likely he or she has any mental disorder.

Cohort members who have children tend to be more likely to have mental problem, which is reasonable as the burden of raising children can be an important factor causing mental stress. The effect of having children has, however, diminished after controlling absolute and relative parental income in Model 3. This interesting observation may suggest the support of cohort members' parents may ease their stress of raising a child, therefore, having a child becomes less of a predicator of suffering from mental disorders.

In general, being any other category of marital status tends to have more chances of mental problems compared with the reference married category. Being male is consistently significant to be less likely to suffer from mental disorders in all three models, which is in agreement with the findings in Chapter 7. Generally, being in higher social class leads to less chance of suffering from mental problems and being in lower social class appears to be the opposite with social class III manual as the reference group. In addition, there are some significant location variables, but in general the location factors' effect is minimal.

The example shown in Table 5.4 may form some evidence supporting the relative income hypothesis – it suggests that applying the panel data model on mental health variables may better capture the effect of relative income which may be overlooked when cross-sectional data at a point in time is used that cannot observe lagged effect or general health is used that may be not sensitive enough to the effect of income inequality.

The results across different models shown in Tables 5.1 - 5.3 display a variety of significance and signs in absolute income and relative income. This phenomenon, on one hand, may be showing the inconclusiveness of the relative income hypothesis, which will need further testing; on the other hand, the situation may also be the result of some modelling issues, in particular, the models may suffer from multicollinearity problems caused by the inevitable correlation between absolute income and relative income measures in the models. However, the estimations would be biased if absolute income were excluded in the models as any investigation of the relative income hypothesis needs to control for the absolute income in order to separate the effect of absolute income on health (which is widely accepted) from any possible effect of relative income on health.

Potential consequences of multicollinearity in the models are, therefore, unavoidable. This is precisely a substantial difficulty that the research on relative income hypothesis is currently facing and no research methods have been found to overcome this problem. This research has shown that using longitudinal data on mental health variable can provide some robustness in modelling and may be one way of addressing the issue. More advanced modelling approach needs to be developed to overcome the potential multicollinearity issue that may lead to the lack of robustness in the results.

5.7 Summary

To conclude, the relative income hypothesis in the investigation of health inequalities of the 1958 cohort members in Britain seems to only hold for models using relative deprivation and deprivation from the mean as the relative income measures for long standing illness and the Malaise Inventory.

In general, cohort member’s own income is showing significant effect in almost all the models of the three health indicators in model type 1. For model type 2 where cohort member’s own relative income is included, and model type 3 where both cohort member’s own relative income and parental relative income are included, in addition to absolute income, income inequality measured by Gini appears to be insignificant in almost all the models tested whereas relative deprivation and deprivation from the mean seem to perform better in modeling the relationship between health and relative income.

In terms of health indicators, longstanding illness and Malaise Inventory have more significant associations with income inequality than SAH. If the conventional 95% is chosen as the confidence level, with regard to the modeling of SAH, only the pooled OLS in model 3 for the entire sample shows a significant relationship between parental income inequality and SAH where income inequality is measured by deprivation from the mean. However, when testing the relationship between income inequality and longstanding illness, more significant correlations are observed: in model 2, only some of the models using deprivation from the mean as income inequality measure display a significant relationship between cohort member’s own income inequality and longstanding illness; and in model 3, both relative deprivation and deprivation from the mean measures of income inequality tend to be significant in some models tested, however, cohort member's own income inequality appears to be only significant in models using deprivation from the mean.

There are, however, some unexpected signs observed in model 3 of longstanding illness when parental income is concerned. When relative deprivation is the measure of income inequality, men's likelihood of having longstanding illness is positively related with parental income in all three types of modeling in model 3; whereas women's likelihood of suffering from longstanding illness is negatively associated with parental income inequality. When deprivation from the mean is used as the income inequality measure, the possibility of suffering from longstanding illness is positively associated with parental income and negatively associated with parental income inequality for women in all three types of modeling in model 3. The unexpected signs need further investigation as the types of longstanding illness may be playing a role.

A number of relative income variables in both model 2 and model 3 are significant in the modelling of Malaise Inventory when relative deprivation and deprivation from the mean are used. For relative deprivation, pooled OLS model type seems to be more sensitive to cohort members own income inequality and for deprivation from the mean, both pooled OLS and panel data models appear to perform equally well.

The results indicate the types of income inequality indicator play an important role in determining the significance of the relative income. A study on income, income inequality and health shows similar findings that the sign and significance of the effect of relative income are dependent on the reference group chosen and how relative income is measured (Gravelle and Sutton, 2009). It is also inevitable that the results are affected by the choice of a reference group as the base to form the indicator of income inequality. A study by Salti (2010) on relative deprivation and mortality in South Africa has provided consistent evidence in favour of age as reference group suggesting that people are more likely to compare within their own cohorts with respect to relative income. In this study since respondents are from the same cohort, age is naturally used as reference group in every comparison; however, the results continue to be inconclusive. It seems that the use of different income inequality indicators, health indicators and types of modelling all play a role in investigating the relationship between health and income inequality. A more advanced modelling approach is required to overcome the potential multicollinearity issue that leads to the lack of robustness in the results. Further research may also be carried out to examine whether using different reference groups has any effect on this relationship.

In the complete regression models (which can be found in the Appendix 4), a number of other covariates also display significant effects on the health indicators, among which education, whether having children, social class and marital status tend to be significant for most of the models. Education consistently displays significant effects on all the health indicators in all models. Increase in education level raises the likelihood of reporting better SAH, and reduces the possibilities of suffering longstanding illness and mental illness. Whether the respondents have children has significant effects on the Malaise Score for the whole population and females only. Whether the respondents have children has significant impacts on longstanding illness for the whole population and males and females only. Respondents with children tend to be less likely to have mental illness and longstanding illness. This can work in both ways: children may play a positive part in life – bringing joy to the parents, giving parents extra motivation to look after their own health; and on the other hand, parents with less mental or chronical conditions are more likely to have children. Further research may investigate whether the number of children may have an effect on the health of the parents as it is possible that larger numbers of children increase the financial and emotional stress for the parents which cannot be good for their health.

Part II. Health and Wellbeing

"Happiness is nothing more than good health and a bad memory."

--Albert Schweitzer [2]

[2] Albert Schweitzer(1875 – 1965)

Chapter Six: Health, psychological wellbeing and happiness

6.1 Introduction

This chapter extends the investigation of inequalities in health to a broader sense of health – mental health and psychological wellbeing, and through which suggests implications for the ultimate goal of life – happiness. There is so far no study that has provided any framework of the relationship between these concepts and despite the WHO definition of health being commonly used, studies on health inequalities have rarely included all the aspects of health suggested in the definition. This chapter tries, for the first time, to build a conceptual model on health in the broad sense as well as happiness, which will then be used as the foundation for the empirical studies of the next chapter.

6.2 Background

If we consider health as the necessity of a flourishing life (Culyer and Wagstaff, 1993), then happiness can be viewed as the utility obtained in life. According to German Theologian Albert Schweitzer, happiness is no more than good health and a bad memory – not everyone wants to have a bad memory, but good health is probably something nobody would refuse. The bonus of happiness that good health brings is then even more appealing. The link between health and happiness is often found in studies, and researchers tend to agree that happiness is positively associated with psychological health and physical health. Subramanian, et al (2005) studying the US population have found that poor health and unhappiness are highly positively correlated among individuals, and communities that are healthier tend to be happier and vice versa. Happiness is found to be inversely associated with mortality, although after controlling for physical activity and prevalent morbidity, this relationship is no longer significant; so the authors then conclude that the predication of happiness for lower mortality may partly be mediated by more physical activity and lower morbidity (Koopmans, et al, 2010). The relationship between health and happiness are more often found to be through psychological wellbeing and mental health. Linear correlations between happiness and perceived stress are found to be significant indicating an inverse relationship between the two (Schiffrin and Nelson, 2010). Summarised by Michalos (1991), people with low levels of anxiety and high level of physical health are more likely to be happy, although material conditions are not mentioned to be associated with happiness. It is, thus, safe to assume that suffering from poor psychological or physical health has a negative impact on individuals' happiness level, while income level may not play a major or direct role in promoting happiness. National survey results on happiness have reflected this. According to the opinion poll results of the market research agency GfK, Britain's happiness levels are declining compared with 50 years ago despite the fact that Britons now are three times richer. In the same opinion poll, people were also asked whether the government's prime objective should be the "greatest happiness" or the "greatest wealth" and a remarkable 81% wanted happiness as the goal with only 13% choosing greatest wealth. How to increase people's health and income has been at the top of governments' agendas in the last century, but following the dramatic improvement of physical health and income in the developed nations, we may ask the ultimate question: do people feel happy and have their happiness levels increased with the improvement of health and wealth? The answer is obviously negative. The British findings reflect that a very important part of individual welfare, happiness, has been overlooked. It seems the governments have succeeded in delivering greater wealth but failed to translate it into extra happiness. This has also been confirmed by many studies showing that the increases in income in the developed countries over the last century do not seem to be accompanied by increases in the happiness level (Tella, 2008). The well-known Easterlin Paradox is one of the most discussed findings on the association between income and happiness: although there is a correlation between individuals' wealth and happiness at a point in time, the strong correlation between happiness and income may neither hold across countries nor over time (Easterlin, 1974).

These findings strike a new concern for the government and policy makers. As some researchers have put it, governments may in the future also be judged on their performance in making people happy. For this reason, studies on happiness have grown rapidly in the recent years and in this research, the focus is on the relationship between health and happiness through the link from psychological wellbeing and mental health. By doing so, the research results of health can then be extended to give implications for the study of happiness and provide insight into how to improve the nation's happiness level.

6.3 Literature review

In industrialised countries, over 40 percent of the total burden of disease is now related to mental disorders (Melchior, 2007). The World Health Organisation has rated depression as one of the top three causes of disability and morbidity in the developed world (WHO, 1999). In the UK mental health problems have become one of the leading causes of ill health, disability and mortality since late 1990s, bringing distress to individuals and families and constituting a substantial and costly public health burden (Department of Health, 1999).

Mental health and physical health are recognised to be inseparably correlated for achieving a more complete state of wellness (WHO, 2008). It is already well established that poor mental health is a direct cause of mortality and morbidity. Mental, neurological, and substance use (MNS) disorders are prevalent in all regions of the world and contribute to 14% of the global burden of disease (WHO, 2008). Mental disorders such as depression, alcohol use disorders and psychoses (e.g. bipolar disorder and schizophrenia) are among the 20 leading causes of disability, especially for women aged 15–44 years, where they make up 3 of the 10 leading causes of disease burden in low- and middle-income countries, and 4 of the leading 10 in high-income countries (WHO, 2004a). Depression was the fourth largest contributor to the disease burden in 1990 and is expected to be the second largest after ischemic heart disease by 2020. In contrast to the overall health gains of the world's populations in recent decades, the burden of mental illness has grown (WHO, 2004b).

Apart from contributing largely to the global disease burden, poor mental health is also a direct cause of poorer physical health, and economic and social outcomes, which then in turn leads to social and economic inequalities. Having the same pattern as physical health, mental health problems are also more common in areas of deprivation with poor mental health being consistently associated with unemployment, less education and low income or material standard of living (WHO, 2009).

Socioeconomic inequalities in mental health are evident worldwide. Studying the Brazilian population, Marín-León et al (2007) find that common mental disorders are unevenly distributed and significantly more frequent in socially disadvantaged individuals. Similar results are also found in a Norwegian study, where a strong social gradient in mental health is observed as the prevalence of psychological distress increasing by decreasing social status (Dalgard, 2008). In a review of studies on mental health, common mental disorders are found to be significantly more frequent in socially disadvantaged populations, especially among people with poorer education, employment and material circumstances in the UK as well as other countries (Fryers, 2003). There have also been many attempts to specifically disentangle the relationship between income and mental health in Britain. Using CI approach, income-related inequalities in mental health are found evident in Britain, and as Mangalore et al (2007) point out much of the observed inequality is probably due to factors associated with income and not due to the demographic composition of the income quintiles, therefore, these inequalities are potentially avoidable. A longitudinal analysis of mental health mobility using 11 waves' data in Britain by Hauck and Rice (2004) reveals that the existing inequality in mental health is not just one point in time but over time with more disadvantaged groups experiencing greatest persistence and more periods of ill-health. In addition to SES factors, birth weight is also found to be a possible cause of mental disorder. Gale and Martyn (2004) reveals that impaired neurodevelopment during foetal life may increase susceptibility to depression.

In some studies, mental health is also referred to as psychological wellbeing, while in others, these two are reported to be highly correlated. Shields and Price (2001) use the term "psychological health" in their research, which is defined by GHQ 12 – an indicator primarily used for screening mental disorders. On the other hand, Gardner and Oswald (2006b) apply the term "mental wellbeing" to refer to happiness. Whether the respondent is feeling generally happy is often among the questions asked to evaluate a person's mental health or psychological wellbeing. Some researchers have then linked mental health and psychological wellbeing with happiness because of their close relationship, with GHQ as their measure (Gardner and Oswald, 2006a).

Similar to mental health, happiness is also often found to be affected by absolute income across different countries in the world (Ball and Chernova, 2008). Windfalls through lottery wins and inheritance of material wealth are found to bring people happiness, although whether these happiness gains wear off over time remains unclear (Gardner and Oswald, 2001, 2006b). In addition to income, education is found to affect happiness both directly and indirectly worldwide (Castriota, 2006). In a Swedish sample happiness is reported to be positively related with income, health and education and negatively related with unemployment, urbanisation, being single and male gender and having a U-shaped relationship with age, with happiness being lowest in the age-group 45–64 years (Gerdtham and Johannesson, 2001). An extensive review on the economics of happiness studies across different countries has shown evidence that poor health, separation, unemployment and lack of social contact are all strongly negatively associated with happiness (Dolan et al, 2008), although panel data are needed to overcome problems with some contradictory evidence, concerns over the impact on the findings of potentially unobserved variables and the lack of certainty on the direction of causality as some other studies show that happiness does protect against becoming ill (Veenhoven, 2008). Drawing data on 15,000 randomly sampled individuals from 16 countries, Blanchflower and Oswald's paper provides evidence suggesting that happier nations report fewer blood-pressure problems (Blanchflower and Oswald, 2007). In another across country comparison of 15 countries, Peiro's study (Peiro, 2006) also supports the previous findings of the strong association of age, health and marital status with happiness, although income seems to have a weaker relationship with happiness. Studying a sample of the Dutch population, an indirect effect of body mass index is found on happiness via perceived health, and being married is reported to positively affect happiness (Cornelisse-Vermaat, et al., 2006).

Mean dependent regression approach is often found to be the most popular method in the investigation of happiness data, which may not be sufficient to provide information for policy makers. Cross sectional data at a point in time is also subject to many drawbacks as suggested by the literature review. In this research, new methods are used in the study of psychological wellbeing and happiness which will overcome the problem by studying the entire distribution through time.

6.4 A conceptual model of health and happiness

Happiness has been a topic of philosophic discussion for thousands of years as it is often believed that happiness is the purpose of life and the ultimate aim of human existence - everyone wants to be happy, regardless of gender, age, race or social background. Recently there has been growing interest in the study of happiness, and some even suggest that happiness be used as an alternative to GDP as a measure of economic progress or welfare, although also disagreed by many (see discussion in Johns and Ormerod, 2007). For economists, there are more important reasons to carry out happiness research. The fundamental building block on which economic analyses are based is the preferences revealed in choices, which is measured in terms of utility. However, there is a general lack of clarification on how utility is conceptualized. Although some economists, such as Frey and Stutzer (2002) and Easterlin (1974), explicitly equate utility with happiness, others have argued that it is important to distinguish between decision utility and experienced utility as labelled by Kahneman et al. (1997). The former constitutes utility the way economists commonly use it, i.e. utility as revealed in choices; the latter is more associated with happiness and feelings of pleasure and pain. When examining the relationship between health and happiness, it probably has more to do with the experience side of utility than choice utility; therefore, a distinction between the two is necessary. As such, happiness research may also help to improve the understanding of utility in economics and can even be used to test different economic theories and their predictions (Frey and Stutzer, 2005).

The attention to the topic of happiness by social scientists has mostly concentrated on how to measure happiness and what relationship it has with national wealth and social policy. However, there is no structured conceptual modelling on what factors systematically affect happiness and how they interact with each other. Obviously it is fair to say that each individual has their own understanding of happiness, own experience of being happy and own way of achieving it, but if we want to address this at the population level, we need to provide a whole framework surrounding this issue that can be applied to the general public. Because of the great importance and central study interest of health and its close association with happiness, the conceptual model is built up to describe the effects of socioeconomic and environmental elements on both health and happiness.

6.4.1 Definition of happiness

There have been various attempts to define happiness by a variety of scholars, such as philosophers, religious leaders, psychologists, biologists and economists. In the social science context, happiness is often defined as the degree to which a person evaluates the overall quality of his/her present life-as-a-whole positively (Veenhoven, 1984, 1997).

There are some synonyms that are used interchangeably with happiness, such as life satisfaction, subjective wellbeing and psychological wellbeing (Norrish and Vella-Brodrick, 2008), although these terms are precisely distinguished by psychologists

(Linley et al, 2009). Life satisfaction is commonly used as a component of the psychological wellbeing measures (Ryff, 1989, Linley et al, 2009). Subjective wellbeing and psychological wellbeing are two different perspectives in the psychology literature to derive measures of happiness, with the former taking the hedonic approach that focuses on happiness and defines wellbeing in terms of pleasure attainment and pain avoidance and the latter applying the eudaimonic approach which concerns self-realization and the fully functioning of an individual (Ryan and Deci, 2001). In such instances, subjective wellbeing is more related to happiness than psychological wellbeing and the elements of the latter are also contributing to happiness to a high degree, however, this is not conclusive in the psychological field. This research will not go into details of the psychologists' debate, but the common practice of using the terms happiness, subjective wellbeing and psychological wellbeing interchangeably reflects that these concepts are considered to be indistinguishable by researchers other than psychologists. This study then holds the view that psychological wellbeing is the measurable part of happiness and is overlapping with mental health.

6.4.2 Definitions of health

What is health? Health is "the condition of the body and the degree to which it is free from illness, or the state of being well" (Cambridge Advanced Learner's Dictionary 3rd Edition, 2008). Health can be defined negatively, as the absence of illness, functionally, as the ability to cope with everyday activities, or positively, as fitness and well-being.

The most widely quoted definition of health is the WHO definition created in 1946: "health is a complete state of physical, mental and social well-being, and not merely the absence of disease or infirmity." In more recent years, the 1978 Health for All declaration at Alma Ata modified this definition by adding the ability to lead a "socially and economically productive life" and also made health a fundamental human right. Despite criticism from outside of the WHO, there also have been many attempts within the WHO to revise the Organization's definition of health. As late as 1998, an effort was made to modify the rigidity of the notion of health as a state of wellbeing in that definition, by inserting the word "dynamic." It was also suggested that, instead of the three domains of health, a fourth "spiritual" domain should be added. The definition thus altered was to read: "Health is a dynamic state of complete physical, mental, spiritual and social well-being and not merely the absence of disease and infirmity" (Sein, 2002).

The WHO definition was criticised as corresponding more to happiness than to health. Saracci (1997) argued that 'health' and 'happiness' define distinct life experiences, whose relationship is neither fixed nor constant. Failure to distinguish happiness from health implies that any disturbance in happiness, however minimal, may come to be perceived as a health problem. Whereas it can be argued that health is a positive and universal human right, it seems impossible to construct an argument that happiness (though these may be not the material and social preconditions that happiness reflects) is a positive right simply because happiness cannot be delivered or imposed on a person by any societal action (Saracci, 1997). Empirical evidence also shows that when individuals respond to the self-reported health question "how would you describe your overall health?" with options "excellent, good, fair or poor", people tend not to incorporate happiness into their decision of which category to choose. A study by Subramanian et al (2005) concludes that self-reported health declined with advancing age, whereas happiness did not.

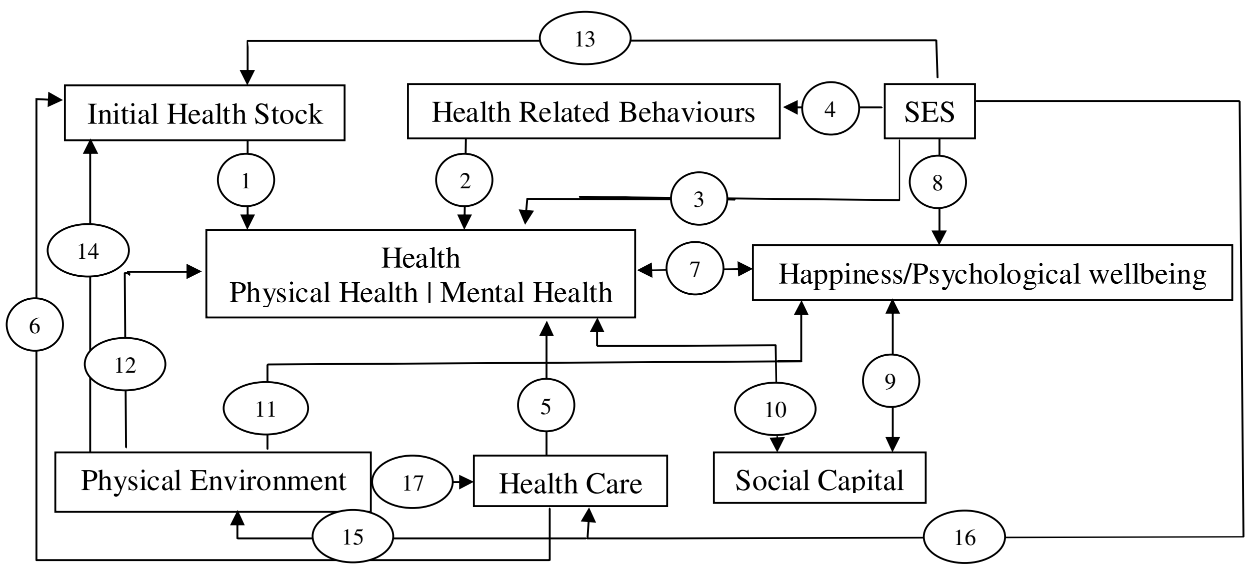
Although being criticised, we can see the logic behind WHO's comprehensive definition of health. It has been widely accepted that there should be more to health than just a collective of negatives – not suffering from any designated undesirable conditions, and it is also without doubt that the ultimate goal of health related activities is not simply a reduction of disease or even the promotion of human health, but the enhancement of human wellbeing (Evans and Stoddart, 1990). However, a complicated and comprehensive health definition such as the one from WHO is simply not practical and makes the definition of health become the objective of all human activities. It basically requires not only health policy but all policy to address any problem in health (Evans and Stoddart, 1990). For this reason, we have to take a narrow version of the WHO's definition by only including physical health and mental health, and addressing the wellbeing side separately from health. Nevertheless, taking a narrow definition has a cost. Addressing only the specific measurable dimensions of health may leave out the inexplicit side of health that might be judged by individuals to be more important to their life. The evaluation of the unobservable health (or health related) dimensions may be included in the term "psychological wellbeing", which express the inner state of wellbeing.

Therefore, for the benefit of maintaining the precision of research and the comprehensiveness of the valuation of individuals' life, a combination of happiness and health defined by the narrow sense seems to be the best achievable model to build. As a health economist, my focus here is to explore the relationship between the health measured in narrow terms as well as happiness and how socioeconomic factors influence them both directly and indirectly. Based on the literature review in the previous section, the most direct link from health to happiness is possibly through mental health.

6.4.3 The conceptual model

A broad range of candidates are influencing both health and happiness concurrently. The social determinants of health discussed in Chapter two will be the basics that form part of this framework. Figure 6.1 shows the conceptual model developed for the concepts of health and happiness, and the factors that affect them. The model is believed to be the first to explicitly explain how different determinants affect health and happiness as well as how they interact with each other. This conceptual model may not be exhaustive and conclusive, but it can help build a foundation for the research of health and happiness.

Figure 6.1, The conceptual model of health and happiness



According to Grossman's health production model (Grossman, 1972), an individual's health is built upon his or her initial health stock and influenced by health investments along the life-course. Initial health stock is some inherited genetic endowment that plays a crucial role in determining the foundation of individuals' health (shown as link 1 in the model). For example, a child born to a healthy couple may have less chance of catching disease than his or her counterpart born to less healthy parents. In addition, some genetic diseases can be passed on from generation to generation, such as heart disease and diabetes. Parental behaviours during or after pregnancy also account for a child's initial health stock. The well-known example is the effect of smoking during pregnancy on the birth outcome. There is sufficient evidence showing maternal smoking is associated with a higher chance of having premature birth, low birth weight and still birth (see for example, Sexton and Hebel, 1984, Wilcox, 1993). Smoking during pregnancy was found to be the most important single factor among other social and psychological factors in the reduction of corrected birth weight adjusted for gestational age (Brooke, et al, 1989) and the differences in the late foetal plus neonatal mortality rate and birth weight persist even after controlling for a number of maternal and social factors when studying a British population (Butler et al, 1972). Maternal smoking also has long term effects on the child (Hardy and Mellits, 1972), one of which is that the survival rate of these babies during the first year is much lower than babies born to non-smoking mothers due to their lower birth weight (Wilcox, 1993). Even among the survived babies born to mothers who smoke during pregnancy, their health outcomes in later life are also affected due to low birth weight, such as more prevalence of asthma, hypertension or lower IQ (Steffensen, et al, 2000, Richards, et al, 2001, Godfrey and Barker, 2000). All these factors happened before or shortly after birth have a non-negligible impact on individuals' health later on in life. Some of these factors can be observed through survey questions while others not. Parental behaviour and existing health problems are easy to be captured by questionnaires, however, genetic elements are difficult to obtain. Thus in practice, using the information on parental behaviours and health is possibly the only way to maximise our knowledge and gain the best understanding of an individual's initial health stock.

Health investments can be considered as the input by individuals to keep healthy and improve health, which in other words means everyone decides on how to produce their own health. Health investments consist of a range of factors, including health related behaviours by the individual – physical exercise, smoking, drinking or dieting habit and the use of health care. The former may reflect an individual's life style or choice – the terms sometimes used by researchers as a domain of the determinants of health. These behaviours have an inevitable impact on health (shown as link 2 in the model). For example, very active middle-aged men and women (compared with sedentary controls) are found to be in lower risk of coronary heart disease (Wood, 1994). Health related behaviours are generally heterogeneous and often endogenously determined; nonetheless, they are to a certain degree systematically influenced by socioeconomic status (shown as link 4 in the model). For instance, research evidence has shown that there are a smaller proportion of smokers among better educated people (See for example, Bjartveit and Lochsen, 1979, Pierce, et al, 1989, Escobedo, et al, 1990, Samet, et al, 1992). SES affects health via two channels: through health related behaviour, and its direct association with health (shown as link 3 in the model). The range of SES correlated with health has been extensively discussed in the literature. Health care obviously plays an important role in determining health directly or through initial health stock – receiving adequate and quality medical care can help cure disease and in turn improve health status; and obtaining good parental health care will certainly help building better initial health stock and indirectly improve adult health (shown as links 5 and 6 in the model).

Moving on to happiness – the ultimate goal of human existence and closely related to the broader sense of health defined by WHO, we study its determinants with special focus from the health point of view. Research evidence has shown that health is remarkably important to happiness (Clark and Oswald, 2002). The closest link from health to happiness is probably through mental health or psychological wellbeing as noted before that mental disorders are negatively related with happiness (shown as link 7 in the model). A number of studies even inexplicitly imply mental wellbeing is happiness or represents happiness by having "happiness" in the title of the research while referring to mental wellbeing in the article, such as studies by Oswald and Powdthavee (2008) and Gardner and Oswald (2001, 2006a, 2006b). Clearly, happiness is primarily some subjective feeling a person experiences towards his or her life as a whole. It has more to the mind and the mental side than the physical side and it is rather self-explanatory that a physically impaired person is more likely to be happy than a depressed person; however, that is not to say that the physical side of health does not influence happiness, but studies have shown that after adverse events people tend to adapt happiness level back to their normal level before the events, so the impact of physical health on happiness is relatively small or does not last in the long term. There is longitudinal evidence showing that people who become disabled go on to exhibit a considerable recovery in happiness (Oswald and Powdthavee, 2008).

Happiness adaptation may also apply to favourable events. A model developed by Graham and Oswald (2006) indicates that hedonic adaptation occurs when shocks gradually wear off - let it be winning the lottery or becoming disabled. This creates difficulties for economists as economics literature is unfamiliar with the notion that people's utility might have a reference level and the utility gain or loss may wear off over time (Graham and Oswald, 2006). However, this sense of happiness applies when being examined over a long time period and even then a rapid and complete recovery may not be guaranteed as some catastrophes may have a scarring effect. For contemporaneous happiness, we still need to consider factors that may have a short or long term impact. This is possibly the reason why some studies state money does not buy happiness while others conclude income or wealth has an impact on happiness level. A study using national panel survey from five developed countries reports that wealth, income and consumption have a strong impact on happiness. The study has also tested the adaptation theory with longitudinal data ranging from 3 to 9 years and concludes that adaptation does not always occur and happiness is considerably more affected by economic circumstances than previously believed (Headey, Muffels and Wooden, 2008). However, in this study when testing the adaptation theory, the dependent variable is life satisfaction, which is not exactly the same as happiness. Furthermore, the time difference between the two comparison years is possibly not long enough to detect any adaptation. Thus, whether adaptation occurs and to what extent it occurs are still unclear. In practice, we still include all potential influential candidates in our research.

Both health and happiness are affected by a range of factors grouped as socioeconomic status (SES), social capital and physical environment in this framework (shown as link 8-12). SES normally consists of income, education level, social class and deprivation; social capital indicators often include the elements of trust, social participation, and social support network; and physical environment may involve living conditions, air and water quality, pollution, crime and overcrowding, etc. All these factors have both a direct and indirect influence on health and happiness and are themselves interactively related as well.

The way SES affects health has been much documented in the literature and its impact on psychological wellbeing is also evident: income creates the material base for good health and happiness, and also influences them through the physical and social environment; education has long been recognised as an important determinant of health both indirectly through its effect on employment and earning potentials and directly beneficial to health and wellbeing in terms of developing knowledge, values, emotional intelligence, self esteem and social functioning skills; social class and deprivation make their way by both laying a material base and creating a social hierarchy as comparisons with other people in different social positions may have a psychological effect on health and happiness. One of the oldest assumptions in social science is that wellbeing does not only depend on absolute levels but also on relative comparisons with other people (Clark and Oswald, 2002).

Social capital, which is often endogenously determined, has been shown to be closely related to health. A study by D'Hombres et al (2010) reports that the individual degree of trust is positively and significantly correlated with health, while social isolation is negatively and significantly associated with health using data from eight countries from the Commonwealth of Independent States. People with a well connected and strong social support network tend to enjoy better physical and mental health and recover more rapidly from physical illness and psychological problems (Carr, 2004).

Similarly, the physical environment also influences health and happiness both directly and indirectly. Directly, physical environment, such as poor air quality, unclean water and pollution may lead to health problem and cause unhappiness (shown as link 11 and 12). This was particularly the case in the 19^{th} century when remarkable health advances in public health were made based on improvements in water supplies and sewerage systems and in the 20th and 21st century, housing and clean air. Indirectly, a good physical environment, such as green space, can influence health related behaviours by encouraging walking and cycling, and these physical activities promoted by such environment have been proven to be beneficial to health both physically and psychologically (see for example, Pretty, et al, 2005, Mass et al, 2006, de Vries and Verheij, 2003, Mitchell and Popham, 2007, Groenewegen, et al, 2006). Evidence has also shown that populations exposed to greener environments enjoy lower levels of income deprivation related health inequality (Mitchell and Popham, 2008).

All the elements in the above categories also influence each other simultaneously while they affect health and happiness. Initial health stock may be determined by parental SES and the physical environment they live in (shown as link 13 and 14); a person's living condition and the level of health care received can also be the result of his or her SES (shown as link 15 and 16) whereas a better physical environment, such as good and sufficient resources may provide better health care (shown as link 17). Such complicated and interactive relationships will require more research and better research methods to be fully understood. The conceptual model developed in this section is a first attempt to organise the concepts and explain the mechanism of the extremely complex links among them, and it is by no means meant to be conclusive and draw the complete picture. The purpose of developing this conceptual model is to draw attention to the need for research in this area, provide an initiative to explore further and deeper into the complex yet important concepts of life and serve as a theoretical foundation to the empirical studies in the next chapter.

As a structural model, it may be useful in empirical studies of health and happiness when reverse causalities are expected. In this case, this conceptual model can be used to choose instrumental variables, for example, initial health stock can be used as instrumental variable to model the relationship between health and happiness as initial health is directly related with health but not happiness.

6.5 Summary

This chapter extends the previous investigations of health inequality to another field of economics by including the broader sense of health – wellbeing into this research. Health has been often reported to be related with psychological wellbeing or happiness and according to WHO's comprehensive health definition, being healthy requires to be in "a complete state of physical, mental and social well-being", although the majority of the health economics literature uses the narrow sense of health – physical and mental health. Being the ultimate goal of human existence, happiness should not be neglected when we promote good health and equality in health. Studies then will be carried out to investigate happiness and its inequality in Chapter Seven. But before that, a clear structure on the interacting concepts needs to be built. This chapter, therefore, serves as the foundation to chapter seven. The conceptual model builds around the core concepts of health and happiness, and happiness is related to health primarily through mental health. Acknowledging the links between happiness and health, this chapter has first reviewed the literature on psychological wellbeing and happiness, analysed the definitions of health and happiness, and following which an attempt has been made to build a conceptual model of the relationships between health, happiness and the factors influencing them. This is the first attempt that tries to detangle these complicated overlapping concepts in the economics literature.

Chapter Seven: Changes of psychological wellbeing over time in England

7.1 Introduction

Based on the concepts discussed and the conceptual model developed in the last chapter, this chapter is the empirical study to explore how psychological wellbeing is distributed in England and how the distribution is changing over time. By using the new research method, the results on psychological wellbeing will then be extended to implications for happiness. A number of socioeconomic variables are examined for their association with psychological wellbeing. Research on psychological wellbeing in the socioeconomic context has appeared to mainly rely on cross sectional observations. Although cross sectional information can show the distribution of the research subject at a point in time, different groups with long term effects or transitory nature and consideration for the macroeconomics business cycle may be overlooked (Hauck and Rice, 2004). This research adopts a longitudinal perspective. Different from other studies that only examine the average level of the population's psychological wellbeing, this study also investigates the distributions across the entire population and over time as the understanding of how the entire population's psychological wellbeing is distributed is crucial for policy makers to target groups at different quantiles of the distribution with specific interventions. This study will also shed light on other health issues, such as health inequalities. The chosen indicator of psychological wellbeing is first discussed followed by a description of the data used. Research methods, including the relative distributions method and quantile regression are introduced, following which study results are then presented and conclusion is drawn.

7.2 The indicator of psychological wellbeing

The most commonly and widely applied measure of subjective wellbeing by economists in the UK is the General Health Questionnaire (GHQ) (Shields, 2005). The GHQ is a self-administered screening test aimed at identifying current minor psychiatric disorders, including depression, anxiety, social impairment and hypochondriasis. It does not make a clinical diagnosis. The GHQ has good predictive validity and content validity in comparison with other well-known scaling tests of mental illness and also performs well in reliability tests (Bowling, 1991). It is said to be one of the most prominent measures of an individual's subjective wellbeing (Powdthavee, 2007). It has been widely used and translated into many languages and extensively validated in general and clinical populations worldwide (Werneke et al, 2000). Applying the GHQ in 15 centres in the world, GHQ-12 (which is the version in this study) is found to be remarkably robust with high validity as measured by sensitivity and specificity and works as well in the developing world as the developed world and loses only a small amount by translation into other languages (Goldberg et al, 1997)

There have been numerous applications of the GHQ as a measure of mental health, psychological wellbeing and happiness, which shows that the literature currently contains a mix of the usage of the GHQ as well as the understanding of these concepts. Using German data, GHQ-12 is proven to be a useful tool for identifying mental disorders in primary care practice and research (Schmitz, 1999). Weich et al (2001) use the GHQ as a measure of mental health to investigate the differences in the prevalence of mental disorders between men and women in Britain. Studies applying the GHQ as measure of mental health have also been done in Australia (Korten and Henderson, 2000), Brazil (Marín-León et al, 2007), the Netherlands (Verhaak, et al, 2005) and many other countries worldwide (Werneke, et al., 2000). A number of studies use the GHQ to measure psychological wellbeing worldwide (Coyle, 1993, Donatella, et al., 2000, Department of health of Australia, 2007). The GHQ has also been widely used to measure happiness in a number of studies (Clark and Oswald, 2002, Gardner and Oswald, 2001, 2006a, 2006b). In the investigation of the money-happiness connection in the US and UK, DeVoe and Pfeffer (2009) have adopted the GHQ as their measure of happiness.

The use of the GHQ to measure happiness has been controversial. Some argue that real happiness is something more than just being free of anxiety, depression and other mental problems, while others argue that the GHQ can be used as a proxy for happiness as long as the 12 GHQ items are measuring the same underlying function as psychological wellbeing. Blanchflower and Oswald (2007) have shown in their paper that the cross-country pattern in mental distress measured by the GHQ is found to be consistent with those found in happiness, life satisfaction and hypertension. The literature indicates that studies on happiness have to assume that the GHQ is either a proxy for happiness or is actually a measure of happiness, which are both strong assumptions. However, this research only relies on happiness being a monotonic transformation of mental or psychological wellbeing, which is a much weaker assumption. The fact that a large amount of evidence has shown that happiness is closely and positively related with health, especially mental health, makes the assumption required in this research very plausible. The relative distributions method to be used in the study is equipped to do so. This method has the advantage of scale invariant that makes less restrictive assumptions about the underlying utility functions in the inequality context, requiring only that they be monotonic, so that any monotonic transformation will give identical results. If happiness is a monotonic transformation of psychological wellbeing or mental health, whichever is the true concept being measured by GHQ, then any relative distribution results of GHQ can be translated into results for happiness. The relative distributions method will describe changes in the entire distribution of the GHQ in a non-parametric fashion.

As the total GHQ score is used to indicate the level of psychological wellbeing (the lower the GHQ score, the better psychological wellbeing), it is, like any other aggregated summary measures, prone to some drawbacks. Firstly, a cut-off point of the GHQ score is normally chosen for screening psychiatric disorders; however, apart from the debates on what cut-off point should be used, when setting a cut-off point, some information is inevitably lost and therefore, the validity of comparisons is compromised. Secondly, a summary score cannot tell the whole story: the same average summary scores can be derived from two completely different distributions, therefore may have different implications for policy. The use of relative distributions method can overcome these problems by examining the entire distributions instead of only the population average.

7.3 Methods

7.3.1 The relative distributions method

A detailed introduction of the relative distributions method has been given in chapter three. Nevertheless, it is worth noting that the scale invariant property of this method has a useful implication for the study of happiness. If happiness is a monotonic transformation of psychological wellbeing, then any relative distributions results for GHQ measured mental health or psychological wellbeing can be translated into results for happiness. Therefore, this study can relax any assumption of the linear association between mental health and happiness and make the results applicable to both. This research, therefore, requires a much weaker assumption than the currently used assumptions in the literature.

7.3.2 Quantile regression

Ordinary least-squares regression models the relationship between one or more covariates X and the conditional mean of a response variable Y given X = x. This performs well if the research interest is in the mean of the distribution, however, when the rate of change in the conditional quantile, known as the regression coefficients, is dependent of and fluctuates with the quantile, the traditional OLS will then give misleading results. Furthermore, in some instances, the study interests not only lie on the mean of the subject in question, but also the lower and upper tails or all quantiles, quantile regression then proves to be particularly useful.

In this study on the distribution of psychological wellbeing as measured by GHQ, all quantiles are of interest, as the majority of the population is located in the lower quantiles while upper quantiles are the target population of policy to improve psychological wellbeing. Therefore, a regression that takes into account all quantiles is needed. Quantile regression, introduced by Koenker and Bassett (1978), meets the requirement by modelling the relationship between X and the conditional quantiles of Y given X = x. As a useful tool for measuring mean values as well as extremes, quantile regression provides a more complete picture of the conditional distribution of Y. Quantile regression generalizes the concept of a uni-variate quantile to a conditional quantile given one or more covariates.

For a random variable Y with probability distribution function

$$F(y) = P(Y \le y) \tag{7.1}$$

The τ th quantile of Y is defined as the inverse function

$$Q(\tau) = Inf\{y : F(y) \ge \tau\} \tag{7.2}$$

where $0 < \tau < 1$. In particular, the median is Q(1/2).

For a random sample $\{ y_1, ..., \ y_n \}$ of Y, the sample median in OLS regression minimises the sum of absolute deviations

$$\min_{\varepsilon \in R} \sum_{i=1}^{n} |y_i - \varepsilon| \tag{7.3}$$

In the case of quantile regression, the general τth sample quantile $\varepsilon(\tau)$, is then formulated as the solution to the optimization problem:

$$\min_{\varepsilon \in R} \sum_{i=1}^{n} \rho_\tau (y_i - \varepsilon), \tag{7.4}$$

where $\rho_\tau(z) = z(\tau - I(z < 0)), 0 < \tau < 1$. Here $I(\cdot)$ denotes the indicator function.

In the OLS model, the estimator $\hat{\beta}$ is found by minimising the sum of squared residuals:

$$\sum_{i=1}^{n} (y_i - x_i^{'} \beta)^2 \tag{7.5}$$

of the linear conditional mean function:

$$E(Y \mid X = x) = x^{'} \beta . \tag{7.6}$$

Similarly, the estimator $\hat{\beta}$ of the linear conditional quantile function:

$$Q(\tau \mid X = x) = x^{'} \beta(\tau) , \tag{7.7}$$

can be estimated by minimising the sum of residuals:

$$\sum_{i=1}^{n} \rho_\tau (y_i - x_i^{'} \beta) \tag{7.8}$$

for any quantile $\tau \in$ (0, 1). The quantity $\hat{\beta}(\tau)$ is called the τth regression quantile. In the case of $\tau = 1/2$, which minimizes the sum of absolute residuals, corresponds to the commonly used median regression.

7.4 Data

The data used in this study is the Health Survey for England (HSE) which is an annual cross sectional survey designed to measure health and health related behaviours in England. The HSE contains the short form of the GHQ – the GHQ-12, which is used to measure the study subject – psychological wellbeing. This research includes 14 years of the HSE from 1991-2005 (except the year 1996 where the GHQ questions were not included). The HSE has a "core" set of questions which are repeated every year; however, each survey year has also included one or more modules on subjects of special interest and as a result, the survey sample size varies markedly between years, ranging from less than 3000 to above 12000 in different years after excluding observations with missing variables. Nevertheless, the HSE is designed to be a national representative of people in England of different age, gender, geographic area and socio-demographic circumstances, so the samples are comparable over years. The sizes of usable observations in each wave are recorded in table 7.1.

Table 7.1, Sample size of each year

Year	1991	1992	1993	1994	1995	1997	1998
Sample size	2463	3015	12486	11677	11788	5745	9752
Year	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Sample size	3694	4659	9008	5812	8678	3406	4221

Four types of comparisons using relative distributions are carried out on all 14 years of observations: year by year comparison using the whole sample, year by year comparison using only male or female sample and male vs. female within each year. For each type of the comparisons, this study investigates the relative distributions on observations with the entire range of GHQ scores, GHQ scores truncated at 0 (meaning that observations with GHQ of 0 are excluded) and truncated at 2 (meaning that observations with GHQ scores of 0, 1 and 2 are excluded). The cut-off point 2/3 is widely used and recommended for mental disorders as a range of studies have confirmed 2/3 to be the optimal threshold for screening psychiatric morbidity (see for example: Bashir et al. 1996; Jacob et al. 1997; Plummer, et al, 2000; Hoeymans, et al, 2004). The research by Jacob, Bhugra and Mann (1997) has shown that this 2/3 optimal threshold has a sensitivity of 96.7% and a specificity of 90%.

Each of the 12 GHQ questions has four options. The options to positive questions are: “Better than usual”, “Same as usual”, “Less than usual” and “Much less than usual” and to negative questions are: “Not at all” “No more than usual” “Rather more than usual” and “Much more than usual”. A full list of the GHQ-12 questions can be found in Appendix 1. The total GHQ score is a simple addition of each individual’s responses to all the 12 questions. The so called “GHQ scoring” system is used to code each of the options as “0” “0” “1” “1”, which means that the total GHQ scores range from 0 to 12. A total score of 0 indicates no sign of psychiatric disorder while a total score of 12 means that the individual has chosen the options for the worst outcomes of every one of the 12 questions, so that GHQ scores increase in ill-health. This type of scoring method is most widely used and reported to produce the least measurement error although discriminatory power is sacrificed (Hankins, 2008).

Socioeconomic factors adopted in the analyses for the purpose of covariates adjustment of the relative distributions include age, education, income, social class, body mass index (BMI) and marital status. BMI is included because a number of studies have shown that obesity and mental health or happiness are related, however, study results are mixed (McElroy, 2004). Happiness and mental health are found to be worse among fatter people in both Britain and Germany (Oswald and Powdthavee, 2007). McLaren, et al (2008) conclude that the relationship between BMI and mental health differs by type and severity of mental illness and by sex and age. There are also studies which do not uniformly support a particular relationship between body weight and mental health and new research methodology is proposed to investigate this issue further (Friedman and Brownell, 1995). Age, income and BMI are measured as continuous variables whereas education, social class and marital status are categorical. A detailed description of the covariates can be found in section 7.5.2.

7.5 Descriptive analysis

7.5.1 Descriptive analysis of GHQ

The average scores of the GHQ for each year are displayed in table 7.2. The results are shown in three different sets: mean GHQ of all the respondents, males only and females only; mean GHQ of all the respondents, males only and females only when GHQ is truncated at 0; mean GHQ of all the respondents, males only and females only when GHQ is truncated at 2.

Table 7.2, Average GHQ scores

Year	All non-truncated	Male non-truncated	Female non-truncated	All truncated at 0	Male truncated at 0	Female truncated at 0	All truncated at 2	Male truncated at 2	Female truncated at 2
91	1.51	1.22	1.78	3.49	3.15	3.74	5.70	5.61	5.76
92	1.57	1.29	1.82	3.58	3.25	3.84	5.76	5.51	5.94
93	1.55	1.32	1.77	3.58	3.21	3.89	5.77	5.46	5.99
94	1.51	1.24	1.77	3.59	3.25	3.85	5.80	5.62	5.92
95	1.68	1.46	1.87	3.64	3.38	3.85	5.89	5.85	5.92
97	1.55	1.24	1.83	3.56	3.20	3.82	5.84	5.76	5.89
98	1.52	1.24	1.76	3.67	3.36	3.89	5.96	5.74	6.09
99	1.76	1.54	1.95	3.64	3.38	3.85	5.99	5.79	6.13
00	1.41	1.18	1.63	3.87	3.69	3.99	6.29	6.30	6.29
01	1.33	1.14	1.49	3.44	3.24	3.59	5.85	5.90	5.83
02	1.63	1.35	1.86	3.53	3.28	3.70	5.84	5.60	5.98
03	1.29	1.11	1.44	3.50	3.29	3.66	5.91	5.78	6.00
04	1.50	1.29	1.68	3.86	3.82	3.88	6.11	6.08	6.13
05	1.31	1.09	1.50	3.68	3.28	3.98	6.03	5.83	6.15

The population average for the entire sample is between 1 and 2 which is within the healthy range if we use 2 / 3 as the cut-off point for mental disorder. Obviously, after GHQ scores are truncated at 0 or 2, the average GHQ scores of the cohort increase markedly. For GHQ score truncated at 0, the average score is between 3 and 4. As it is a common practice to use GHQ score of 2 as the cut-off point of mental disorders' diagnosis, once respondents with no symptoms are excluded, the average GHQ scores switches to beyond the healthy range. When the GHQ scores are truncated at 2, the mean GHQ becomes very high to be above 5. For all of the three sets of results, the difference in mean GHQ scores between male and female is consistent in that men in general have lower GHQ scores than female indicating men tend to be in better mental health status than women. The only exception to this is the years 2000 and 2001 when GHQ scores are truncated at 2 where the male mean GHQ score is slightly higher than women's. This poses questions that the distributions of male and female samples at the higher end of GHQ scores' distributions are possibly different, which may be hidden when only examining the entire sample without truncation.

The average GHQ scores of the different classifications are depicted graphically to provide an intuitive insight of how the average GHQ scores are changing over time. Figure 7.1 shows the trend of the mean GHQ scores over time for non-truncated samples. For the whole population as well as male or female-only sample, the average GHQ score generally moves downwards indicating that the average psychological wellbeing of the sample population in England is improving; however, during the 15-year period, there are some very striking spikes, such as the years 1995, 1999, 2002 and 2004 and before every spike year there is always a sudden dip. Except for the first three years where there appears to be lack of movement in the average GHQ scores, from the year 1994 on it seems that the average GHQ scores move in a cyclical pattern – there is always a drop in GHQ scores after an increase in GHQ scores in the previous year in all three categories. It is also very clear that the average GHQ scores for women are above the national average whereas the average male GHQ scores are below the national average in every year examined. The comparison between male and female suggests that in general, men have better psychological wellbeing than women and this situation persists for the 15-year period. The overall average of GHQ scores below 2 indicates that the population's psychological wellbeing is within the healthy range.

Figure 7.1, Average GHQ scores for non-truncated samples

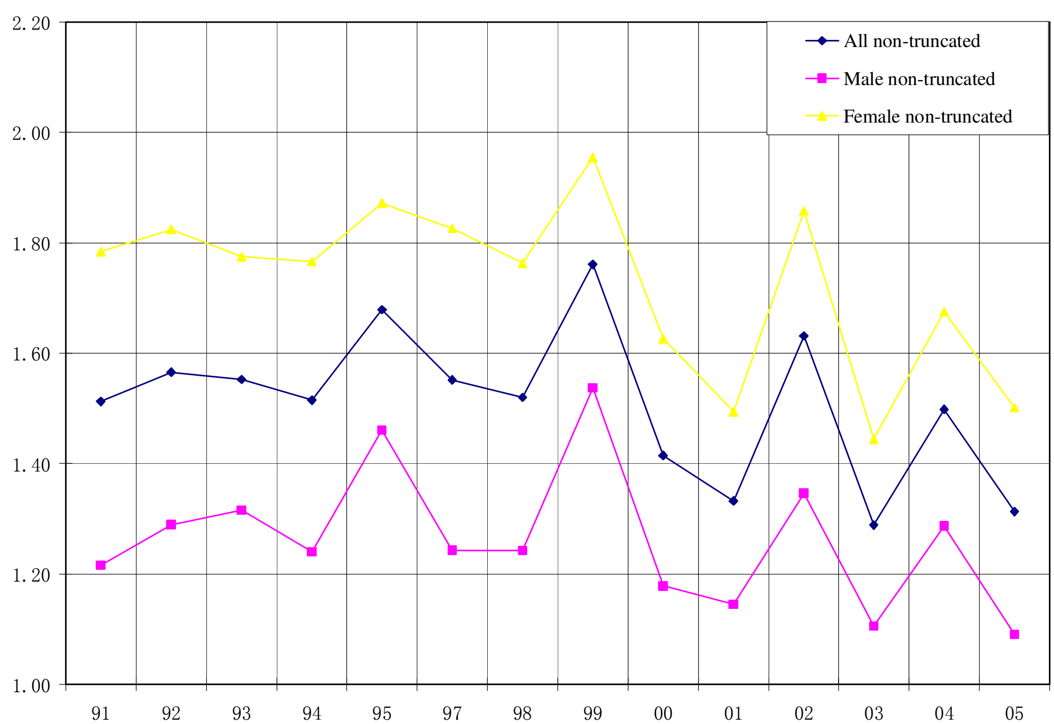
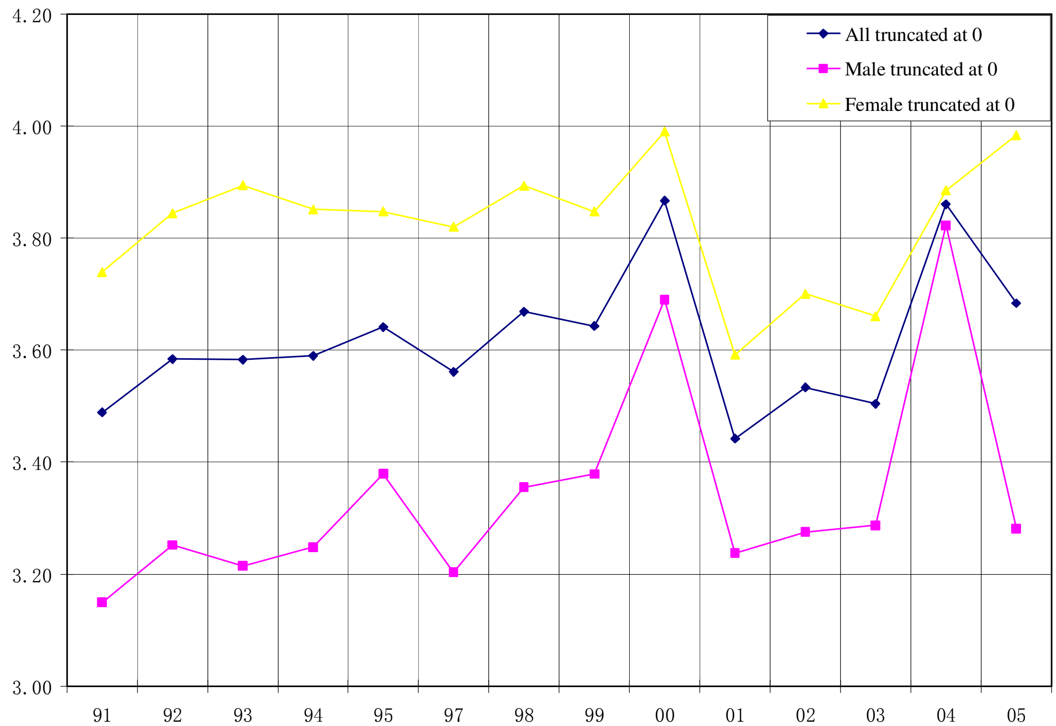


Figure 7.2 displays the trend of average GHQ scores over the 15-year period when respondents with GHQ scores of 0 are excluded. It appears that when GHQ scores are truncated at 0, the average psychological wellbeing of the sample population in England

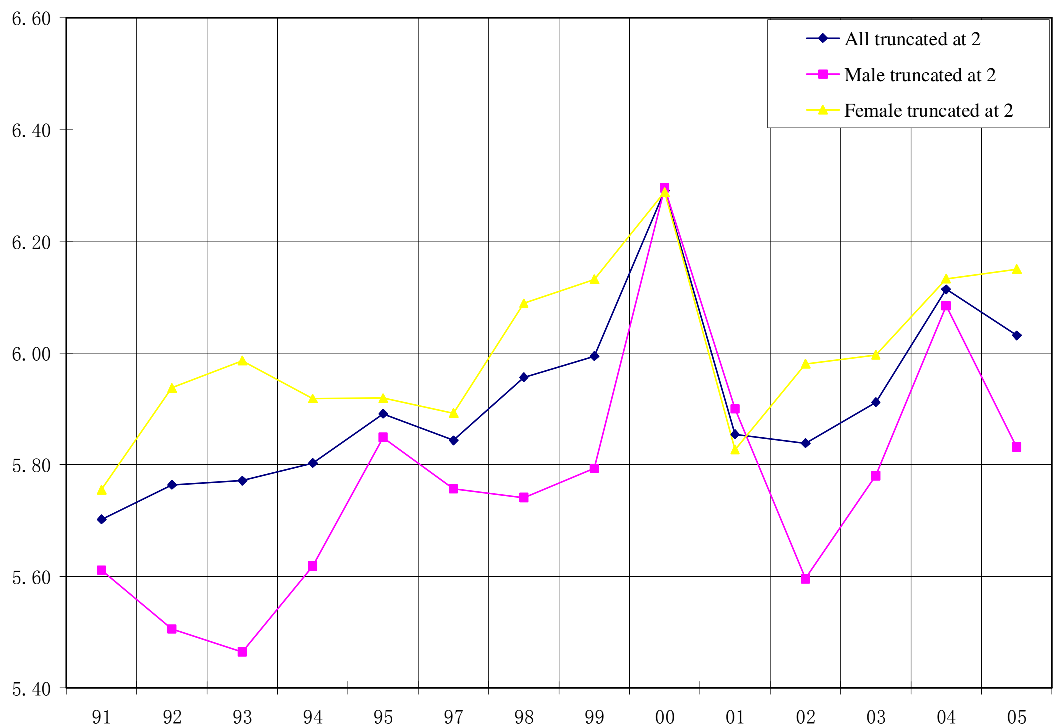
stays at about the same level over years with some notable fluctuations occurring in the years: 1997, 2000, 2004 and 2005.

Figure 7.2, Average GHQ scores for samples truncated at zero



Once truncated at 0, the trend of GHQ over time looks very different from Figure 7.1 except for the first five years. For example in 2004, the male-female gap becomes very small once GHQ is truncated at 0. This indicates that in the previous graph when GHQ is not truncated, the lower male average GHQ score in 2004 is largely driven down by the number of men with GHQ score of 0, and once these respondents are excluded, the average male GHQ becomes closer to women's. This is a good example to show how important it is to look at the entire distribution of the research subject rather than only concentrate on the national average. Aggregate or average data may often hide information that is crucial to policy makers, and using the example of male and female GHQ scores in 2004, it suggests that although men have lower average GHQ than women, it is mainly caused by larger proportions of GHQ score of 0 in the male sample, and women's higher GHQ scores are a result of higher than men's concentration of GHQ score of 1 but below the critical value; so if we want to make policies to improve the pupolation's psychological wellbeing, males with high GHQ scores (such as 11 and 12) should be targeted as well as women with low GHQ scores (such as 1 and 2) rather than a universal intervention. Similarly, in the 2005 samples truncated at 0, the gap between male and female GHQ scores becomes much larger than the non-truncated sample. This suggests women, in general, have actually worse psychological wellbeing compared with the previous years, but only among those with GHQ scores of above 0. Without truncation, it seems that women's average psychological wellbeing has improved compared with the previous year. So again, it is the proportion of samples with GHQ score of 0 plays an important role and it is, therefore, very necessary to examine the entire distribution rather than only the population average.

Figure 7.3, Average GHQ scores for samples truncated at two



Once respondents with GHQ scores of 0, 1 and 2 are excluded, the trend of average GHQ scores over the 15-year period becomes rather dramatic. Figure 7.3 reveals that the average GHQ scores are above 5 for all the years. In general, an increase in GHQ scores is observed when the last year is compared with the first year, although in the years 1993 and 2002 the mean GHQ scores have dropped considerably. In agreement with the previous graphs, female sample is mostly above the national average and male sample below. However, some patterns different from the previous non-truncated and truncated at 0 samples are also observed. The year 2004 continues to see narrowing of the gap between men and women's mean GHQ scores, and the same situation also occurs in 1995.

Furthermore, the years 2000 and 2001 have demonstrated an opposite trend of men and women, in which case men's mean GHQ score is above women.

When GHQ scores are truncated at 2, the remaining sample is more spread across different GHQ scores and in this instance, more information is revealed. The fact that some years that used to have large gaps between male and female average GHQ scores and then have much smaller or no gaps, indicates that men's lower average GHQ scores in some years are due to their larger concentration of observations between GHQ scores of 0 and 2 compared to women's. Men may have better psychological wellbeing than women overall, but women perform better above the critical value in some years. This leads to a call for more close examinations of the distribution of the sample rather than only the average. The relative distributions method applied in this research is able to do so.

7.5.2 Descriptive analysis of key social demographic covariates

The summary statistics of the key demographic variables for samples 1997 and 2005 are displayed in Table 7.3, as these two years are chosen to perform the covariates adjustment decomposition. Four categorical variables are presented by their frequency and percentage and three continuous variables are shown by their mean, standard deviation and minimum and maximum values. There are slightly more women than men in the sample. The education variable is categorised into the five conventional groups. Comparing the two years of highest educational achievement, there is an obvious increase in the proportions of higher education levels and a decrease in the lower or no qualification groups. Occupation based social class has eight categories, apart from the conventional social class I to V, full time students are coded as one separate category as well as other people with insufficient information and those in the armed forces. Marital status has 4 categories: Married/cohabitant, Single, Widowed and Divorced/separated. The percentages of married or widowed have decreased while the other two groups have increased when 2005 is compared with 1997.

Table 7.3, Summary statistics of key variables

Variables	1997				2005			
	Freq.		Percent (%)		Freq.		Percent (%)	
Gender								
Male	2710		47.17		1934		45.82	
Female	3035		52.83		2287		54.18	
Education								
NVQ4/NVQ5/degree	864		15.04		936		22.17	
NVQ3/GCE/A level	1420		24.72		1163		27.55	
NVQ2/GCE/O level	1533		26.68		1100		26.06	
NVQ1/CSE/foreign	523		9.10		246		5.83	
No qualification	1405		24.46		776		18.38	
Social Class								
Professional	269		4.68		235		5.57	
Managerial technical	1457		25.36		1334		31.60	
Skilled non-manual	1350		23.50		955		22.62	
Skilled manual	1031		17.95		683		16.18	
Semi-skilled manual	954		16.61		631		14.95	
Unskilled manual	301		5.24		177		4.19	
Full time students	238		4.14		107		2.53	
Insufficient information/all other never worked and Armed forces	145		2.52		99		2.35	
Marital status								
Married/cohabitant	4003		69.68		2336		55.34	
Single	1190		20.71		1275		30.21	
Widowed	124		2.16		84		1.99	
Divorced/separated	428		7.45		526		12.46	
	Mean	**S.D.**	**Min.**	**Max.**	**Mean**	**S.D.**	**Min.**	**Max.**
Age	40.11	13.31	16	65	42.24	13.77	16	65
Income	21064	18036	243	204918	31050	25165	263	262295
BMI	26.20	4.80	3.89	53.24	26.98	5.15	12.45	53.97

Body Mass Index (BMI) is a statistical measure of body weight based on a person's weight and height defined as the individual's body weight divided by the square of his or her height. Between the two years, there seem to be a slight increase in BMI. Age is truncated to be between 16 and 65 years. This is because there are limitations in the validity of BMI for younger and older people. For children aged 15 years and younger, the relationship between densitometrically-determined body fat percentage and BMI differ from that in adults, due to the height-related increase in BMI in children (Deurenberg, Weststrate and Seidell, 1991). And for seniors over 65 years, the BMI classification systems are found to be not appropriate (Heiat, Vaccarino, and Krumholz, 2001, WHO, 2000). The income variable is equivalised household income based on the McClement scale (Taylor, 1995), to take account of differences in household size and composition. The calculation of the equivalised income involves calculating a McClement score for each household (dependent on number, age and relationships of adults and children in the household), and then dividing the total household income by this score to get an equivalised household income.

7.6 Relative distributions results

Table 7.4 shows all the relative distributions comparisons that have been carried out. Each of the comparisons is performed for the entire population, and male and female separately across the 14 waves. Every year is compared with their previous year and the years 1991 and 1997, which are used as benchmark years, are also used as reference group and compared with all the years after them. The year 1991 is the first year that HSE was conducted and the year 1997 is the first year with complete social-demographic information (such as income). For each pair of years that is compared, the early one is always chosen as the original cohort and the latter one as comparison cohort. The consistent differences observed in the comparisons of average GHQ scores between men and women prompt the need to examine the genders separately, therefore, within each year, comparisons are carried out between men and women and male is used as the reference cohort and female as the comparison cohort. All the comparisons are performed for the entire sample, as well as sample truncated at 0 and sample truncated at 2. All of these amount to a total number of 330 comparisons. After decomposing each pair of relative distributions into location and shape changes, there seems to be a similar trend for all of the paired comparisons that the shape change between distributions is the main cause of overall distributional differences. So due to the large volume of comparison results and the similarities in the results, in this section only a few representatives of the relative distributions are discussed and the rest of the results can be found in Appendix 7.

Table 7.4, Pairs of years carried out for relative distributions comparisons

Year		The comparison cohorts													
		1991	1992	1993	1994	1995	1997	1998	1999	2000	2001	2002	2003	2004	2005
The reference cohorts	1991		X	X	X	X	X	X	X	X	X	X	X	X	X
	1992			X											
	1993				X										
	1994					X									
	1995						X								
	1997							X	X	X	X	X	X	X	X
	1998								X						
	1999									X					
	2000										X				
	2001											X			
	2002												X		
	2003													X	
	2004														X
	2005														

It should be noted that the relative distributions results have been produced using R with predefined programming, and some entropy values produced may not be consistent (for example, the sum of entropy values of location effect and shape effect may not be exactly equal to the entropy of the overall relative distributions) due to the technical issues with the programming which we have little control over.

The results will show the relative distribution PDF of each comparison and these diagrams are intuitive such that one can read the relative density of different GHQ scores directly from the graphs. The first panel represents the overall distribution of the two years. The second panel represents differences in distribution caused by location change and the third panel show the distributional differences due to changes in the shape of the distribution. The short dashed lines define the confidence interval of the relative density. Each of the connected horizontal straight lines represents a GHQ score starting from 0 to 12 in the non-truncated case, ranging from 1 to 12 if GHQ score is truncated at 0, and from 3 to 12 if GHQ score is truncated at 2. The upper axis indicates GHQ scores. Lines below 1 indicate the reference group has more density and lines above 1 denote the comparison group enjoys a higher density. The label on the left hand side tells how much more (or less) density the recent cohort has than the reference cohort if the value is above 1 (below 1).

It is also worth noting about the curve presented in each graph as a smoothing process to aid presentation. The curve sometimes varies within some GHQ range, for example, when GHQ score is 0. This is because there are a large number of observations with the same GHQ score of 0 – resulting to have the same rank. This smoothing process has to smooth the rank out, which introduces variation. As the variations of the smoothing curves always fall in the confidence interval of the relative distributions, they are completely justified.

7.6.1 Non-truncated sample

The relative distributions results selected to be presented here are the comparisons between years that have some interesting movements observed in the graphs of average GHQ scores. For the non-truncated samples, the comparison between the years 1998 and 1999 is chosen because it has one of the most notable differences in the average GHQ scores between the two years and the movements of the entire sample, male-only sample and female-only sample do not demonstrate the same pattern.

Figure 7.4, 1998-1999 relative distributions for the whole sample

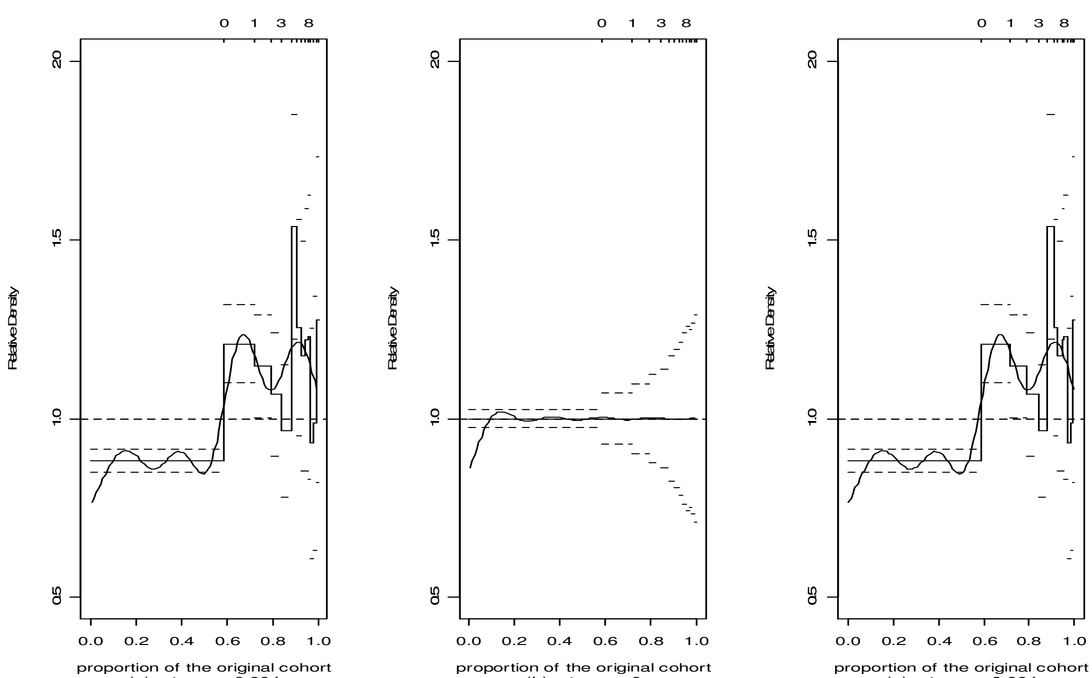
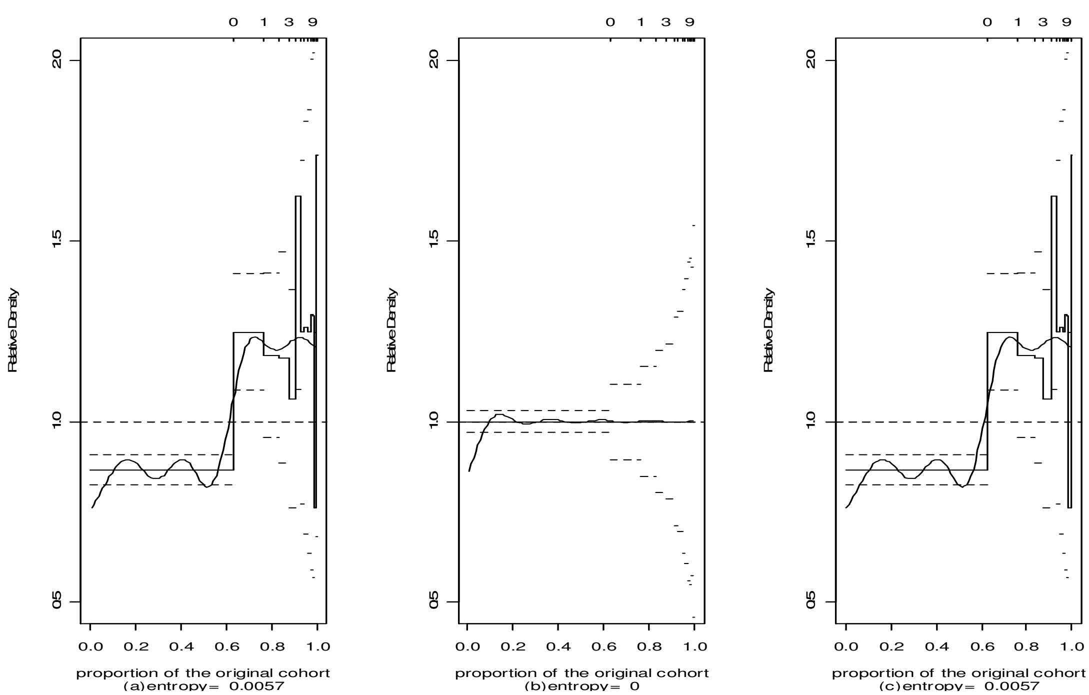


Figure 7.4 displays the relative distributions for the non-truncated sample of 1998 and 1999 comparison and the location and shape decomposition. The PDF of the relative

distributions shows that the year 1998 has significantly more density in the lower tail to the median when GHQ score is 0 and the year 1999 has more concentration almost entirely among the GHQ scores of above 0 (except GHQ scores of 4, 10 and 11). This explains why the average GHQ in 1999 is so much higher than it is in 1998. It is also obvious that there is no location change between the two distributions, so the distributional differences are almost entirely caused by the change in the shape of the distribution. Change in shape may be caused by the change in the distributions of GHQ or GHQ's relationship with covariates, such as the range of socioeconomic variables examined in the research. As a result, respondents in 1999 have, in general, moved upwards on the GHQ scale, while the median stays the same as in 1998 – the uniform distribution in location shift revealed by the middle panel. The entropy value associated with each panel also proves this – the entropy value of shape change is the same as the overall entropy whereas the entropy for location change is approximately zero.

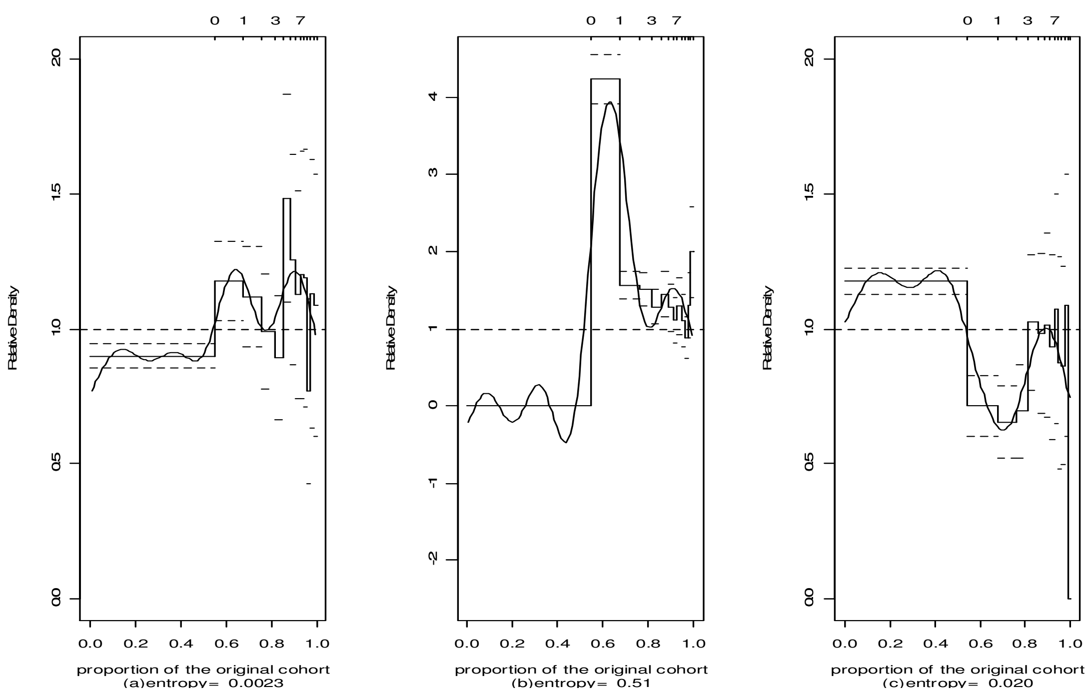
Figure 7.5, 1998-1999 relative distributions for the male sample



When examining the relative distributions for the male-only sample, Figure 7.5 displays a similar picture as the whole sample result: the relative density at up to more than sixtieth percentile of the 1998 cohort is about 0.85, which means fifteen percent fewer recent cohort (1999) members have attained GHQ score of 0. On the other hand, the recent cohort has relative density up to 1.8 (when GHQ score is 12) in the higher end of the

GHQ scale. The high relative density of the male-only sample in the recent cohort is more significant than the whole sample comparison in the median to upper tail when GHQ scores are above 0 with the only exception of GHQ score of 11. Similarly, the three panels and the respective entropy values indicate that shape change is the main contributor of the overall distributional differences of male GHQ between the two years and there is almost no median shift. The implication of the shape change is that the distribution of the GHQ scores of 1999 has become flatter with more weight at the upper tail and less right skewed. Men in the recent cohort have, in general, moved upwards on the GHQ scale while keeping the population median the same as the reference cohort.

Figure 7.6, 1998-1999 relative distributions for the female sample



The female-only sample has a rather different story as shown in Figure 7.6. The overall difference is similar to those of the whole sample and male-only sample, that 1999 has more density in the GHQ scores of above 0 and 1998 has absolute more density in the first nearly 60% of the distribution defined by the reference cohort when GHQ score is 0. The three panels clearly show both location change and shape change exist among the female respondents. The middle panel represents the effect of median shift in the GHQ scores between the two cohorts – reporting what the relative density would have looked like if there had been no change in distributional shape. The effects of median shift are quite large. Excluding the shape effects, the reference 1998 cohort would have more density in the first nearly 60% of the distribution when GHQ score is 0, and the relative density ratio is higher than the overall difference shown in the first panel. The recent 1999 cohort is almost entirely dominating the rest of the distribution when GHQ score is above 0. The differences between the second panel and the first panel are due to the change in the distributional shape reflected by the last panel, which indicates what the shape differences would be if there were no change in location. Taking away the effects of location change, the picture is rather the opposite of the first two panels. The recent cohort has more density in the percentiles when GHQ score is 0 and a few high GHQ scores whereas the reference cohort has more density in the rest of the distribution.

Table 7.5, Polarization indices: 1998-1999 non-truncated sample

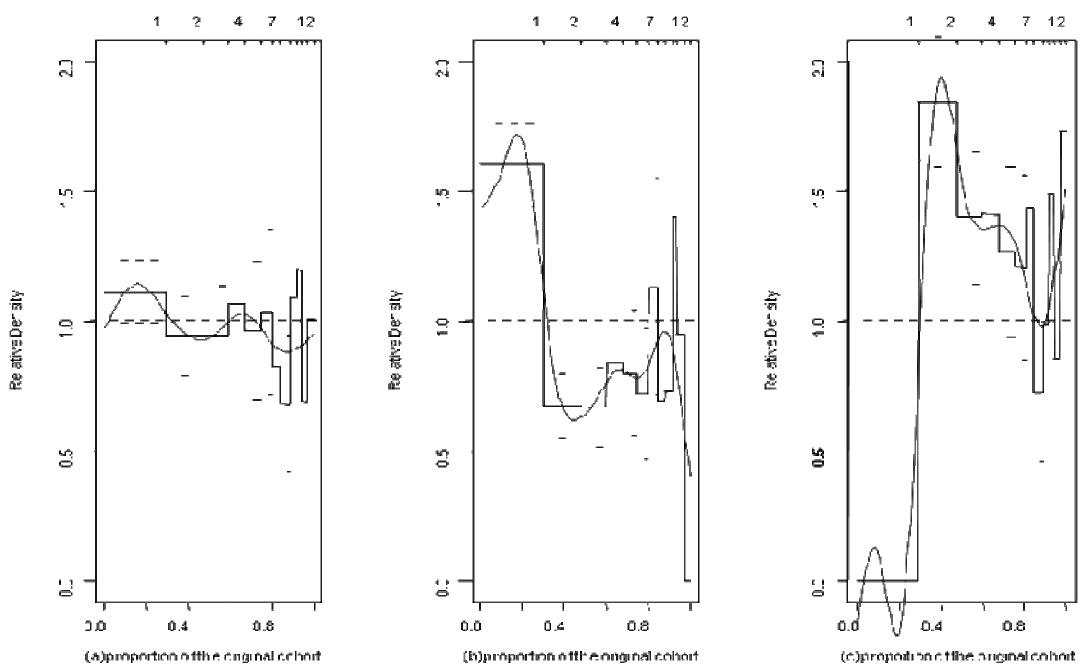
98-99 non-truncated	Polarization index	Estimate	95% CI	P-value
Whole sample	Median index	-0.192	-0.214 – -0.170	0.000
	Lower index	NaN	NaN	NaN
	Upper index	-0.192	-0.235 – -0.149	0.000
Male-only sample	Median index	-0.108	-0.079 – -0.050	0.000
	Lower index	NaN	NaN	NaN
	Upper index	-0.079	-0.136 – -0.022	0.003
Female-only sample	Median index	0.465	0.432 – 0.497	0.000
	Lower index	NaN	NaN	NaN
	Upper index	-0.054	-0.113 – 0.005	0.036

Polarization indices are calculated for each of the comparison categories as displayed in Table 7.5. Due to the large number of respondents reporting GHQ score of 0 that accounts for more than 50% of the population, polarization index is not applicable in the lower tail. For the whole sample and the male-only sample, there is less polarization occurring in the median and the upper tail and the indices are all significant. However, for the female-only sample, polarization does occur in the sample median but not in the upper tail. This indicates that compared with women in 1998, women in 1999 tend to move both upwards and downwards from the median. The distribution of female sample in 1999 becomes flatter compared with their counterpart in 1998. As the median of the non-truncated GHQ covers low GHQ scores of 0 and 1, the occurring of polarization indicates women are moving to higher GHQ scores and the number of women having median GHQ scores is reducing. This is a sign of the female population moving towards both ends of the distribution. The large percentage of respondents reporting GHQ score of 0 may have prevented us from having a clearer picture of the movement, and the truncation of GHQ from 0 or 2 may reveal more important and clearer patterns.

7.6.2 Sample truncated at GHQ score of zero

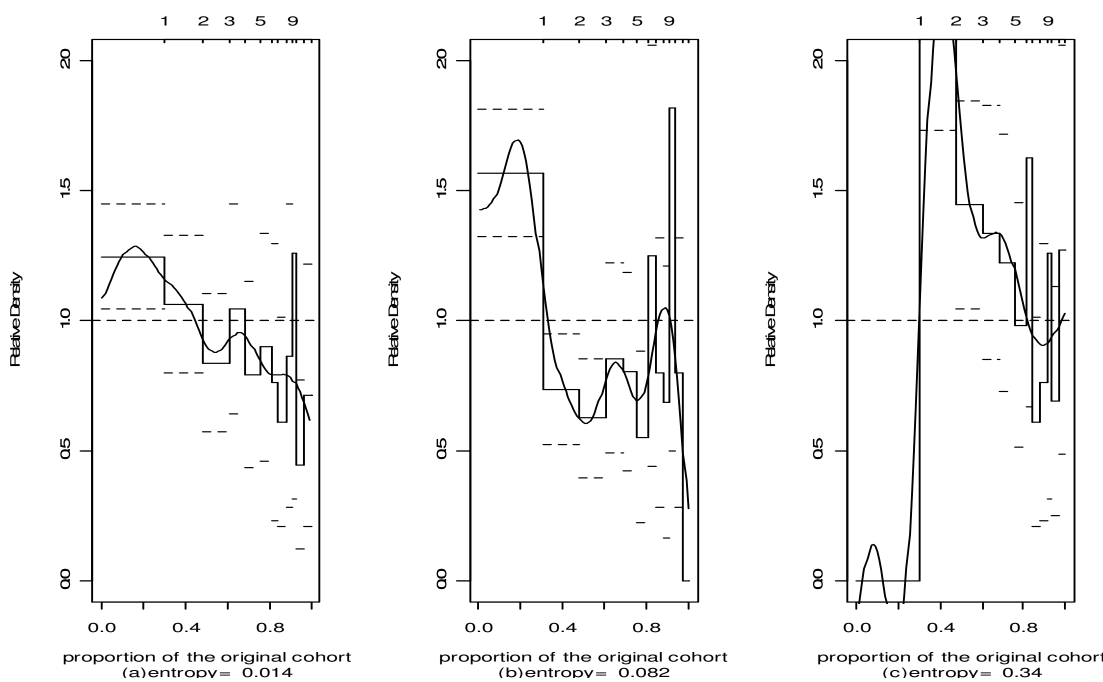
The pair 2004 and 2005 is chosen as an example of the relative distributions results for samples truncated at 0. This is because the trends of the whole sample, male-only sample and female-only sample between the two years are different. For both the whole sample and the male-only sample the average GHQ score seems to have decreased while for female-only sample the mean GHQ score is increasing.

Figure 7.7, 2004-2005 relative distributions for the whole sample truncated at GHQ score of zero



When GHQ scores are truncated at 0, Figure 7.7 shows the remaining GHQ scores of 1 to 12 are more evenly distributed. Lower GHQ scores continue to have more proportions than higher GHQ scores. For the whole sample, the recent 2005 cohort has more density in the lower tail and the upper median of the distribution defined by the original 2004 cohort, while the original cohort has more density in the lower median and very upper tail of the distribution. The year 2005's higher concentration in the lower end of the GHQ distribution explains the decrease of the average GHQ score from 2004 to 2005. It is also clear that both location change and shape change contribute to the differences in the relative density observed. The middle panel shows the location change separated from the overall difference. If there had been no shape change between the two distributions, the recent cohort would have even higher density in the lower tail and lower upper tail while the reference cohort's density in the median and very upper tail is also intensified. The right panel displays the shape change between the two distributions if there had been no location change. Taking away the location change, the shape change shows that the recent cohort would have much heavier median and upper tail and the reference cohort 2004 would have a much heavier lower tail than the recent cohort.

Figure 7.8, 2004-2005 relative distributions for the male sample truncated at GHQ score of zero



Examining the male-only sample of 2004 and 2005 in Figure 7.8, the high density of the reference 2004 sample in the higher end of the GHQ scores intensifies whereas the higher density of the 2005 cohort in the lower end of the GHQ scores has also increased. The clear difference between the two distributions explains the large drop in the mean GHQ scores from 2004 to 2005. The intensified relative distributions also explain why the decrease in the male-only sample is much steeper than in the whole sample. There continues to be both shape and location changes contributing to the distributional differences between the two cohorts with the middle panel showing the location change and the right panel depicting the shape change. If the two distributions had exactly the same shape, the recent cohort 2005 would have dominated the lower tail and the lower upper end while the 2004 cohort would have more density in the median to upper tail and the very upper tail. This means that when only looking at the location change of the distributions, zero-truncated male respondents in 2005 have, in general, shifted downwards on the GHQ scale. If the location of the two distributions had been the same, the recent cohort would have a much heavier upper tail. The graphs of both shape and location change indicate that the recent cohort 2005 in general has shifted its median downwards, however, there are some increases in density towards median and the upper tail. This means the reason to the fact that the recent cohort has much lower mean GHQ score is due to the location change between the two distributions.

Figure 7.9, 2004-2005 relative distributions for the female sample truncated at GHQ score of zero

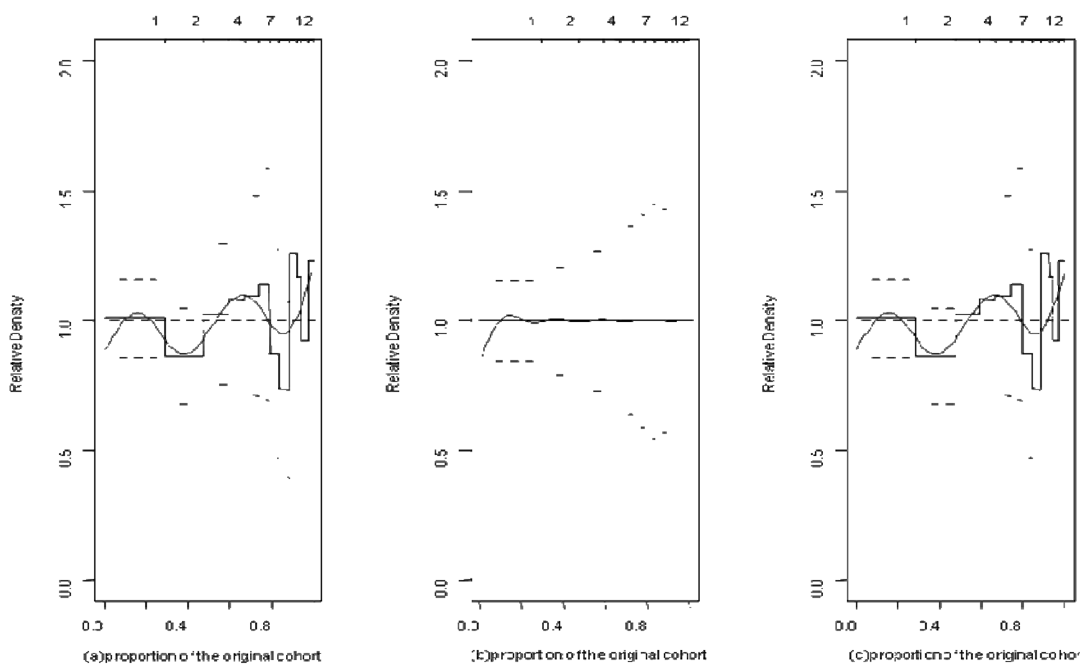


Figure 7.9 shows that the female relative distributions appear to have a complete different scenario from the comparisons of the whole sample and the male-only sample, which

explains the mean GHQ score in 2005 has actually increased compared with 2004 for women, contrary to the decrease in the whole sample and male sample. The left panel displaying the relative distributions between the two years' female sample justifies the rise in mean GHQ score – the recent cohort 2005 have considerably more density in the median and very upper tail. For the female sample, there seems to be no location change between the two distributions, so the shape change is the sole contributor to the distributional differences observed.

Table 7.6 displays the polarization indices of the three comparisons. The negative values mean that there is no polarization present – no divergence occurring in the GHQ distributions when 2005 is compared with 2004. The upper polarization indices are positive for all the samples, but only significant for the female only sample indicating only the female distribution experiences a trend of shifting towards the high end of GHQ scale. The example of 2004 and 2005 comparison shown here demonstrates that the analysis of relative distributions can reveal hidden matters that cannot be captured by simple examination of mean scores – it is the location change where the year 2005 has moved downwards on the GHQ scale that has caused the average GHQ score truncated at 0 for males in 2005 is lower than in 2004, the shape of the 2005 distribution actually has a much bigger upper tail than the 2004 cohort.

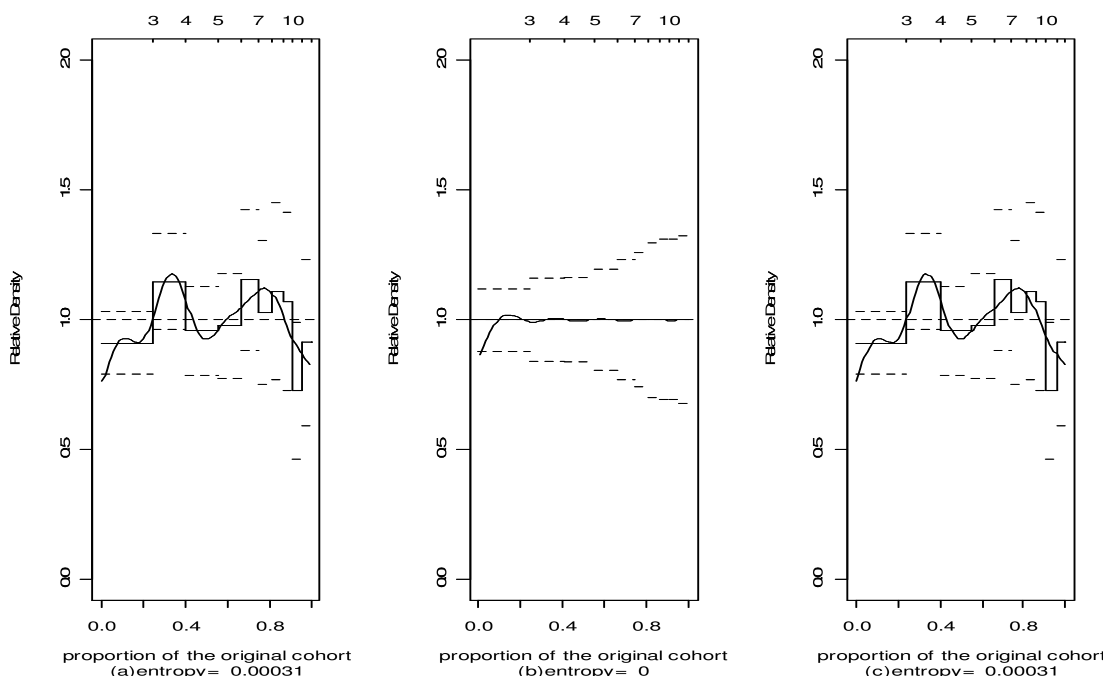
Table 7.6, Polarization indices: 2004-2005 sample truncated at GHQ score of zero

04-05 truncated at 0	Polarization index	Estimate	95% CI	p-value
Whole sample	Median index	-0.264	-0.314 – -0.214	0.000
	Lower index	-0.903	-0.972 – -0.834	0.000
	Upper index	0.052	-0.036 – 0.140	0.124
Male-only sample	Median index	-0.340	-0.415 – -0.265	0.000
	Lower index	-0.916	-1.042 – -0.791	0.000
	Upper index	0.014	-0.113 – 0.141	0.413
Female-only sample	Median index	-0.144	-0.194 – -0.094	0.000
	Lower index	-0.419	-0.482 – -0.356	0.000
	Upper index	0.082	-0.025 – 0.188	0.066

7.6.3 Sample truncated at 2

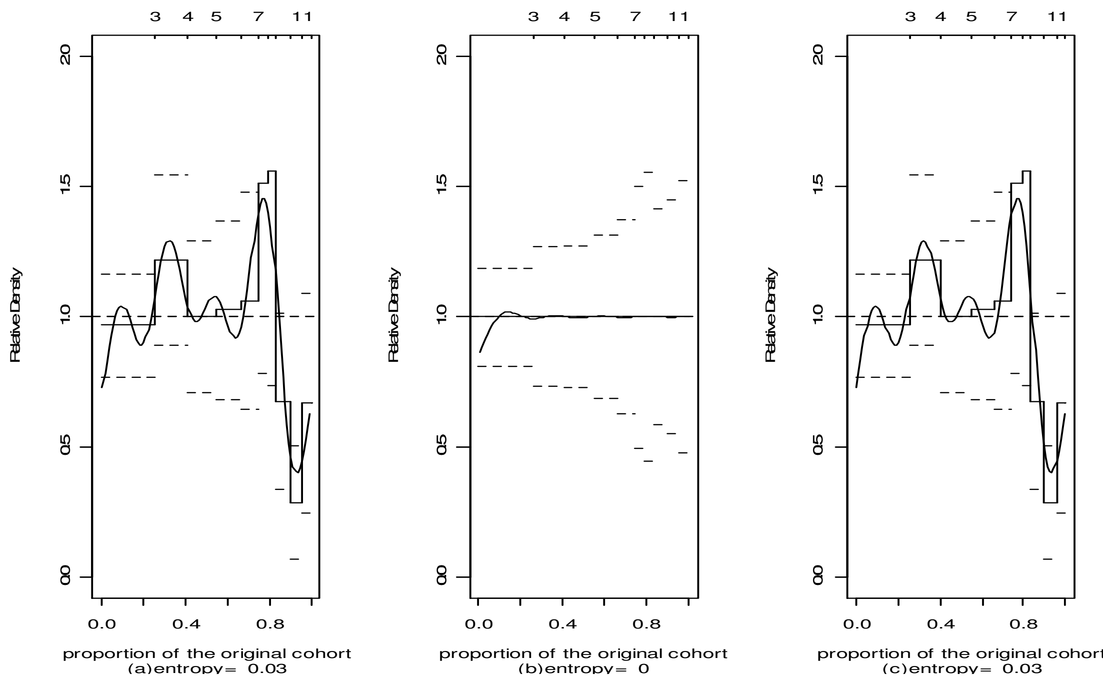
Once the sample is truncated at GHQ score of 2, more drastic movements are observed. The example taken here is the relative distributions between the years 2001 and 2002, which is also due to the different trends observed for the whole sample, male-only sample and female-only sample. In 2001 the male sample has slightly higher mean GHQ score than the female sample whereas in 2002 female has increased its average GHQ score while a considerably deep drop occurs in men's mean GHQ score so that there is a large gap between men and women.

Figure 7.10, 2001-2002 relative distributions for the whole sample truncated at GHQ score of two



For relative distributions of the whole sample, the recent 2002 cohort seems to have higher density in both lower median and upper median (Figure 7.10). The recent cohort 2002 dominates the lower median (30-40%) and lower upper tail (70-90%) whereas the 2001 cohort has absolute advantage in the very lower tail, median and very upper tail. The lack of large fluctuations in movement between the two distributions justifies the relatively small changes in the mean GHQ scores – the year 2002's mean GHQ score is only slightly lower than 2001's. Separating location effect and shape effect provides more information on what causes the distributional differences between the two cohorts. For the whole sample, the shape change appears to be the main contribution as the location change showing in the middle panel is close to uniform distribution. Therefore, the right panel showing the shape change is exactly the same as the overall relative distributions.

Figure 7.11, 2001-2002 relative distributions for the male sample truncated at GHO score of two



The relative distributions for the male-only sample have a much more dramatic and clearer trend of movement than the relative distributions for the whole sample between the two years (Figure 7.11). The recent 2002 cohort has considerably more density in the middle range (20-80%) while the original cohort 2001 has more density in the lower end and very large concentration in the very upper tail. This explains the large drop in the mean GHQ scores from 2001 to 2002 for the male samples. Shape change continues to be the main contributor to the distributional differences between the two years, reflected by the uniform distribution of the middle panel and the right panel being the same as the left panel.

The relative distributions for the female-only samples seem to have a very different trend (Figure 7.12). There are many variations in the relative distributions across the entire distribution and the recent 2002 cohort in general seems to be more concentrated around the higher end of the distribution defined by the original 2001 cohort, which explains the increase of mean GHQ score in 2002 compared with 2001. Shape change is still the main contributor to the overall distributional differences, which is reflected by the entropy value of shape change being 0 and the close to uniform distribution of the middle panel.

Figure 7.12, 2001-2002 relative distributions for the female sample truncated at GHO score of two

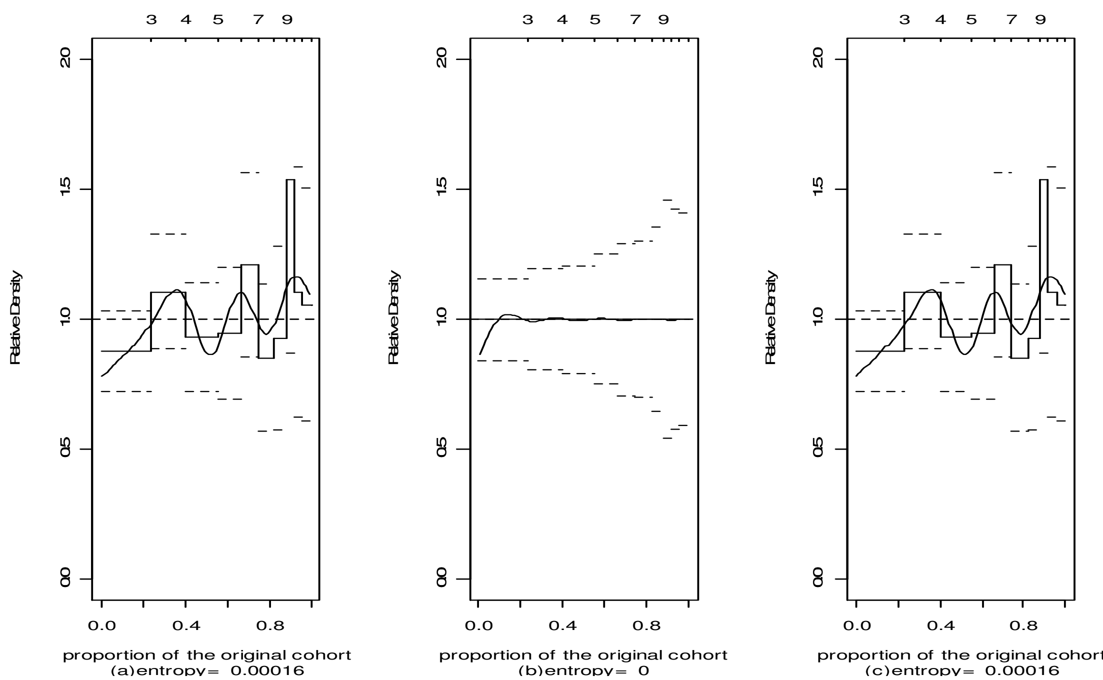


Table 7.7 displays the polarization indices of the three comparisons. The negative values mean that there is no polarization present – no divergence occurring in the GHQ distributions when 2002 is compared with 2001. Although the upper polarization index for female sample is positive, it is not significant. The difference observed in the descriptive analysis for samples truncated at 2 where average female GHQ score in 2002 is higher than 2001 and average GHQ score for male is higher in 2001 is clearly explained by the relative distributions. For the female sample, the increase in average GHQ score in 2002 is caused by more contribution in the upper median and upper tail, whereas the decrease in the mean GHQ score in 2002 for men is driven by a much smaller upper tail. All the differences observed are due to change in the shape of the distributions.

Table 7.7, Polarization indices: 2001-2002 sample truncated at GHO score of two

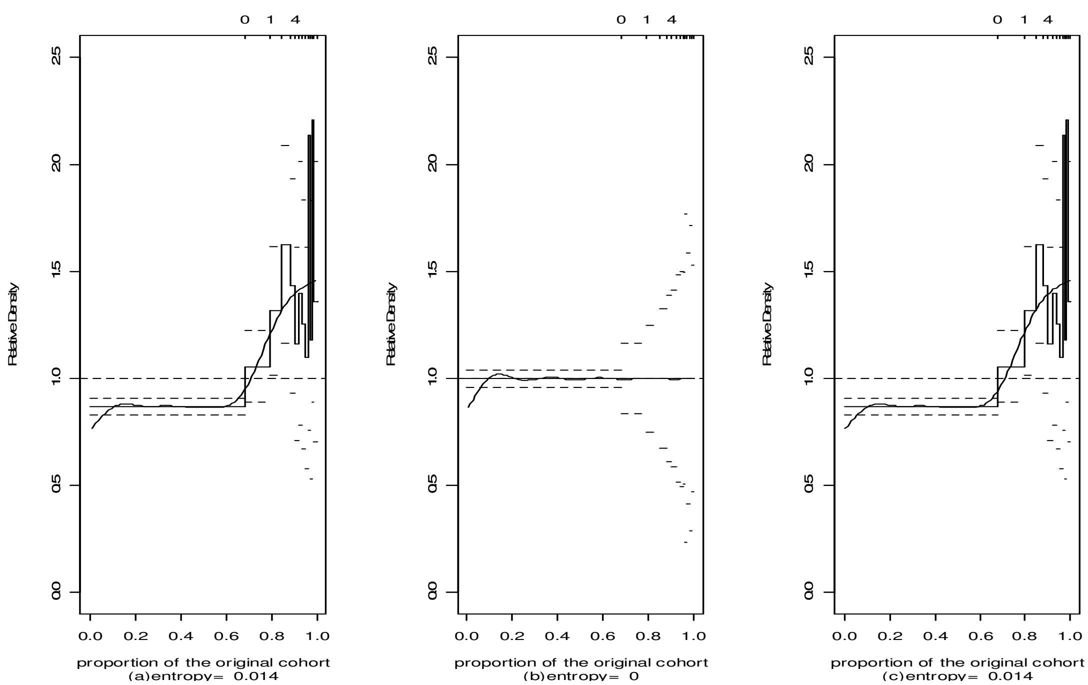
01-02 truncated at 2	Polarization index	Estimate	95% CI	p-value
Whole sample	Median index	-0.117	-0.155 – -0.079	0.000
	Lower index	-0.265	-0.314 – -0.216	0.000
	Upper index	-0.016	-0.104 – 0.071	0.357
Male-only sample	Median index	-0.178	-0.238 – -0.117	0.000
	Lower index	-0.284	-0.360 – 0.208	0.000
	Upper index	-0.097	-0.234 – 0.040	0.082
Female-only sample	Median index	-0.083	-0.132 – -0.034	0.000
	Lower index	-0.256	-0.320 – -0.192	0.000
	Upper index	0.028	-0.085 – 0.140	0.316

7.6.4 Male-female comparisons

The relative distributions between male and female samples in each year are also carried out. Male sample is chosen as the reference group and female as comparison group. In general, men have better psychological wellbeing than women in almost all the comparisons, reflected by having higher density than women in the lower scale of the GHQ distribution. When the male-female relative distributions are further decomposed into location and shape effects, the distributional differences between males and females are mainly due to shape effect as the entropy of location effect is approximately zero. Some polarizations are also observed. The example chosen here is the male-female comparison in 2000 where we can see a changing male-female gap of mean GHQ score when whole sample, zero-truncated sample and two-truncated sample are examined. Before truncation the female average GHQ score is much higher than men's, when the samples are truncated at 0, the female average is still higher but the gap between male and female is getting smaller, and when the samples are truncated at 2, men's average GHQ score becomes higher than women's.

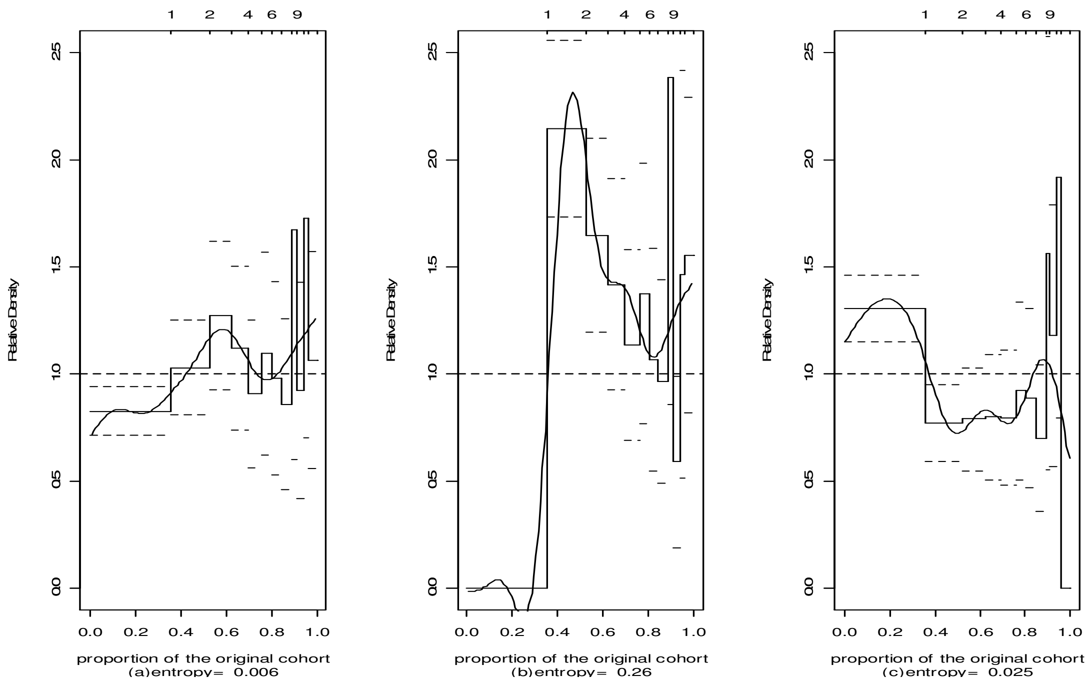
When comparing the entire GHQ scale (Figure 7.13), it is obvious that women have absolute more density from the median onwards of the GHQ distribution (GHQ score of above 0) and men are more concentrated at the lower half of the GHQ distribution when GHQ score is 0. Neither male nor female sample has many respondents with GHQ scores of 2 or more, so the relative distributions are very narrow at the higher end of the GHQ scale. The fraction of women reporting GHQ scores of 9, 10, 11 and 12 is 2.3 times more than men, while for GHQ score of 0 women have 20 percent less density than men. This clearly justifies the large gap between male and female average GHQ scores. The decomposition of the overall relative distributions into location and shape change shows that shape change is the sole contributor to the overall relative distributional differences as the middle panel representing location change is close to uniform distribution.

Figure 7.13, 2000 male-female relative distributions for the non-truncated sample



When only GHQ scores of above 0 are examined (Figure 7.14), women continue to have more density at the higher end of the GHQ distributions but with less absolute advantage compared with non-truncated sample. Men continue to dominate the lower end of the GHQ scale, but also display some more density in the upper end (GHQ scores of 5, 7, 8 and 10). As a result of these, the female sample's mean GHQ score continues to be higher than men, but the gap is smaller. Decomposition of the overall relative distributions sees the existence of both location and shape changes. The middle panels shows that if the two distributions had exactly the same shape, the location of the female sample would have moved upwards, taking absolute advantage over male sample from median onwards. The right panel indicates that if there had been no location change of the two distributions, the female sample would have had heavier tails in both ends – women's GHQ distribution is much flatter than men's.

Figure 7.14, 2000 male-female relative distributions for sample truncated at GHO score of zero



Once the GHQ scores are truncated at 2 (Figure 7.15), a different trend is observed. There is less clear dominance between the male and female samples along the GHQ scale. Women only have more density among GHQ scores of 3, 9 and 11, while men dominate the rest of the GHQ scores. The magnitudes of women's higher densities are larger than men's – at GHQ scores of 9 and 11, the fraction of women is 50% more than men; however, at GHQ scores where men have more density, the magnitude becomes smaller: for example, at GHQ score of 8 where men have more density, the fraction of women with GHQ score of 8 is only 25% less than men. All of those facts then explain why after truncation at 2, the mean GHQ scores of men and women are very close and men only have slightly higher mean GHQ score than women. All the distributional differences between men and women are entirely due to the shape effect, reflected by the uniformed distribution in the middle panel of all the relative distributions.

Figure 7.15, 2000 male-female relative distributions for sample truncated at GHO score of two

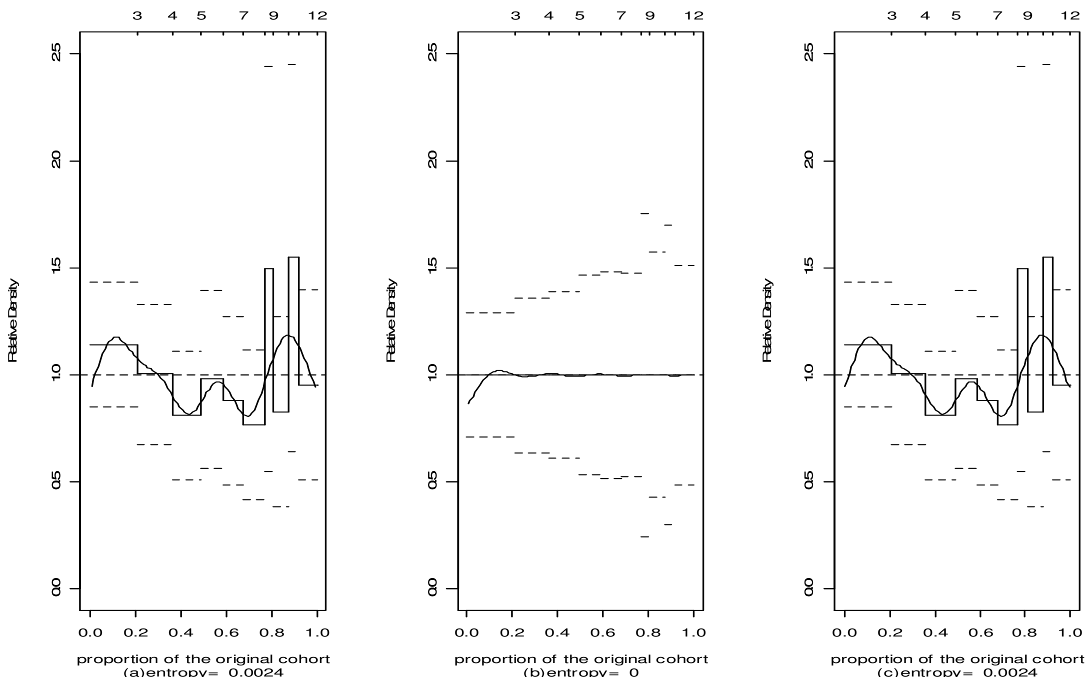


Table 7.8, Polarization indices: 2000 male-female relative distributions

2000 male-female	Polarization index	Estimate	95% CI	p-value
	Median index	0.043	0.017 – 0.069	0.001
Whole sample	Lower index	NaN	NaN	NaN
	Upper index	0.043	-0.009 – 0.095	0.052
	Median index	0.177	0.113 – 0.240	0.000
Truncated at 0	Lower index	0.475	0.390 – 0.560	0.000
	Upper index	-0.085	-0.196 – 0.026	0.067
	Median index	-0.047	-0.123 – 0.030	0.116
Truncated at 2	Lower index	-0.268	-0.387 – -0.149	0.000
	Upper index	0.173	0.021 – 0.325	0.013

According to the polarization indices in Table 7.8, polarization is clearly present. For the whole sample, polarization occurs at the median level, indicating there is a divergence of women's GHQ scores from the location-adjusted median to the tails of the GHQ distribution defined by the reference male distribution. Due to the large proportion of reporting GHQ scores of 0, the polarization index for the lower tail is not applicable in this case. At the upper tail, there is also polarization occurring in the female distribution compared with men's, although the significance level is only 10%. When the samples are truncated at 0, polarization is evident at both the median and the lower tail, which means comparing with men, women respondents' reporting GHQ scores are more diverse and the differences in the distributional polarization between men and women are highly significant. The upper tail again sees a convergence in women compared with men at lower significance level. Once the samples are truncated at 2, we see a convergence at the lower tail when women's GHQ scores are compared with men's, but at the higher end of the GHQ scale, women continue to show a divergence at 5% significance level.

7.7 Covariate adjustment

Distributional differences are further decomposed using social demographic covariates. These covariates include age, gender, education, income, social class, BMI and marital status. By adjusting the relative distribution for changes in the distributions of selected covariates, one can separate the impacts of changes in population composition from changes in the covariate-outcome relationship. This makes it possible to answer questions like, "How would the GHQ distributions have looked like if there had been no changes in the distribution of income?" or "How did median and shape changes of a covariate combine to produce the changing returns to GHQ?" This is done by constructing a counterfactual distribution that accounts for variations in covariates affecting the GHQ distribution. It separates the relative distribution between any two groups into a component that represents the effect of changes in the marginal distribution of the selected covariate (the composition effect), and a component that represents the residual changes (Handcock and Morris, 1998). In the context of this study, compositional effect is the impact one covariate has on the change in the distribution of GHQ and residual effect reveals any change in the relationship between the covariate and GHQ.

The covariate adjustment is performed by creating an adjusted population that matches the covariate distribution of the reference group, using the conditional outcome attribute distribution (GHQ, in this study) of the comparison group. Relative distributions of the adjusted population to the reference and comparison groups then separate the composition and residual effects, respectively (Handcock and Morris, 1998). This method also allows us to control other covariates while observing the compositional and residual effects caused by the variable of interest. This can be achieved by arranging the variable of interest to be decomposed as the last variable when sequentially adjusting multiple covariates. Gender and age covariates are always adjusted first as they are endogenous. Both the composition and residual effects can be further decomposed into location and shape changes. The explanations for the compositional component's location and shape changes are straightforward; the response effect due to location or shape change in the covariate. The location and shape shifts of the residual component, on the other hand, provide a more interesting insight of the inter-related distributional changes. Location shifts in the residual component capture the impact of the changing "returns" to the covariate. Shape shifts represent changes in the dispersion of conditional returns that are typically ignored by regression-based models.

Presented here is the comparison between the 1997 cohort (the first survey year that included SES variables) and the 2005 cohort (the last survey year included in my study). The comparisons between these two years can maximise the observable differences of respondents' psychological wellbeing through time.

7.7.1 Single covariate adjustment – example: 1997-2005 whole sample

Relative distributions adjusted by each of the three covariates – income, marital status and education, are selected to be presented in the thesis. Before performing the covariate adjustments of the variables of interest, age and gender are always first adjusted as they are endogenous. In order to have a better understanding of how these covariates affect the relative distributions of GHQ between the two years, relative distributions of each covariate are also performed.

7.7.1.1 Income adjustment

The first example is how the changes in income distribution influence the relative distribution of GHQ, controlling for age and gender. The relative distribution of income is shown in Figure 7.16. Note that income has not been adjusted for inflation.

Similarly to PDF of the relative distributions for GHQ, this shows the relative density of income between the two cohorts. Different from the single lines in the graphs for the

GHQ distribution, the graph for income's relative distribution has solid charts because income is measured as a continuous variable. Values above 1 indicate more density in the recent distribution and values below 1 represent less, and the actual value is the multiplicative factor more (or less). The proportion of the top centile of income in the recent cohort is 2.5 times more than the reference cohort whereas the bottom centile of the income distribution is over 50% less than the reference cohort. The general trend of income is upward moving. The recent cohort has more density in the top three centiles of the income distribution defined by the original cohort distribution, whereas the reference 1997 cohort is more concentrated in the bottom centiles. There seems to be no difference in the 6th centile between the cohorts. The understanding of the changes in the income distribution will be helpful to analyse the effect of income on the changes of GHQ distributions between the two cohorts.

Figure 7.16, 1997-2005 relative distributions of income

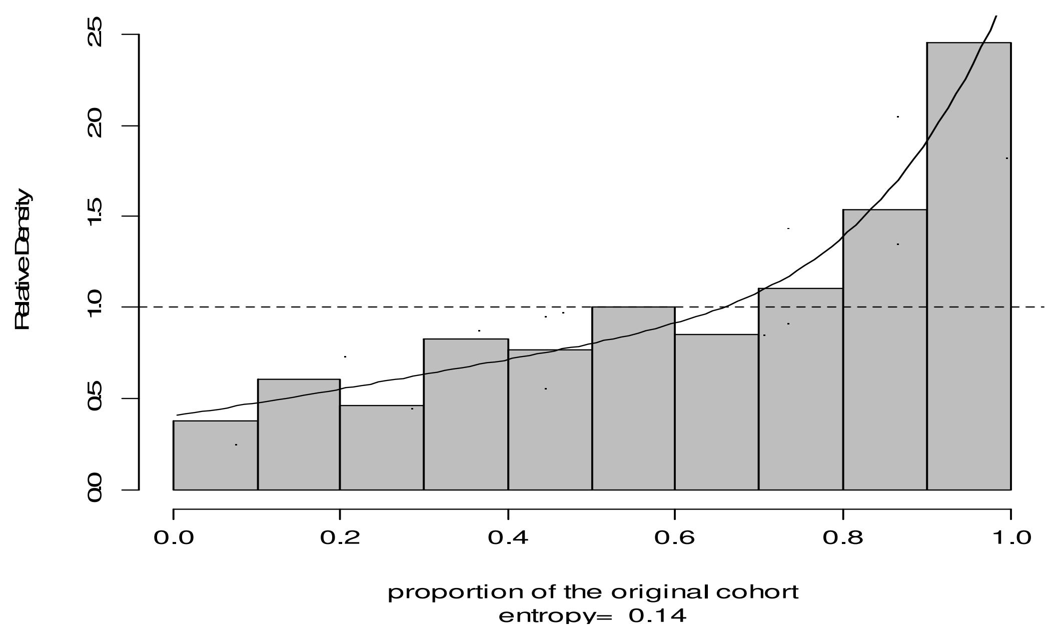
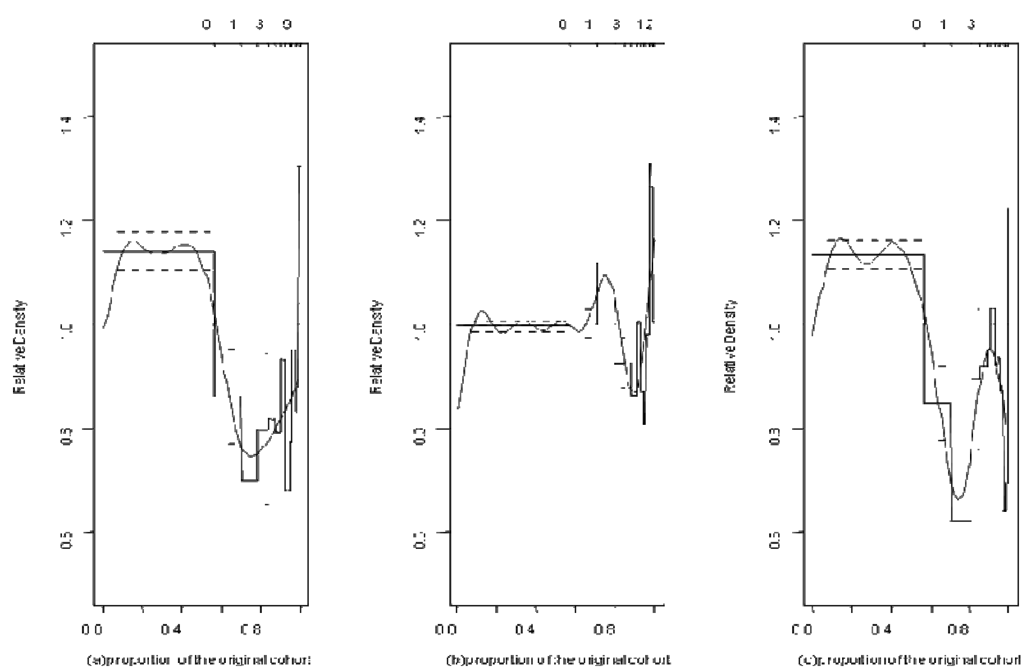


Figure 7.17 shows the effect of income distribution on the relative distribution of GHQ, controlling for age and gender. The first panel is the unadjusted relative distributions between the two years. It is obvious that the recent 2005 cohort has significantly more density at GHQ scores of 0 and 12. The proportion of respondents reporting GHQ score of 0 in 2005 is 15% more than it is in 1997 and 30% more for GHQ score of 12. Respondents in 1997 have more density for the rest of the GHQ scores. Due to the large

proportion of reporting GHQ scores of 0, the 2005 cohort's mean GHQ score is lower than the 1997 cohort. It seems that the 2005 cohort have shifted to both ends of the GHQ score compared to the 1997 cohort almost a decade ago. The second panel represents the effect of changes in the income profile between the two cohorts on the relative GHQ distribution, controlling for age and gender. The third panel displays the residual effect of income, or in other words the income-adjusted relative density of GHQ - that is, the expected relative density of GHQ had the income profiles of the two cohorts been identical. From the middle panel, it seems that the difference in income composition between the two cohorts had little effect on the observed relative distribution of GHQ in the lower to middle range where GHQ score is 0, however, there is an increase when GHQ score is 2 and at the very high end, and a reduction when GHQ scores are between 3 and 8, which are associated with the income compositional change. This indicates that income only plays a role among the people with higher than the threshold value of GHQ score. The increase in income causes polarization among individuals with GHQ score above 1, but only to a modest degree. Given the relatively small effect of the compositional effect of income, the income-adjusted distribution is not much different from the original distribution.

Figure 7.17, 1997-2005 relative distributions adjusted for income



7.7.1.2 Marital status adjustment

Figure 7.18 shows the relative distributions of marital status between the two cohorts. As the marital status variable is discrete, the relative distributions graph of marital status is in the same fashion as the relative distributions for GHQ. The 2005 cohort has more density in the categories 2 (single) and 4 (divorced or separated) whereas the 1997 cohort is more concentrated in the categories 1 (married or cohabitating) and 3 (widowed), although the 1997 cohort's higher density in category 3 is not significant judging by the confidence interval lines that are on both sides of the 1.0 line. Reading from the y-axis of relative density, there are 50% more singles and 70% more divorced or separated in 2005, but 20% less married compared with the 1997 cohort.

Figure 7.18, 1997-2005 relative distributions of marital status

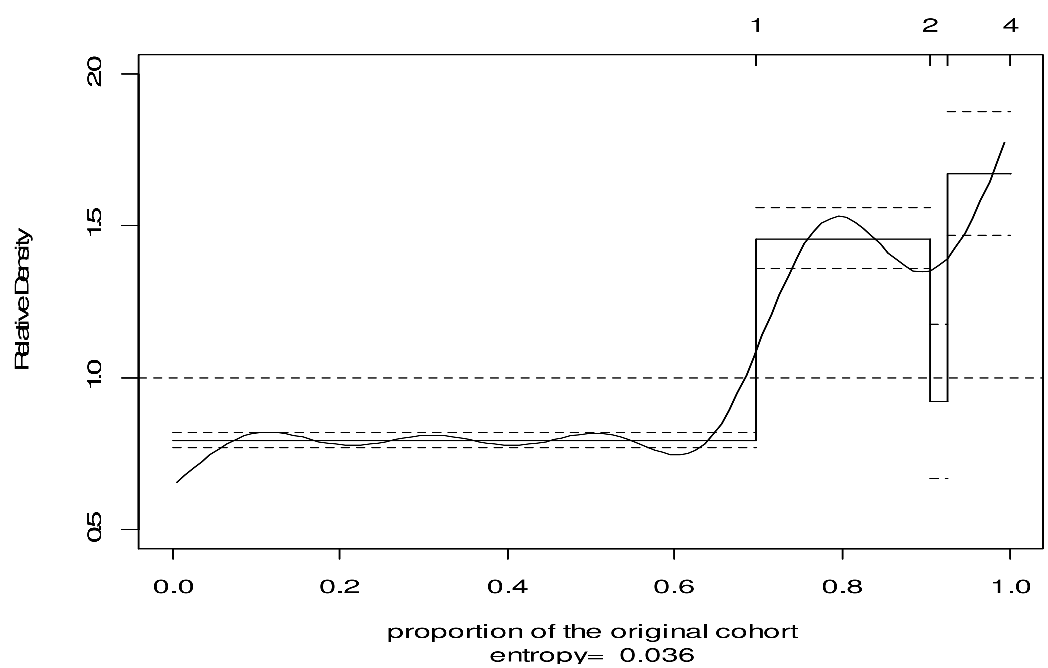
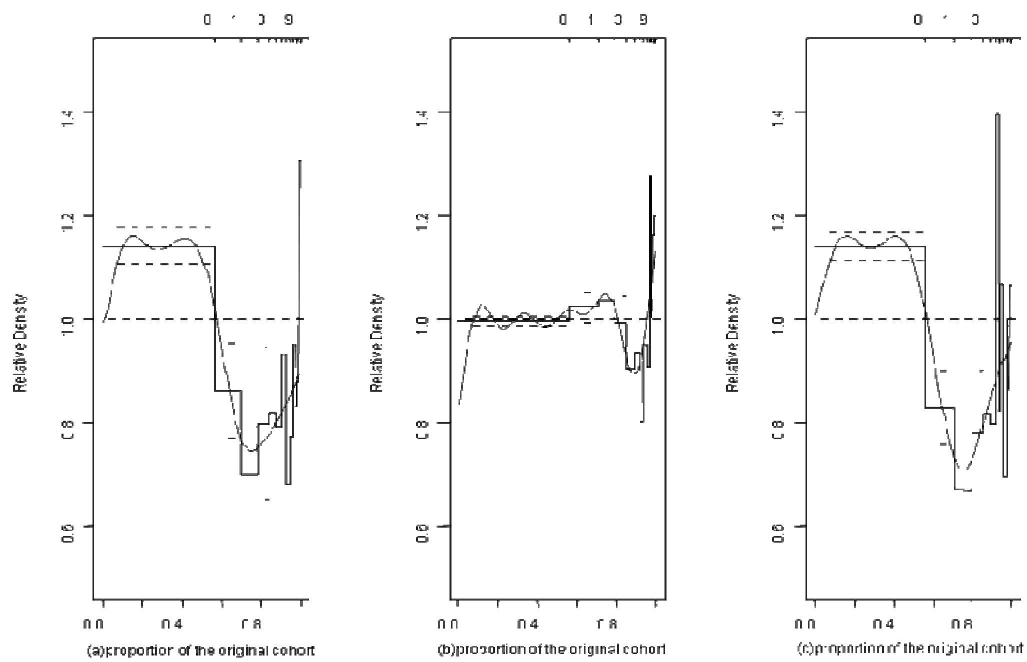


Figure 7.19 presents marital status' compositional and residual effects on GHQ. The first panel is exactly the same as the first panel of the income adjusted relative distribution as they are both the original relative distribution between the two cohorts. According to the second panel showing the composition effect of marital status, the lower tail to median of the GHQ distribution where GHQ score is 0 is again not affected by the adjusted variable. The compositional effect of marital status, however, does influence the distribution of GHQ where GHQ score is above 0. There is an increase in marital status associated GHQ relative distribution when GHQ scores are 1, 2 and above 8, and a decrease when GHQ

scores are between 3 and 8 inclusive. The increase in the proportions of single or divorced/separated category has resulted in polarization in the higher end of the GHQ scale but only has a small impact. This is another example that the covariate is only influential on GHQ distribution when GHQ score is above 0. The residual effect of marital status is still large, which is normal as many other possible covariates are not accounted for at this stage.

Figure 7.19, 1997-2005 relative distributions adjusted for marital status



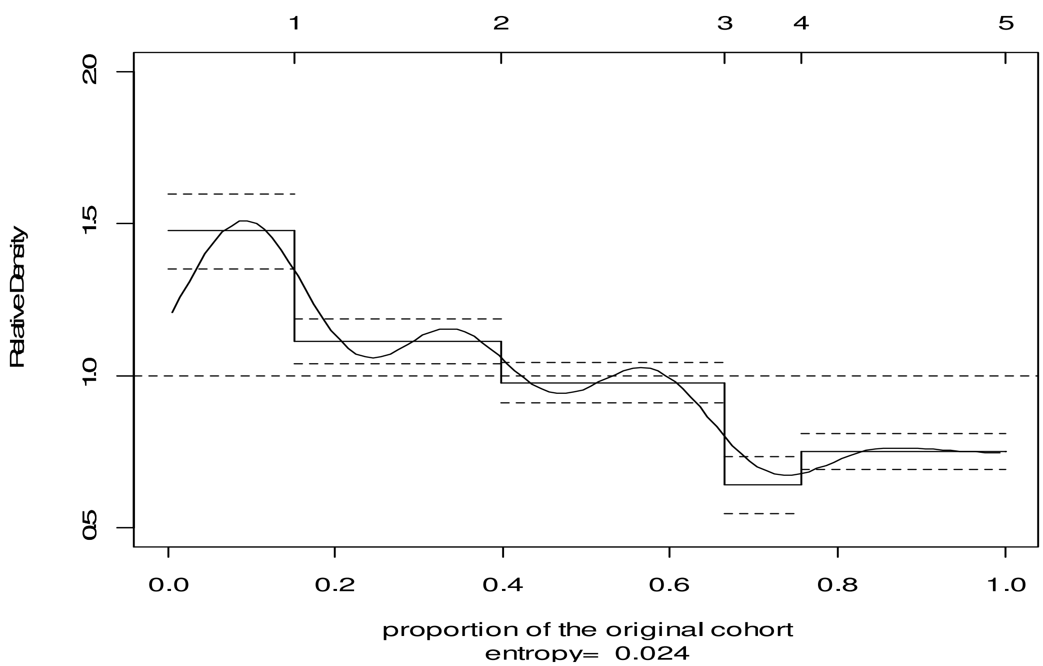
Combining the relative distributions of marital status and the compositional component of the effects of marital status, one can see that an increase in the proportions of respondents in the categories of being single and being separated or divorced and a decrease in the fraction of people in the married category leads to an increase of density in the very top centiles of the GHQ distribution.

7.7.1.3 Education adjustment

When examining the relative distribution of the education variable between the 1997 and 2005 cohorts, one can see a clear trend of people moving up towards the scale of the education attainments (Figure 7.20).

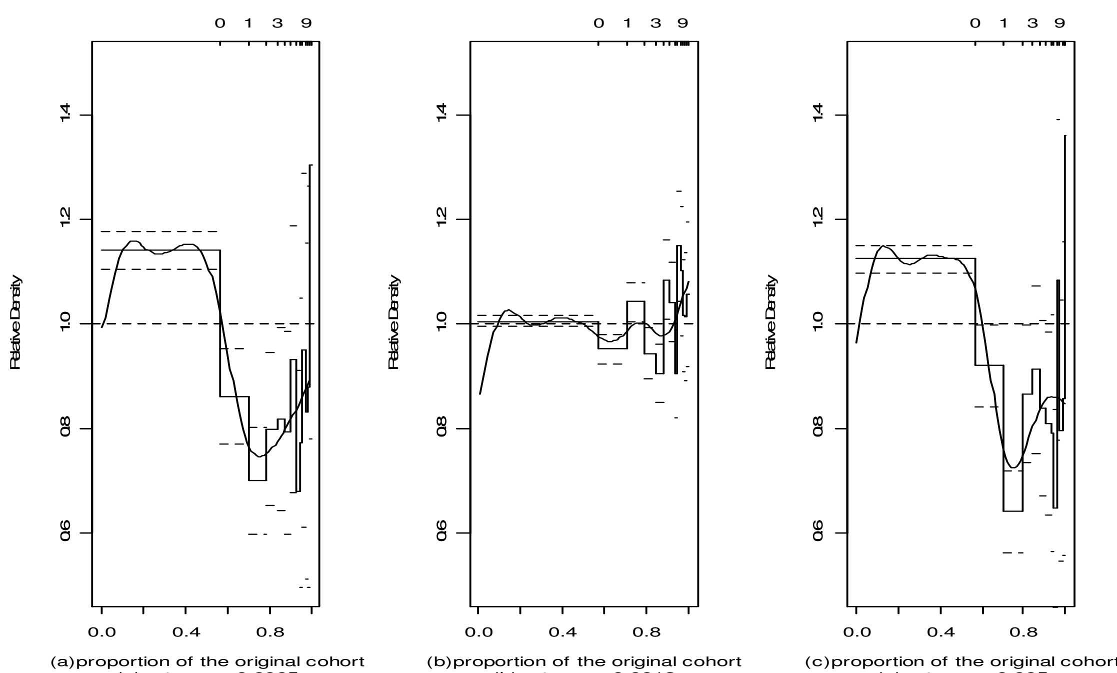
There are significantly more densities in the higher education levels of categories 1 (NVQ4/NVQ5/degree or equivalent and above) and 2 (Higher education below degree/NVQ3/GCE/A-level or equivalent) in the recent 2005 cohort compared with the 1997 cohort. For example, there used to be about 15% of the respondents obtaining degree level education in 1997 and the nearly 50% increase of density in 2005 signified by the relative density value of 1.5 on the y-axis means the proportion of people achieving degree level education rises to nearly 23% in 2005. Similarly, there is about 10% increase in category 2 of the education level in 2005 compared with 1997. Significant decreases in density in category 4 (NVQ1/CSE/other grade equivalent/foreign grade) by 30% and in category 5 (no qualification) by 25% are also observed in the recent 2005 cohort. Category 3 (NVQ2/GCE/O-level or equivalent) has experienced a slight decrease in distributional density in 2005 compared with 1997, although the difference between distributions in this category is not significant, reflected by the confidence interval lines of category 3 being on both sides of the 1.0 line.

Figure 7.20, 1997-2005 relative distributions of education



Education as another covariate examined for its composition and residual effects, also displays a similar pattern as the previous covariate adjustments (Figure 7.21). Samilarly, the first panel showing the original relative distributions between 1997 and 2005 is identical to the previous two covariate adjustments' left side panel. The compositional effect of education is only evident on GHQ scores of above 0 as shown in the middle panel. The effects of education associated GHQ relative distributions are mixed, increase on some GHQ scores and reduction on others across the entire above-zero GHQ distribution. The 1997 cohort seem to be more concentrated in the median to lower upper percentiles of the education incorporated relative distribution of the GHQ scores, and the 2005 cohort has more density in the very top percentiles. This seems to indicate the rise in proportions of higher education levels may have some effect on people with not very serious psychological problems by reducing the density distributed in the upper middle percentile, but seem to have made it worse at the very top of the GHQ distribution. The changes in the distribution of education levels only have a small impact on the relative distributions of the GHQ scores, judging by the entropy value from the middle panel, it only amounts to less than one fifth of the overall differences (the ratio of 0.0012 to 0.0065). The education-adjusted relative distribution (residual effect) is again very large and accounts for more than four fifths of the overall distributional differences. The fact that the relative distributions showing in the last panel is very close to the original relative distribution also justifies its importance.

Figure 7.21, 1997-2005 relative distributions adjusted for education



7.7.2 Sequential covariates adjustment

Sequential decomposition is carried out to account for more influential covariates and the last variable in the sequence is the one of interest. The sequential decomposition assumes that all the other variables have the same distribution except the last one in the sequence. It is essentially a way of investigating how the variable affects the distribution controlling for other covariates.

7.7.2.1 Example 1: 1997-2005 sample truncated at GHQ score of zero

Income is used as an example for the sequential covariate decomposition for samples with GHQ score truncated at 0. Figure 7.22 shows the relative distributions of income between the two years when respondents with GHQ value of 0 are excluded. There is more density in the top four centiles of the income distribution of the 2005 cohort and the 1997 cohort has more density in the lower six centiles of the relative distributions. The proportion of the top centile of the income distribution is about 2.3 times more in 2005 than in 1997 whereas the fraction of the bottom centile is 60% less in 2005 than in 1997, using the 1997 cohort as the reference distribution. Therefore, the income distribution continues to have an upward moving trend when respondents with GHQ score of 0 are excluded.

Figure 7.22, 1997-2005 relative distributions of income for sample truncated at GHQ score of zero

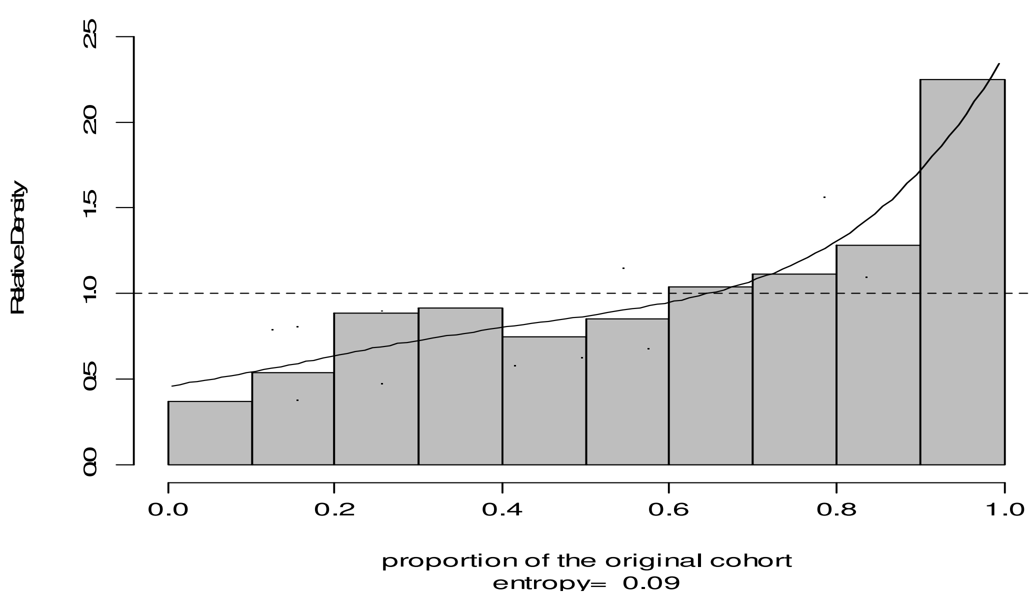
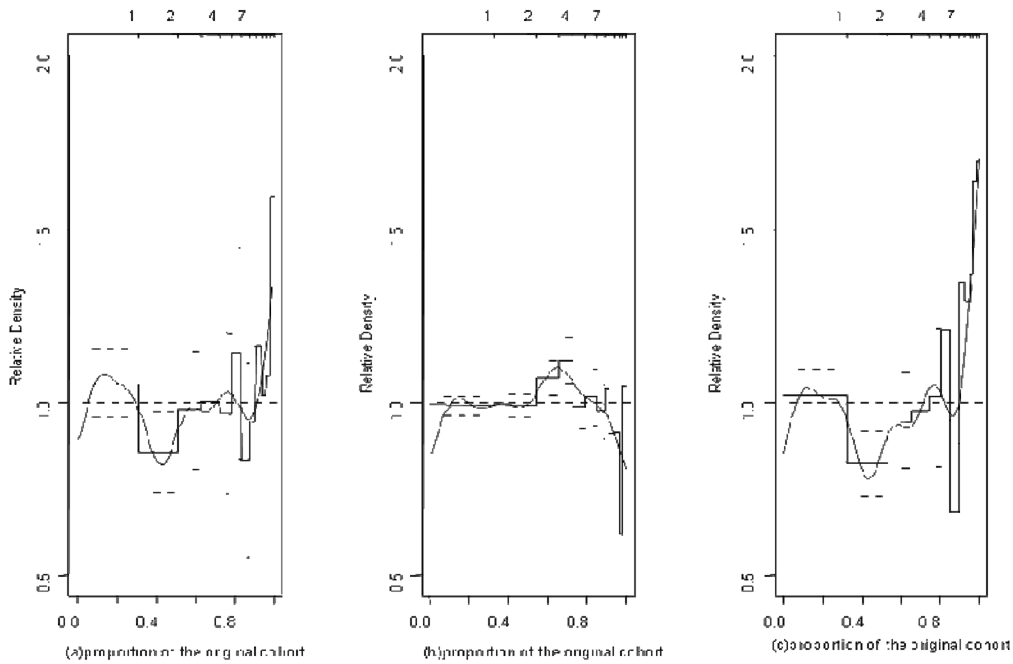


Figure 7.23, 1997-2005 relative distributions sequentially adjusted for income for sample truncated at GHQ score of zero: gender, age, education, marital status, social class, income



When the sample is truncated with GHQ score of 0 excluded, the different GHQ scores are more evenly distributed (Figure 7.23). Overall, the recent cohort 2005 is more concentrated in the lower tail (GHQ score of 1) and very upper tail (GHQ score of 6 and 9 to 12) as showing in the first panel. The mean GHQ score of 2005 now becomes higher than the mean GHQ score in 1997 once respondents of GHQ score of 0 are excluded. The middle panel shows the relative distribution of GHQ when a number of covariates are controlled for with the interest to discover the effect of the distribution of a particular covariate on the relative distribution of GHQ – in this case, income. There seems to be no significant differences between the two cohorts at the lower end of the GHQ distribution when GHQ scores are 1 or 2. The recent 2005 cohort has more density when GHQ score is 3 and 4 while the 1997 cohort is more concentrated in the upper tail where GHQ score is above 4. These observations seem to indicate that the increase in population income has an effect at the top end of the GHQ distribution reflected by the decrease in the proportion of people reporting high GHQ scores in 2005, but has an opposite effect for people at the lower middle range of the GHQ scale. However, the entropy value of the income effect means that the impact of income on GHQ is rather small. The last panel showing the residual effect of income is the income-adjusted relative distribution after controlling a number of other covariates. The close resemblance between the right panel and the left panel reveals that the residual of income effect on GHQ is still large.

In order to fully understand income-related relative distribution of GHQ, both of the composition and residual components are further decomposed into location and shape shifts. Figure 7.24 and Figure 7.25 show the further decompositions of the composition and residual effects of income, respectively. It is obvious that shape change is the main contributor of the distributional differences in both cases. The shape change in the compositional effect of income means that the dispersion other than location change of the income distribution has lead to the observed compositional effect on GHQ. Therefore, income does play a role in influencing the change of GHQ distributions over years, in that the rise in income improves the psychological wellbeing. Shape shift in the residual effect represents changes in the dispersion of income's conditional returns to the GHQ distribution, and this type of change is typically ignored by regression-based models.

Figure 7.24, Location and shape decomposition of the compositional effect of income

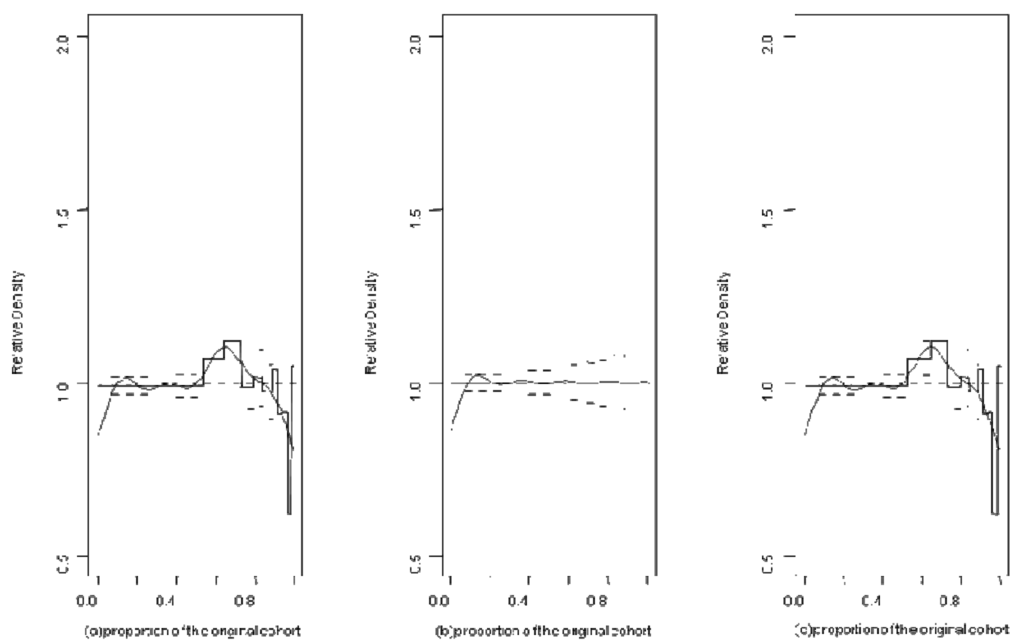


Figure 7.25, Location and shape decomposition of the residual effect of income

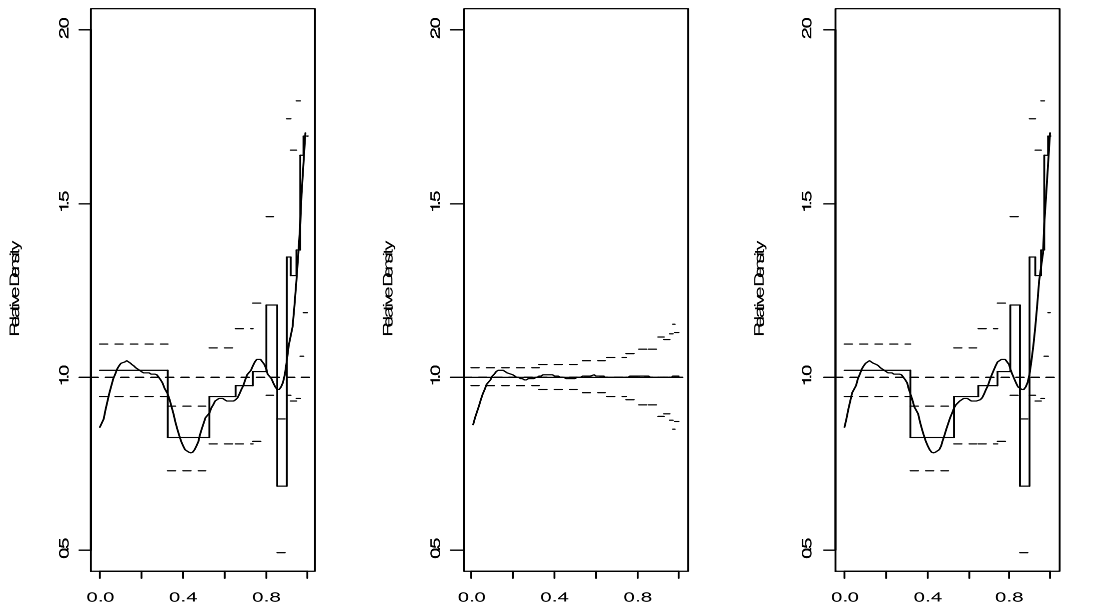


Table 7.9, Polarization indices: 1997-2005 sample truncated at GHQ score of zero

97-05 truncated at 0	Polarization index	Estimate	95% CI	P-value
Compositional effect	Median index	-0.198	-0.208 – -0.189	0.000
	Lower index	-0.313	-0.313 – -0.313	0.000
	Upper index	-0.143	-0.165 – -0.121	0.000
Residual effect	Median index	-0.116	-0.144 – -0.088	0.000
	Lower index	NaN	NaN	NaN
	Upper index	-0.025	-0.092 – 0.042	0.230

Polarization indices have been calculated for both the compositional effect and residual effect of income. Table 7.9 displays the values for all the polarization indices. For the compositional effect of income, all the polarization indices are significantly negative, which indicate that there is convergence toward the centre of the distribution when considering income's composition effect on GHQ. For income's residual effect, only the median index is significantly negative, showing less polarization occurring in the median of the residual component. The polarization index is not applicable for the lower tail and not significant for the upper tail of the residual component.

7.7.2.2 Example 2: 1997-2005 sample truncated at GHQ score of two

In the case of the sample truncated at 2, marital status is taken as an example of the sequential covariates adjustment. Figure 7.26 shows that the truncated samples still see a significant increase in the single (category 2) and divorced or separated (category 4) categories. The proportion of respondents reporting divorced or separated is 1.8 times more in the recent 2005 cohort than the reference cohort and 1.3 times more for reporting marital status of single, and both are statistically significant as the confidence interval lines for both categories are above the 1.0 line. Reading from the graph, about 10% of the respondents in 1997 reported to be divorced or separated, so the relative density indicates that there are now 18% in that category in 2005. Similarly for the single category, there used to be around 20% in 1997 and with the increase of density in that category in 2005, the figure now becomes 26%. There is also a higher proportion of respondents in the category of being widowed in the recent 2005 cohort, although the distributional difference for this category is not significant. The reference 2005 cohort continues to have significantly more density in the married group (category 1) with 25% less proportion of respondents than the 1997 cohort – there used to be about 65% respondents in the married category in 1997, so the proportion of respondents in the married category in the recent cohort has become less than 50%.

Figure 7.26, 1997-2005 relative distributions of marital status for sample truncated at GHQ score of two

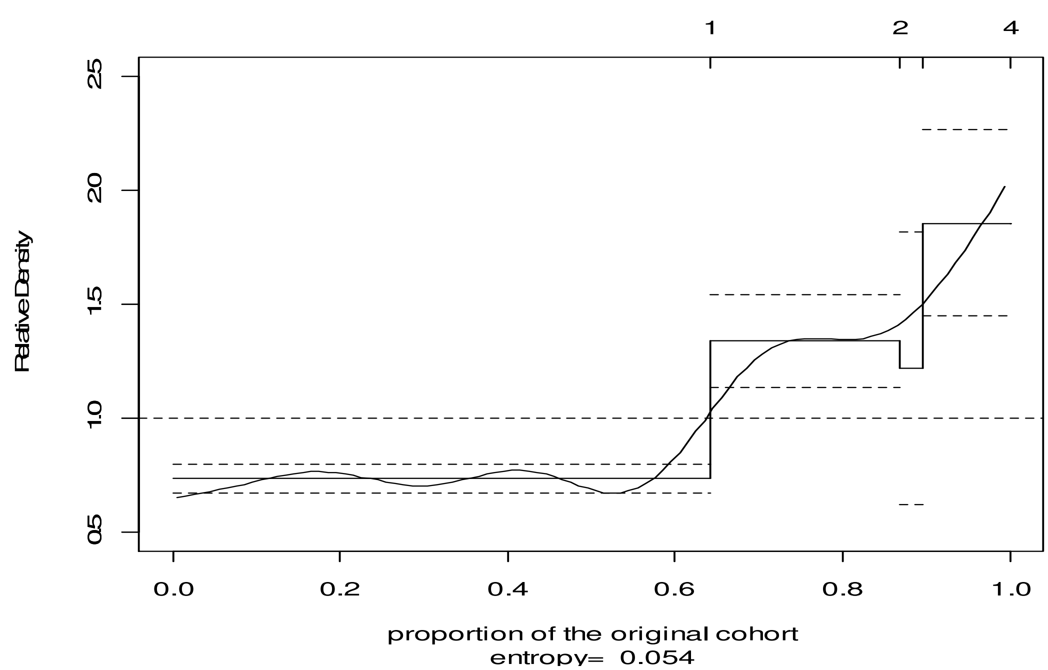
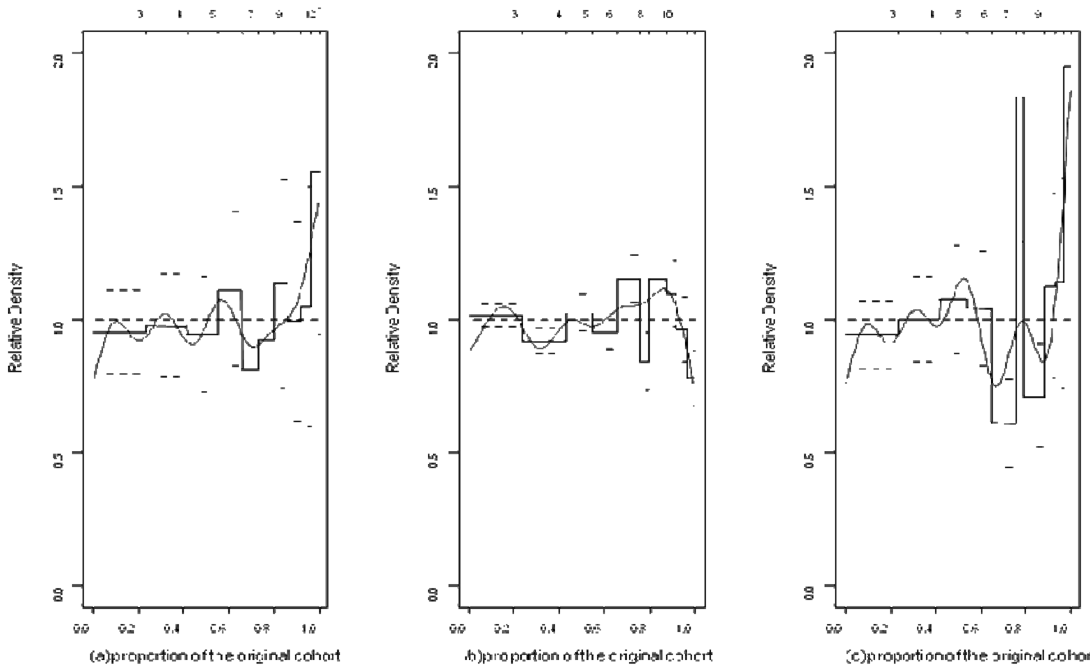


Figure 7.27, 1997-2005 relative distributions sequentially adjusted for marital status for sample truncated at GHQ score of two: gender, age, education, income, social class, marital status



When gender, age, education and income are controlled for, the compositional effect and residual effect of marital status are examined in Figure 7.27. The first panel shows the original relative distributions when GHQ score is truncated at 2 between the two years. There is more density in the middle of the GHQ distribution (GHQ score of 6) and an increase of density in the very top tail of the GHQ distribution in the recent cohort – over 1.5 times more than the proportion of respondents reporting high GHQ scores in the reference cohort. The middle panel shows the effect of marital status on GHQ score after controlling for a number of covariates. There seems to be a decrease in density at the very top end of the GHQ distribution (GHQ scores of 11 and 12) and an increase in proportion of reporting GHQ scores of 7, 9 and 10 in the recent 2005 cohort. The increase in the very high end of the relative distribution of GHQ observed in the first panel is not associated with the change in the marital status composition; however, the increase in the upper median of the GHQ distribution is related to the composition effect of marital status. Considering the relative distributions of marital status where the proportions of respondents in the categories of being single and being divorced or separated are higher and the fraction of being married is lower in the recent 2005 cohort than in the reference 1997 cohort, one may conclude that the decrease of being in a relationship has damaging effect on people's psychological wellbeing at the higher end of the GHQ scale, but not so at the very top of the GHQ distribution. The right panel showing the residual effect of marital status is more dramatic than the original relative distributions, indicating there are more factors playing in the change of GHQ distributions between the two cohorts.

Similarly, both compositional and residual effects of marital status have been further decomposed into location and shape shifts. Figure 7.28 and Figure 7.29 clearly show that shape change continues to be the sole contributor of the distributional differences in both components of the marital status. The dispersion of the marital status distribution has been the reason for the observed compositional effect on GHQ. The smaller lower tail and heavier upper tail of the recent marital status distribution has increased the fractions of respondents at the upper median of the GHQ distribution. Shape shift in the residual effect demonstrates changes in the dispersion of marital status' conditional returns to the GHQ distribution. This effect continues to be quite large, considering the almost uniform distribution of the location change in the residual effect.

Figure 7.28, Location and shape decomposition of the compositional effect of marital status

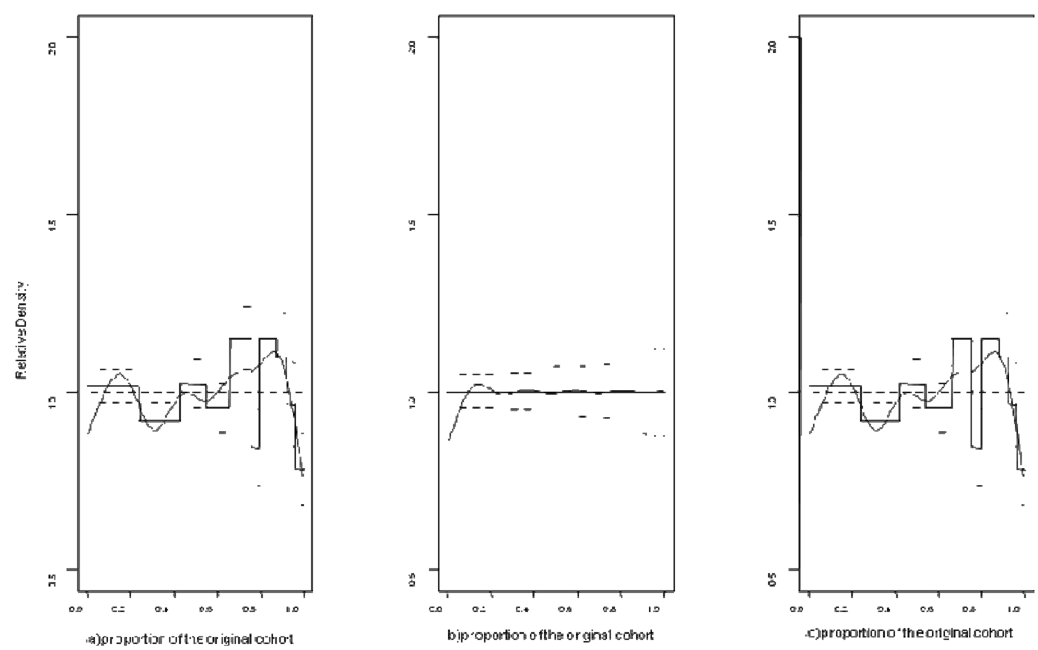


Figure 7.29, Location and shape decomposition of the residual effect of marital status

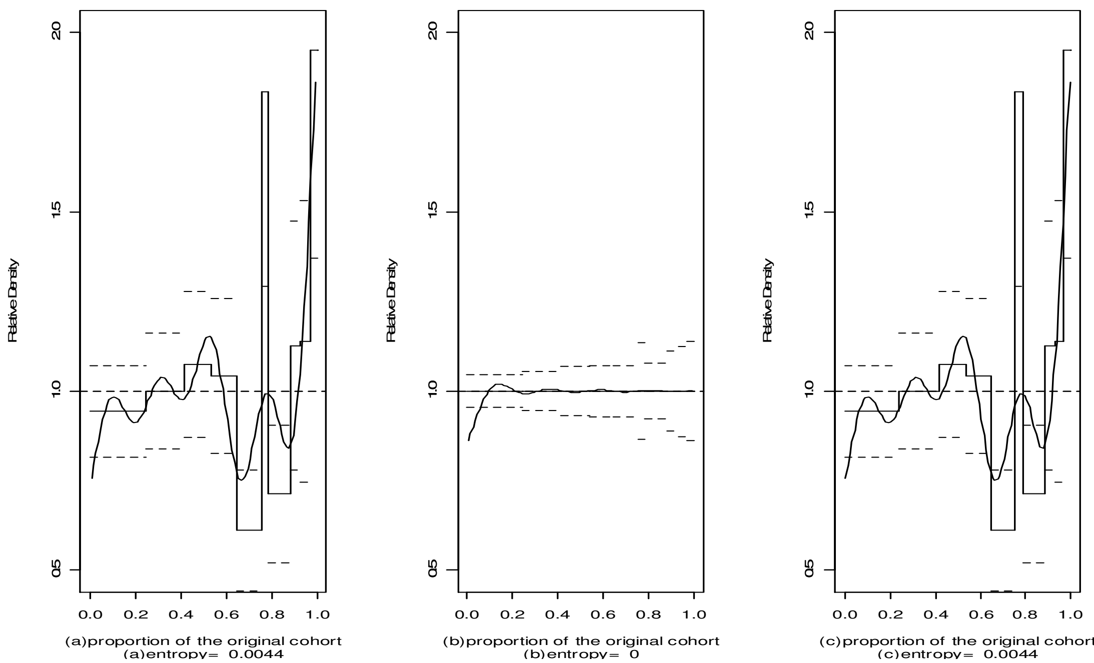


Table 7.10, Polarization indices: 1997-2005 sample truncated at GHQ score of two

97-05 truncated at 2	Polarization index	Estimate	95% CI	P-value
	Median index	-0.099	-0.112 – -0.085	0.000
Compositional effect	Lower index	-0.269	-0.287 – -0.251	0.000
	Upper index	0.023	-0.008 – 0.053	0.072
	Median index	-0.082	-0.124– -0.040	0.000
Residual effect	Lower index	-0.268	-0.319 – -0.218	0.000
	Upper index	0.043	-0.053 – 0.139	0.188

Polarization indices have been calculated for both the compositional effect and residual effect (Table 7.10). The median and lower polarization indices are negative in both the composition and residual effects of marital status, indicating there is convergence toward the centre of the distributions and at the lower end of the distributions. Both of the upper polarization indices are positive; however, only the upper polarization index for the composition effect of marital status is statistically significant at 10%, meaning a slight polarization is occurring at the upper end of the composition component's relative distributions, and the upper polarization index for the residual component's relative distributions is not significant.

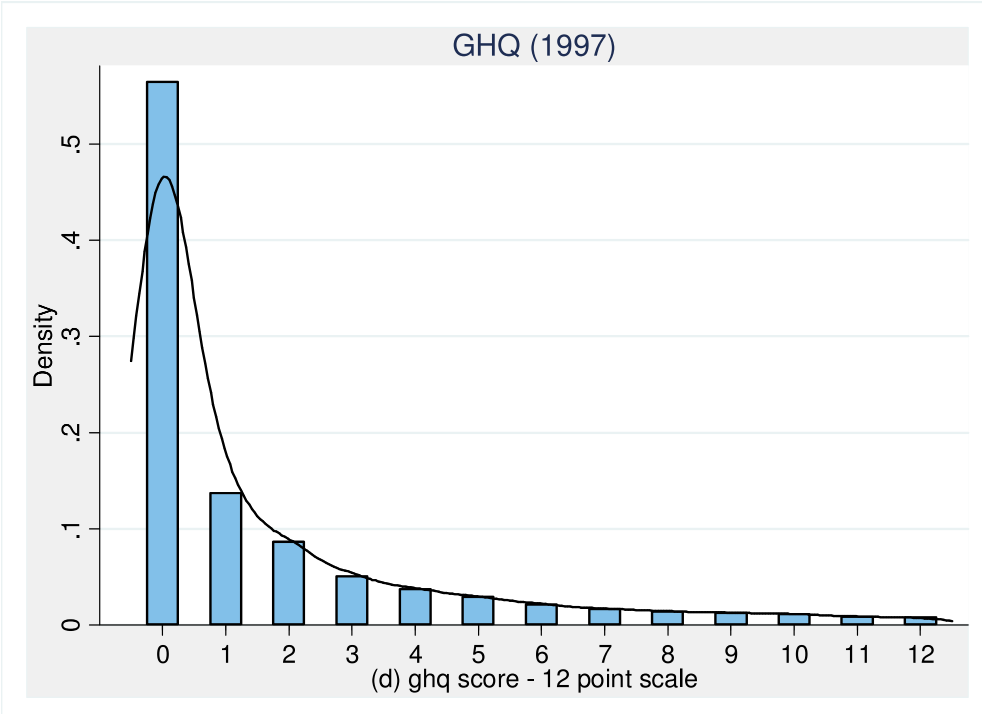
7.8 Quantile regression

Quantile regression results are obtained by using STATA programmes developed by Joao Pedro Azevedo (2005). Similarly, due to the limitation of time and space, only quantile regression results of the two benchmark years – 1997 and 2005 are presented in this section. Quantile regression coefficients are examined at three critical levels for each cohort: the percentile where GHQ score is changing from 0 to 1, the percentile where GHQ score is changing from 2 to 3 and the percentile at the top end of the GHQ scale. This enables us to see which covariates play a role in pushing the GHQ score over the critical values. In this section, graphs of the quantile regressions are shown to provide an intuitive display of the effects of each explainary variable on GHQ for the entire distribution and how their effects change through the distribution. Detailed quantile regression results and the frequencies of the GHQ scores can be found in Appendix 5.

7.8.1 Quantile regression of the 1997 sample

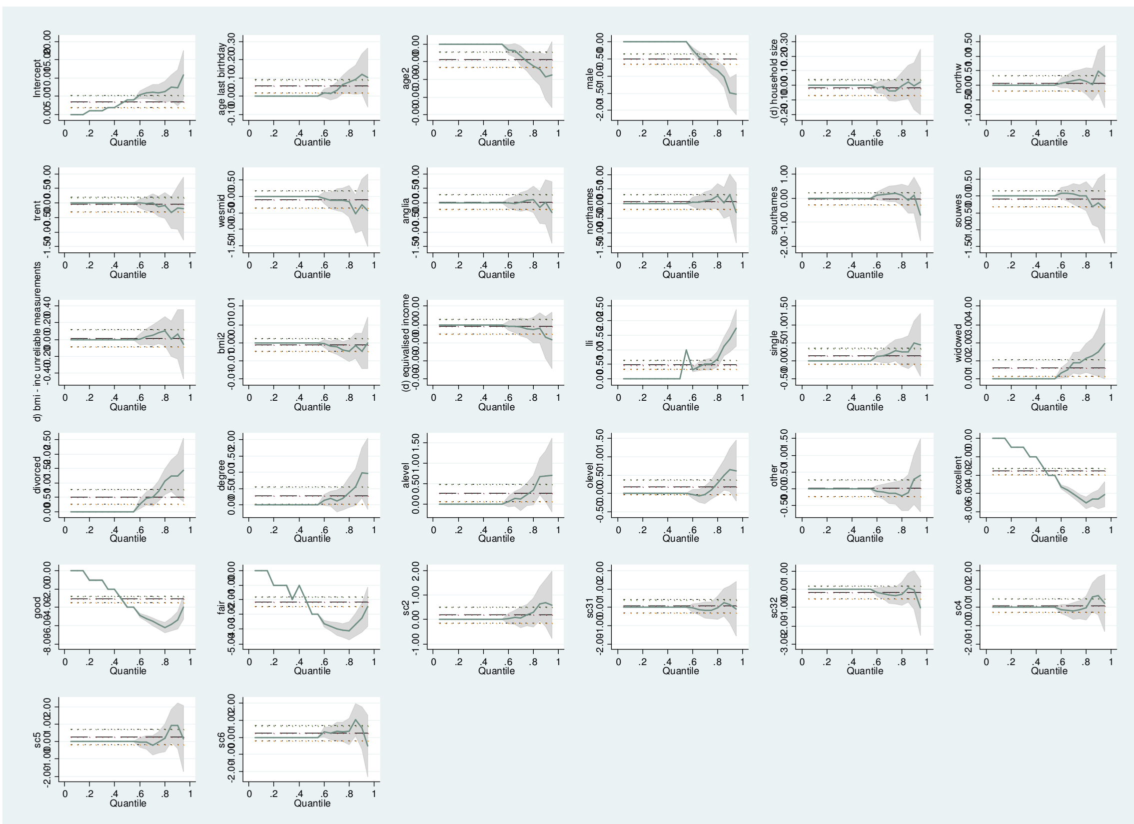
Figure 7.30 provides a clear description of the distribution of GHQ scores in 1997. The proportions of the respondents are decreasing along the GHQ scale, with the GHQ score of 0 taking more than half of the entire distribution. This shape of the distribution seems plausible – the higher the GHQ score or the worse psychological wellbeing becomes, the less proportion of people there would be in the GHQ group. The large proportion of respondents reporting the same GHQ score of 0 means an ordinary regression would not be able to properly model the relationship between GHQ and other socioeconomic factors. Quantile regression, modelling the covariates' association with GHQ at different percentiles, will perform very well in this case.

Figure 7.30, GHQ distribution of 1997



As about 56% of the population have GHQ scores of 0, there is almost no effect from the regressors on the dependent variable GHQ in the first nearly sixty percentile of the distribution shown in Figure 7.31. The variable which is most consistently significant across the entire distribution is self-assessed health (excellent, good or fair compared with the omitted "poor" category). As expected, SAH is negatively associated with GHQ score – the better the SAH, the lower an individual's GHQ score. The magnitudes of the effects differ at different percentiles. SAH has a growing impact on GHQ until the point where GHQ scores change from 2 to 3, then the magnitude is decreasing. This may be due to the long right hand tail of the GHQ distribution that cannot be easily modelled as a result of its small proportion and at the extremely high end of the GHQ scale, therefore, the different categories of SAH do not differentiate much. Being male is another factor that is significant across the entire distribution – men have significantly better psychological wellbeing than women. Two of the regressors – suffering from longstanding illness and being divorced, only start to be significant at the point where GHQ changes from 2 to 3. As expected, suffering from longstanding illness is associated with higher GHQ scores and the magnitude of longstanding illness's effect on GHQ increases moving up along the GHQ scale. Compared with being married, divorced people have worse psychological wellbeing and this effect increases with the GHQ scores. There are also a number of covariates that only have significant effect at the changing point of GHQ between 2 and 3 – age, income, widowed and having A level education. Both age and age squared are included in the model, which allows for a quadratic relationship. This echoes with the previously mentioned study results that psychological wellbeing and age have a U-shaped relationship (Gerdtham and Johannesson, 2001). Rise in age first increases then reduces GHQ scores. Income level has a very small but significant impact on GHQ scores with richer people having better psychological wellbeing. Both being widowed and having A level education have adverse effect on mental wellbeing. Only one of the location variables is significant at the 98 percentile – living in south Thames reduces GHQ scores compared with the reference of living in the north.

Figure 7.31, Quantile regression for GHQ in 1997 sample



It is unexpected that, the higher educated people are, the worse psychological wellbeing they have, although only A level education is significant at 10%. However, a study on happiness and unemployment has also found that highly educated show more mental distress than others for both employed and unemployed, though the effect is similarly small as found in this research (Clark and Oswald, 1994). The study argues that for unemployed, the result fits with the economist's presumption that the opportunity cost of unemployment is larger for the highly-educated due to their greater foregone wage; and for employed, this is some kind of comparison effect due to high aspirations – a theory backed by the Clark and Oswald’s (1993) finding that job satisfaction is a declining function of the person's level of educational qualification. Although the theory can be difficult to prove, it may be true that educated people have higher expectations towards all aspect of life, and therefore, are more likely to be unsatisfied with life, work and anything else, thus, the lower psychological wellbeing.

7.8.2 Quantile regression of the 2005 sample

Figure 7.32 displays the GHQ distribution for the sample in 2005. It is similar to the 1997 sample that GHQ score of 0 continues to be the largest group in the distribution. There are more than 60% respondents belonging to the group of GHQ score of 0. The proportions of the respondents in each GHQ score group are decreasing when moving up along the GHQ scale.

Figure 7.32, GHQ distribution of 2005

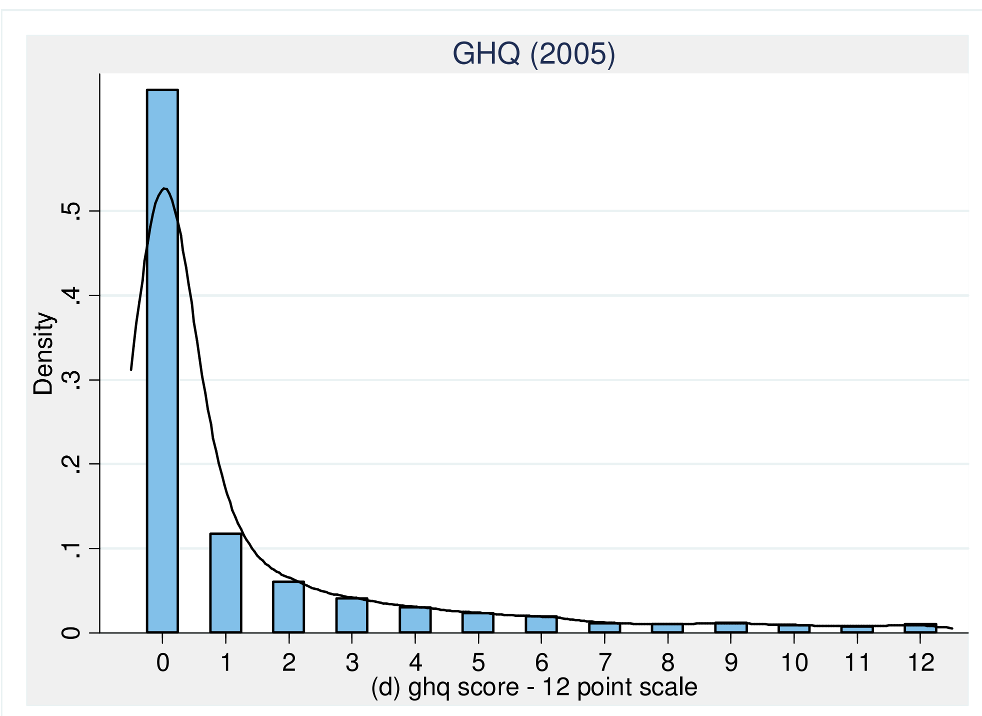
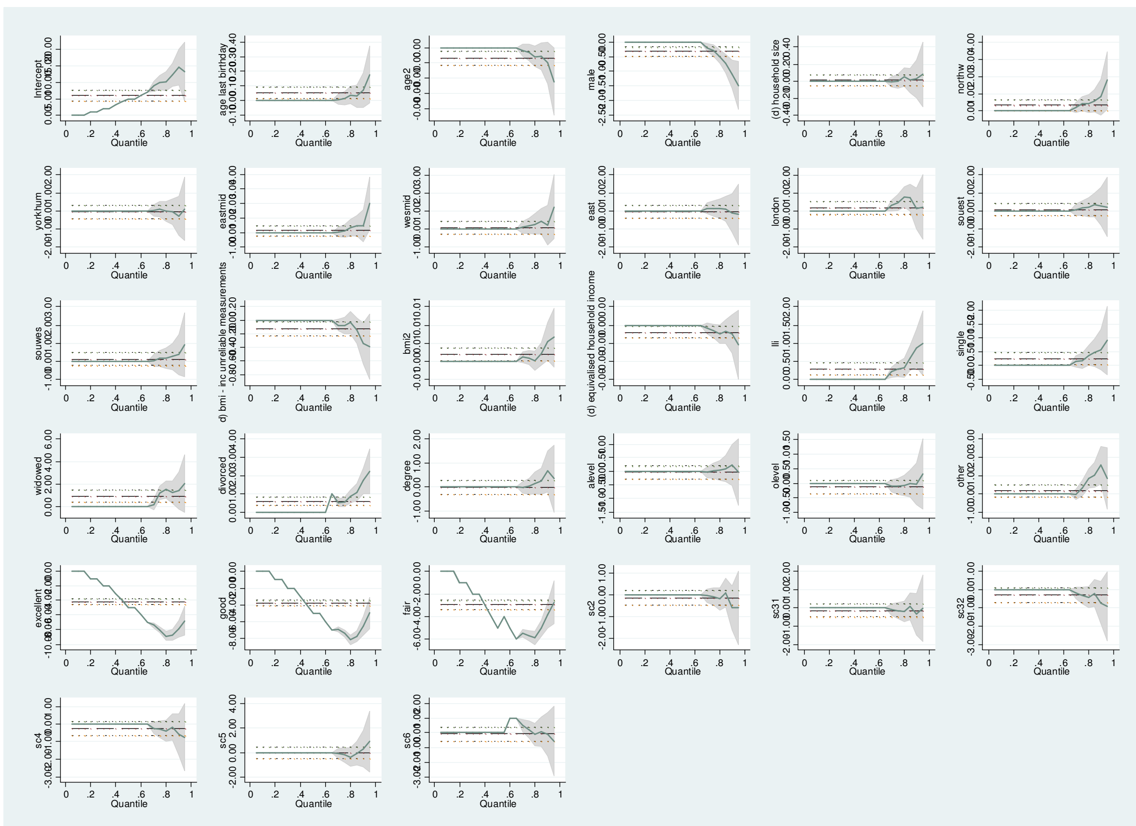


Figure 7.33 shows the quantile regression results in 2005. Similar to the GHQ distribution in 1997, since more than 64% of the population have GHQ score of 0, there are not many fluctuations of the regressors' effect on GHQ in the first sixty four percentile of the distribution in the 2005 cohort. Self-assessed health (excellent, good or fair compared with the omitted "poor" category) consistently displays a significant effect on the GHQ scores across the entire distribution. The better the SAH is, the lower the individual's GHQ score. The magnitude of SAH's effect appears to be bell shaped as it has the largest impact on the population with GHQ scores changing from 2 to 3 and the impact decreases in both ends. This is the same as what is observed in 1997.

Figure 7.33, Quantile regression for GHQ in 2005 sample



Being divorced is another factor that is significant across the entire GHQ distribution with a growing magnitude of impact towards the upper tail. From the graph of the factor "divorce", we can see a clear spike occurring at the percentile around 64% where population change from GHQ score of 0 to 1. This may indicate that being divorced is one of the important factors that decide whether people suffer from any mental disorders. One of the categories of social class – social class six (students, in the armed forces and other not classified, etc) has also a similar spike as being divorced occurring at the point where population change from GHQ score of 0 to 1. Being in social class 6 has an opposite effect depending on the percentile – in the lower tail to median where the population GHQ is 0, it increases GHQ, whereas in the very upper tail where GHQ scores are very high, it reduces GHQ; however, it is only significant at the percentile where population change from GHQ score of 0 to 1. Being male and having longstanding illness start to have a significant effect from the point where the population change from GHQ score of 2 to 3 and the effect increases with GHQ scores. Men have significantly better psychological wellbeing than women and suffering from longstanding illness has a damaging effect on psychological wellbeing. Many covariates only have an impact at around the cut-off point (between 2 and 3) of the GHQ distribution, such as location variables of living in the North West and living in London, being widowed and having other types of education (foreign, etc). Compared with the reference group of living in the North East, residing in the north west and London both increases GHQ scores, and being widowed or having other types of education have the same effect. Education variables do not seem to be significant in the quantile regression in 2005. Only the other type of education compared with no education shows a positive relationship with GHQ, indicating people in this category are more likely to have higher GHQ scores.

There are also a number of covariates that only have a significant impact in the top percentiles of the GHQ distribution, which include age, household size, living in east midlands, residing in west midlands, BMI, being single and in social class two. Both age and age squared are significant with different signs, indicating that age first increases then reduces GHQ, so that younger and older people have better psychological wellbeing than the middle aged. Being single, having a large household size and living in both east and west midlands all have a damaging effect on psychological wellbeing. Belonging to social class two as compared to the reference group of social class one and BMI reduce GHQ scores.

7.8.3 1997 and 2005 quantile regressions summary

A summary table is presented here for all the significant variables in the quantile regressions of both 1997 and 2005. Table 7.11 shows the level of significance and sign.

Table 7.11, Summary of significant regressors in the quantile regressions

Quantiles	Significant Variables	1997	2005
Percentile where GHQ score changes from 0 to 1	Male	(-)*	/
	Excellent (SAH)	(-)***	(-)***
	Good (SAH)	(-)***	(-)***
	Fair (SAH)	(-)***	(-)***
	Divorced/separated	/	(+)**
	Social class: others	/	(+)***
Percentile where GHQ score changes from 2 to 3	Age	(+)**	/
	Age squared	(-)***	/
	Male	(-)***	(-)***
	Income	(-)**	
	Longstanding illness	(+)***	(+)*
	Widowed	(+)***	(+)***
	Divorced/separated	(+)***	(+)***
	Excellent (SAH)	(-)***	(-)***
	Good (SAH)	(-)***	(-)***
	Fair (SAH)	(-)***	(-)***
	A-level	(+)*	/
	Other education	/	(+)**
	Northwest	/	(+)*
	London	/	(+)**
98 percentile	Age	/	(+)***
	Age squared	/	(-)***
	Male	(-)***	(-)**
	Household size	/	(+)**
	South Thames	(-)*	/
	East midlands	/	(+)***
	West midlands	/	(+)*
	Longstanding illness	(+)***	(+)*
	BMI	/	(-)*
	Single	/	(+)***
	Divorced/separated	(+)**	(+)***
	Excellent (SAH)	(-)***	(-)***
	Good (SAH)	(-)***	(-)***
	Fair (SAH)	(-)**	(-)***
	Social class II	/	(-)*

*denotes significance level of 10%, **denotes significance level of 5%,***denotes significance level of 1%

Overall, the three categories of SAH are consistently significant in both quantile regressions and throughout the distribution. Feeling excellent, good and fair as opposite to being poor is associated with lower GHQ scores. Another health related factor – longstanding illness is significant in both regressions at higher percentiles where GHQ scores are above 2 and as expected, suffering from longstanding illness is bad for psychological wellbeing. Men tend to be significantly better in their psychological wellbeing than women, which has already been shown and discussed in the relative distributions analysis. Marital status is also significant in most of the regression results and compared with people in a married or cohabitating status, being single, divorced/separated or widowed has a damaging effect of their psychological wellbeing. Age and age squared are significant in the 1997's upper middle percentile and 2005's very top centile, respectively, therefore, a quadratic relationship between age and GHQ is suggested, although this may not be the case for the entire GHQ distribution. Income is only significant in 1997 at the percentile where GHQ score crosses the critical threshold. Social class and some location variables are significant in different situations, which do not seem to have a clear pattern. This shows the difficulty in modelling GHQ, which is not normally distributed.

7.9 Summary

This chapter investigates the change of psychological wellbeing over time in England. Two methods are applied in the analysis: the relative distributions method and quantile regression – both are well equipped to model the GHQ distribution where not only the median, but also the entire distribution is of study interest and GHQ's relationship with other variables may be different at different percentiles. Each of the methods has its desirable merit for the purpose of the study, so it is interesting to compare the results from the two methods.

The relative distributions method directly compares the entire distribution of GHQ for each year with the added bonus of providing distinction between differences due to shape change and location change. In addition to examining the distributional differences of GHQ between cohorts, a number of covariates are also tested for their role in the change of GHQ distributions. In this chapter, a few examples are used to show the usefulness of the method and examine the effects of some covariates on the changes in the GHQ distribution.

For the relative distributions of the whole sample, the comparison 1998-1999 is chosen. Shape change is found to be the main cause of the differences in distributions between cohorts for the whole sample and the male-only sample. For female-only sample, both location and shape changes play a role. Polarization exists at the median level – a sign of female population moving towards both ends of the distribution.

For the sample truncated at 0, relative distributions between 2004 and 2005 are taken as an example. Both shape and location changes contribute to the distributional differences of the whole sample and the male-only sample. There is only shape change in the female-only sample. The example of 2004 and 2005 comparison demonstrate that the analysis of relative distributions can reveal hidden matters that cannot be captured by simple examination of mean scores – it is the location change where the year 2005 has moved downwards on the GHQ scale that has caused the average GHQ score truncated at 0 for males in 2005 to be lower than in 2004, while the shape of the 2005 distribution actually has a much bigger upper tail than the 2004 cohort. For the sample truncated at 2, the relative distributions between 2001 and 2002 are shown and only shape change exists for the whole sample as well as male-only and female-only samples.

Examining the male-female relative distributions in 2000, the whole sample and the sample truncated at 2 have shape only distributional differences whereas the sample truncated at 0 has both shape and location changes. Clear polarization occurs in the male-female comparisons – the main reason that men's GHQ average score is lower than women's. Women are more likely to shift to the very top end of the GHQ scale than men.

Covariate adjustments are performed for the 1997-2005 comparison. The covariates – income, marital status, education are examined about their relationship with the GHQ distribution, controlling for age and gender, and all of them only affect distributions above median. Improvement in the education achievement leads to more density at the top tail of the GHQ distribution. Rise in income increases the density in the GHQ distribution of just above 0 and the very top tail, but reduces the density at the upper range. Sequential adjustment sees rise in income increases density at just above 2 of the GHQ distribution and decrease density at the very top tail, whereas the change in the marital status that less people are in a relationship, increases density at the upper range and reduces density at the very top end – similar to the effect of income. Both of their composition and residual effects are further decomposed into location and shape change and shape change seems to be the sole contributor of distributional differences in all cases. There is slight polarization at the upper tail of marital status' composition effect distribution.

The examples shown in this chapter do not seem to have a uniform pattern, although in general, shape change is the main cause of the differences in GHQ distributions between cohorts for non-truncated samples and both shape and location change exist when samples are truncated. Thanks to the scale invariant property of the relative distributions method, the results are easily translated to its implication on happiness.

The second method applies a parametric regression approach, which examines the entire distribution, to investigate psychological wellbeing between the year 1997 and 2005 in England. In general, for both years the explanatory variables in the regressions only start to show a significant effect from the point where the average GHQ score changes from 0 to 1. The proportion of the population reporting a GHQ score of 0 is higher in 2005 than in 1997. In both years, SAH is an important predictor of psychological wellbeing, with the highest magnitude at the percentile where the GHQ scores change from 2 to 3. Being divorced seems to be another important factor in the GHQ distribution. Divorced people tend to have worse psychological wellbeing and the higher the GHQ score, the bigger impact of being divorced seems to be. Men consistently display a better psychological status than women in both years. Longstanding illness tends to have more impact on GHQ in 1997 than in 2005, reflected by the fact that it is significant in all tested quantiles in 1997 but only significant in 2005 at the point where GHQ switches from 2 to 3, and as we expect, suffering from longstanding illness is associated with worse psychological wellbeing. Education appears to increase the burden of psychological stress as higher educated people tend to have higher GHQ scores. Income level does not seem to play a significant role in how people feel psychologically.

Comparing the two methods, some similar findings are observed. The more variations observed in the relative distributions when samples are truncated at 2 are echoed by the more significant variables at the above median percentiles of the quantile regressions. Both methods show that higher education level is associated with worse psychological wellbeing, although neither of them is significant. In addition, income and marital status are both found to be related to the GHQ distribution in both methods, but only have a relatively small impact.

The findings in this chapter reflect the theoretical relationships between SES and happiness as predicted by the conceptual model in Chapter six. The link between SES and health or happiness has been demonstrated through both relative distributions and quantile regression, in particular, education and income are found to be associated with happiness, although the impact appears to be small. The quantile regression results also show a strong connection between health and happiness, especially at the turning point of psychological wellbeing from having no mental problem to showing signs of mental disorder.

There are not very clear patterns of variables affecting the distributions of GHQ, which may be due to these variables being quite complex to model. Although the methods have overcome many flaws in the traditional methods, they may still not be sensitive enough to detect changes in this data set. Therefore, further work is required, such as trying out decompositions with different orders of the covariates and using real panel data.

Chapter Eight: Conclusion

Consisting of three pieces of empirical studies and one piece of conceptual modelling, this research undertakes new investigations on inequalities in health and happiness in Britain using longitudinal data. The studies are carried out from a new angle: the life-course perspective; on new concepts and broader sense of health: mental health, psychological wellbeing and a related concept of happiness; and with new methods for measuring health inequalities: entropy measures, the relative distributions method and quantile regression. This chapter summarises the findings for these studies.

The first empirical study comparing different measures of health inequalities has applied both traditional methods – the Gini index, concentration index and related methods, and new measures of health inequality – the entropy measures and relative distributions. Among the inequality measures, the B measure of the entropy family displays an opposite result as to the other methods. The study gives the explanation for this finding – B measure being specially designed for categorical variables regards every category as being equally important whereas other traditional measures rely on a weight being given to each category, and suggests that a combination of the B measure and other inequality measures should be applied when dealing with categorical health indicators.

In the analysis of decomposition of health inequalities using the panel data of NCDS, the study adopts a life-course approach, by including early childhood variables, such as parental income and birth weight. The study finds that health at birth measured by birth weight and parental economic status are important predictors of adulthood health and also contributing considerably to income-related health inequalities, which appears to confirm the theory that health is a function of previous health investments and endowments. Other socioeconomic variables – education, social class and income, also display significant effects on SAH as well as being major contributors of income-related health inequalities. Education is one of the largest contributors to income-related income inequality, and the comparison between the decomposition of parental income- and cohort member's own income-related health inequality indicates that there is more pro rich health inequality when parental income is concerned. This suggests that policies to tackle health inequalities may be overestimated if the opportunity of pursuing higher education cannot be made equal due to family circumstances. Therefore, policies involving income transfer to poorer parents may be a possible way of reducing health inequalities. Vertical comparisons of the decomposition results show that birth weight, parental income and degree level education all display an increase in their contribution in the pro rich health inequality, which may prove the theory that some factors accumulate through life to take an effect. Relative distributions analysis reveals that the distributional differences of SAH are mainly due to the change in the shape of the two cohorts. The median and lower indices are clearly showing the presence of polarisation and in the upper tail of the distribution people seem to be moving towards convergence. The results indicate that as people age, there is more and more self reported poor health which diverge people into poor and fair health groups while there are less people reporting excellent health pushing this group of people to converge towards the mean.

Based on the second empirical study, whether income inequality plays a role in health inequality is still open to discussion. The three measures of relative income – Gini, relative deprivation and deprivation from the mean are applied for three measures of health – SAH, longstanding illness and Malaise Inventory. The relative income hypothesis mostly holds for models using relative deprivation and deprivation from the mean as measures of income inequality when modelling longstanding illness and Malaise Inventory. SAH does not seem to be associated with relative income, despite only a few significant results. This meets the expectation that psychological wellbeing is primarily affected by income inequality before any impact is shown in general health, although longstanding illness also seems to be more sensitive to income inequality than SAH. It seems that the use of different income inequality indicators, health indicators and types of modelling all play a role in investigating the relationship between health and income inequality, therefore, further research is required to examine whether using different reference groups has any effect on this relationship.

A conceptual model is needed because before the research goes on to investigate inequality in psychological wellbeing in addition to physical health, a clear structure of a few different, yet confusing concepts needs to be drawn. In the literature, gaps exist on a clear distinction of the concepts of and the relationship between health and wellbeing or happiness. This research has made a first attempt to address this confusing mixture of concepts and provide a conceptual framework for all the concepts involved. The model puts physical health, mental health and happiness at the centre of the structure, and relates mental health with happiness through psychological wellbeing. The relationships involved may be complex as shown in the conceptual model, however, the relative distributions method can relax any assumptions that link mental health with happiness in the literature, but only require the two subjects to be monotonic. Based on this conceptual framework, a clear picture is provided to help model these factors using econometric techniques.

The last piece of the empirical studies utilises the innovative relative distributions method to measure GHQ distribution and compare its entire distribution across years and between male and female. There does not seem to be a uniform pattern for the relative distributions, although in general, shape change is the main cause of the differences in GHQ distributions between cohorts for non-truncated samples and both shape and location change exist when samples are truncated. Polarization does seem to occur when women are compared with men. Thanks to the relative distributions method, the results for GHQ can be easily translated to its implication on happiness; therefore, the study results can also be informative to policies relating to happiness.

Quantile regression is applied to complement the results from the non parametric relative distributions method. Covariates only start to show significant results in the middle to upper tail of the GHQ distributions when GHQ scores are above 2, which resembles the similar fact in the relative distributions that there are more variations and clearer movements when samples are truncated at 2. Both methods show that higher education level is associated with worse psychological wellbeing, although neither of them is significant. In addition, income and marital status are both found to be related to the GHQ distribution in both methods.

The findings of the empirical studies mirror the theoretical relationships between variables as predicted by the conceptual model in Chapter six. The predictors in the empirical studies mainly cover two areas in the conceptual model – SES and initial health stock. Findings in Chapter four and five have shown evidence of SES and initial health stock in predicting individuals' health in adulthood. Chapter five has also extended the investigation to include mental health and SES, in particular, income, education and social class, appear to be related to mental health as suggested in the theoretical model. Chapter seven examines happiness in addition to mental health and has demonstrated the link from SES, in particular education and income, to mental health and happiness.

To conclude, this research confirms the persistence of the long lasting issue of health inequalities in Britain – not only in physical health but also psychologically. Current research methods of measuring health inequalities need to be used with caution, especially when applied to categorical health indicators. The effect of one of the suggested influential factors on health inequalities – income inequality, continues to show mixed results and seems to be more related with longstanding illness and Malaise Inventory than SAH. The life-course theory does appear to hold proven by the study findings that parental income and birth weight are important contributors to health inequalities. Women tend to have higher GHQ scores than men across the last 15 years. This indicates women suffer from more mental stress and are less happy than men. The population seems to be shifting to both ends of the mental health or happiness scale. Although the overall average GHQ scores are decreasing, there are more proportions of reported very high GHQ scores. Relative distributions do not seem to reveal a clear pattern for the source of the change (location or shape), although shape change is more common in the overall non-truncated GHQ distribution and both are quite prevalent for truncated samples. Decompositions of the relative distributions show similar trends as the quantile regression of the covariates, such as income and education.

There are limitations in this research, and further investigations are suggested. The panel data of NCDS may not be long enough to show clear patterns of the changes in health inequalities over years and it would be more informative if the new waves with the most up to date information of the cohort members in their old age can be included in the future research. The methods to measure health inequalities require further evaluations and the B measure needs to be tested on more data sets. Different reference groups should be used to examine the effect of income inequality on health and other econometric models and measures of income inequality need to be tested. The relative distributions performed on the GHQ distributions also require further work on the covariate decomposition in that different orders of the covariates adjustments should be examined, and in addition, the HSE data is not real panel data, so it may be worth testing the methods on other panel data sets which have the GHQ variable or other psychological wellbeing indicators.

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Appendices

Appendix 1 GHQ & Malaise Inventory questionnaires

General Health Questionnaire (GHQ) 12-item version

Have you recently:

1* Been able to concentrate on whatever you're doing?

2 Lost much sleep over worry?

3* Felt that you were playing a useful part in things?

4* Felt capable of making decisions about things?

5 Felt constantly under strain?

6 Felt you couldn't overcome your difficulties?

7* Been able to enjoy your normal day-to-day activities?

8* Been able to face up to problems?

9 Been feeling unhappy or depressed?

10 Been losing confidence in yourself?

11 Been thinking of yourself as a worthless person?

12* Been feeling reasonably happy, "all things considered"

*these items are positive questions

Malaise Inventory items

1. Do you often have backache?
2. Do you feel tired most of the time?
3. Do you often feel miserable or depressed?
4. Do you often have bad headaches?
5. Do you often get worried about things?
6. Do you usually have great difficulty in falling asleep or staying asleep?
7. Do you usually wake unnecessarily early in the morning?
8. Do you wear yourself out worrying about your health?
9. Do you often get into a violent rage?
10. Do people often annoy and irritate you?
11. Have you at times had a twitching of the face, head or shoulders?
12. Do you often suddenly become scared for no good reason?

13. Are you scared to be alone when there are no friends near you?
14. Are you easily upset or irritated?
15. Are you frightened of going out alone or of meeting people?
16. Are you constantly keyed up and jittery?
17. Do you suffer from indigestion?
18. Do you often suffer from an upset stomach?
19. Is your appetite poor?
20. Does every little thing get on your nerves and wear you out?
21. Does your heart often race like mad?
22. Do you often have bad pains in your eyes?
23. Are you troubled with rheumatism or fibrositis?
24. Have you ever had a nervous breakdown?

Appendix 2 Modelling results of relative income hypothesis

1. Modelling of SAH

1.1 Using Gini as relative income measure

1.1.1 Pooled OLS model

1.1.1.1 Entire sample

goodh	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	.0138526***	.0035031	.013858***	.0035033	.0136183***	.0044124
prof	.0262992**	.0123216	.0259708**	.0123187	.0180862	.0163826
intermed	.0233979***	.008608	.0232339***	.0086068	.0367851***	.0110073
skillnm	.0219323***	.0080078	.0219049***	.0080073	.0273559***	.0103501
skillman	.0067123	.0086071	.0067689	.0086081	.0186052*	.0110154
unsklman	-.0107832	.0154704	-.0107331	.0154714	-.0214173	.0208788
child	.0009025	.0061276	.0009029	.0061271	.003391	.0077778
single	-.0049846	.005967	-.0049794	.0059674	.0013513	.0074118
separated	-.0522147***	.0174783	-.0521816***	.0174738	-.0552987**	.0227566
divorced	-.0141062	.0100112	-.0142456	.0100132	-.0066839	.0129917
widowed	-.0169102	.048196	-.0170462	.0482354	-.0338684	.0640761
cse	.0757789***	.0110103	.0754122***	.0110113	.0666567***	.0147897
ogcse	.1010266***	.0096596	.1008635***	.0096561	.0869084***	.0130972
alevel	.1113135***	.0106941	.1111292***	.0106932	.101934***	.0141548
diploma	.1294245***	.0107437	.1293968***	.0107432	.1003234***	.0146273
degree	.1386222***	.0112506	.1384434***	.0112515	.1165351***	.0151025
men	.0043366	.0050165	.0043763	.0050174	.0039823	.006295
waved5	-.0542126***	.0062035	-.0755009***	.0226649	-.0604255**	.0287507
waved6	-.0699759***	.0079224	-.0811666***	.0138531	-.0757009***	.0175009
giniequiv			.115669	.1180013	.0756627	.1506259
lninc					.0610853***	.0162142
giniatb					-1.113379*	.6270999
_cons	.6841564***	.03139	.6522365***	.0451579	.4812092***	.1110515

1.1.1.2 For men only

goodh	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	.0172301***	.0052827	.0172242***	.0052834	.0121877*	.0063493
prof	.0370939**	.015944	.0372238**	.0159522	.0150647	.0215303
intermed	.0343906***	.0128765	.0345017***	.0128939	.0383036**	.0164612
skillnm	.0249721*	.0133474	.0249938*	.0133489	.0179549	.0170577
skillman	.0116184	.0118359	.0116443	.0118379	.0134045	.0151728
unsklman	-.0057346	.0225694	-.005649	.0225759	-.0562789*	.0319545
child	.0111756	.0088663	.0111769	.0088664	.0117352	.0112013
single	.0018568	.008519	.0018623	.0085182	.0059947	.0107533

separated	-.0138765	.0243027	-.0138618	.0243075	-.0136215	.0301065
divorced	-.0013571	.0162796	-.0013352	.0162828	.0134348	.0209764
widowed	.0331602	.0929412	.0334158	.0928912	-.0003105	.1294354
cse	.0739154***	.0165896	.073986***	.0165904	.0813509***	.0226485
ogcse	.0932373***	.0144714	.093249***	.0144699	.0910792***	.0201119
alevel	.1043598***	.0152371	.1044135***	.0152377	.1049352***	.0208365
diploma	.118532***	.0157665	.118523***	.0157686	.0992769***	.022059
degree	.1286467***	.0161877	.1286761***	.0161884	.1148015***	.022374
waved5	-.070588***	.0091906	-.0648913***	.0320804	-.0556669	.0407132
waved6	-.0956943***	.0109663	-.0927034***	.0196118	-.0893722***	.0248929
giniequiv			-.0309401	.166226	-.0204477	.2098286
lninc					.050636**	.0232815
giniatb					-1.519876*	.8856009
_cons	.662707***	.0482466	.6712481***	.066883	.6238551***	.160182

1.1.1.3 For women only

goodh	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	.0094837*	.0049612	.0094614*	.0049649	.0123607*	.0063871
prof	.0164925	.0225654	.0160816	.0225581	.028986	.0271232
intermed	.015729	.0117903	.0158218	.0117931	.0345761**	.0150543
skillnm	.0198544*	.0101855	.0199611**	.0101852	.0334708**	.0132025
skillman	.0029104	.0147838	.0031925	.0147905	.0159284	.018869
unsklman	-.0183979	.0212876	-.01771	.0213009	.0019019	.0274687
child	-.0069538	.0085962	-.006914	.0085943	-.0006707	.0109034
single	-.0125767	.008524	-.0125445	.0085251	-.0037402	.0104491
separated	-.0807827***	.0245457	-.080561***	.0245368	-.0870943***	.0327211
divorced	-.021196*	.0127599	-.0215575*	.0127643	-.0185052	.0166439
widowed	-.0312244	.0549069	-.0311447	.0549985	-.0454866	.0732916
cse	.0759217***	.014736	.0750215***	.0147415	.0546969***	.0195127
ogcse	.1057048***	.0130219	.105188***	.0130196	.0817899***	.0173152
alevel	.1156926***	.0154652	.1154825***	.0154654	.0981176***	.0198321
diploma	.1387521***	.0148578	.1385253***	.0148588	.1029444***	.0197587
degree	.1466769***	.0158462	.1461798***	.0158508	.1196272***	.0207883
waved5	-.0414898***	.0085001	-.0843356***	.0320641	-.0686648*	.0405476
waved6	-.0454245***	.0116914	-.0679525***	.0196425	-.0643536***	.0247176
giniequiv			.2326358	.1674123	.1718774	.2151388
lninc					.0704048***	.0227208
giniatb					-.7838805	.893424
_cons	.7187639***	.0444401	.6547499***	.0630468	.3818958**	.1551156

1.1.2 Panel data model

1.1.2.1 Entire sample

goodh	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.

lnallinc	.0092535***	.0033524	.0092771***	.0033525	.0102148**	.0042693
prof	.0192213	.0124975	.0188415	.0124933	.0106876	.0167262
intermed	.0184101**	.0086234	.0182145**	.0086219	.0334274***	.0110229
skillnm	.0157931**	.008017	.0158474**	.0080168	.0256516**	.0103768
skillman	.006718	.0084927	.006771	.0084937	.0186513*	.0108184
unsklman	-.0009125	.0146529	-.0008534	.0146535	-.0061759	.0197088
child	.00098	.0060075	.0009611	.0060064	.0052368	.0076149
single	-.0033968	.0059607	-.0032731	.0059635	.0037213	.0073885
separated	-.0444232***	.0166759	-.0443924***	.0166688	-.0535337**	.0217798
divorced	-.0059033	.0098479	-.0060679	.009849	.0033023	.01278
widowed	-.0264065	.0472904	-.0265464	.047347	-.0503491	.0618802
cse	.084721***	.0132312	.0842659***	.0132313	.07244***	.0176587
ogcse	.1127234***	.0115348	.0842659***	.0132313	.0962943***	.0155443
alevel	.1241219***	.0127939	.1238849***	.012794	.1137861***	.0168031
diploma	.1443053***	.0127346	.1442788***	.0127347	.1117608***	.0172804
degree	.1552392***	.0131981	.1549995***	.0131991	.1294301***	.0177131
men	.0046043	.0059778	.0046591	.0059793	.0066388	.0074298
waved5	-.0513469***	.0056563	-.0796852***	.0212244	-.0679823**	.0267199
waved6	-.0697145***	.0074364	-.0845885***	.0129788	-.0808869***	.0163208
giniequiv			.1542074	.1110658	.1172857	.1404981
lninc					.0624159***	.0196164
giniatb					-1.109812	.7652705
_cons	.7126361***	.0306668	.6698313***	.0433421	.4804208***	.129258
sigma_u	.18441355		.18444759		.1680342	
sigma_e	.26881579		.26879608		.2625401	
rho	.32001756		.3201298		.29059982	

(fraction of variance due to u_i)

1.1.2.2 For men only

goodh	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	.0103121**	.0050656	.0102991**	.0050661	.0076986	.0061927
prof	.0293906*	.0160754	.0295935*	.0160774	-.0002114	.02179
intermed	.0272718**	.01286	.0274562**	.0128743	.0241143	.0164194
skillnm	.0177255	.0134068	.0177248	.0134067	.0083611	.0170689
skillman	.0101557	.0116217	.0102181	.0116236	.008461	.0148004
unsklman	.0012852	.0216791	.0014485	.0216841	-.0443051	.0303201
child	.0038179	.0086447	.0038159	.0086456	.0082504	.0109431
single	-.0017299	.0084222	-.0017644	.008426	.0018605	.0105799
separated	-.0215084	.0235736	-.0214932	.0235791	-.0248282	.0293584
divorced	-.0007211	.0160589	-.000692	.0160623	.0140191	.0206682
widowed	.0416909	.07739	.0422325	.0773177	.0144629	.1101782
cse	.0819276***	.0198527	.0820392***	.0198526	.0872453***	.026349
ogcse	.1037406***	.0172116	.1037594***	.0172114	.0981525***	.0233075
alevel	.1154481***	.0181281	.1155292***	.0181308	.115578***	.0241235
diploma	.1322333***	.0186655	.1322175***	.0186685	.1104365***	.0255957
degree	.1430028***	.0188898	.1430535***	.0188924	.1278674***	.0256456
waved5	-.0628123***	.0084906	-.053438*	.0300287	-.0580182	.0380624

waved6	-.0880838***	.0103886	-.0831746***	.0184003	-.0891394***	.0233733
giniequiv			-.0509754	.1561948	.0142187	.1963953
lninc					.0539106*	.0278784
giniatb					-1.569283	1.064676
_cons	.7176302***	.0469804	.7317619***	.0640333	.6437161***	.185133
sigma_u	.18112509		.18114994		.15684645	
sigma_e	.26378471		.26379805		.2570745	
rho	.32040945		.32044718		.27126829	
	(fraction of variance due to u_i)					

1.1.2.3 For women only

goodh	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	.0071728	.0047712	.0072039	.0047744	.0094888	.006173
prof	.0086331	.0231599	.0081838	.0231448	.0272285	.0279244
intermed	.0133899	.0119134	.013614	.011919	.0413606***	.0151606
skillnm	.0154976	.0101311	.015802	.0101308	.0367633***	.0131748
skillman	.0038744	.0143953	.0043745	.0144002	.0165179	.0182043
unsklman	-.0059817	.0199453	-.0049899	.0199484	.0182518	.0258904
child	-.0010306	.0084889	-.0010584	.0084864	.0049156	.0107305
single	-.008829	.0086696	-.0085506	.0086739	.0027435	.0106639
separated	-.0625764***	.0232544	-.0623229***	.0232331	-.074765**	.031031
divorced	-.0103015	.012556	-.0107455	.0125584	-.0042146	.0163949
widowed	-.0454485	.0553649	-.0450494	.0555128	-.0718614	.0726628
cse	.0858754***	.0177439	.084729***	.0177501	.0604189**	.0237596
ogcse	.1183829***	.0155726	.117706***	.0155731	.0925152***	.0209221
alevel	.1305717***	.018551	.1302339***	.0185566	.1106594***	.0240595
diploma	.1540003***	.0175985	.153686***	.0176045	.1126768***	.0236535
degree	.1655852***	.0186655	.164878***	.0186718	.131774***	.0248671
waved5	-.0428815***	.0076816	-.102078***	.0300004	-.0805508**	.0374738
waved6	-.0529602***	.0109563	-.0840972***	.0184164	-.0740541***	.0229812
giniequiv			.3219832**	.1576123	.2187557	.1999347
lninc					.0701319**	.0276952
giniatb					-.7219027	1.10304
_cons	.7235752***	.0435403	.6342262***	.0607206	.3702862**	.1811083
sigma_u	.18696908		.18708774		.17758678	
sigma_e	.27336888		.27322968		.26722351	
rho	.31869887		.31919579		.30634727	
	(fraction of variance due to u_i)					

1.1.3 Probit model

1.1.3.1 Entire sample

goodh	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.

lnallinc	.0736512***	.0239708	.0740408***	.0239848	.0805722**	.0315341
prof	.1594214	.1101775	.1562256	.1102475	.0596171	.1416021
intermed	.1315884**	.0577014	.129971**	.0577344	.2438843***	.077119
skillnm	.1179409**	.0527936	.1180281**	.0528182	.1695425**	.0694872
skillman	.0399909	.0543392	.0405587	.0543588	.1124251	.0729248
unsklman	.0245536	.0830491	.0252979	.0830864	-.0030629	.1115484
child	-.0262075	.0430243	-.0265408	.0430498	-.0004285	.0575017
single	-.0315414	.0487331	-.0313309	.0487569	.0316352	.0649809
separated	-.3021092***	.0943362	-.3014478***	.0943987	-.3548698***	.1270187
divorced	-.0512563	.0618537	-.0517155	.0618875	.0253762	.0862459
widowed	-.1333431	.2985957	-.1356926	.2985417	-.2714828	.3675165
cse	.4585845***	.0710598	.4554323***	.0711468	.4108356***	.0988139
ogcse	.6465442***	.0617147	.6451501***	.0617594	.5779226***	.0860825
alevel	.7316786***	.0759897	.7304358***	.0760408	.7197535***	.1048988
diploma	.9150303***	.0809131	.9152836***	.0809614	.7032254***	.1081743
degree	1.033717***	.0921466	1.032621***	.0922023	.9113876***	.1281448
men	.0310768	.0427084	.0312482	.0427297	.044215	.0573157
waved5	-.3899703***	.0427621	-.566764***	.1556006	-.4882615**	.2054925
waved6	-.5260933***	.0531398	-.6192453***	.095182	-.6066495***	.1255477
giniequiv			.963083	.8146823	.6781375	1.085164
lninc					.5143271***	.1557173
giniatb					8.301221	5.933818
_cons	.6545353***	.2107093	.3862053	.3095295	-1.290172	1.010527
/lnsig2u	.0899601	.0732183	.0916824	.0732292	.082852	.0959515
sigma_u	1.046007	.0382934	1.046908	.0383321	1.042296	.0500049
rho	.5224749	.0182676	.5229046	.0182689	.5207012	.0239468

Likelihood-ratio test of rho=0: chibar2(01) = 694.82 Prob >= chibar2 = 0.000

Likelihood-ratio test of rho=0: chibar2(01) = 695.53 Prob >= chibar2 = 0.000

Likelihood-ratio test of rho=0: chibar2(01) = 407.17 Prob >= chibar2 = 0.000

1.1.3.2 For men only

goodh	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	.0818873**	.0374916	.0816286**	.037492	.0537018	.0517282
prof	.2393905*	.1396326	.2422757*	.1397959	-.0066772	.1811097
intermed	.1886464**	.0895426	.1909324**	.0896934	.1854741	.1242435
skillnm	.1485775	.0999949	.1491783	.1000239	.045007	.1067714
skillman	.0622837	.0760102	.0629369	.0760332	.045007	.1067714
unsklman	.0020629	.1291015	.0037117	.1291606	-.259051	.1751123
child	.0020618	.0644126	.0024198	.064418	.0243482	.0884303
single	-.0001242	.0723707	-.0000413	.0723736	.0329818	.0973059
separated	-.1570375	.1482353	-.1571912	.1482169	-.1673164	.2028471
divorced	-.0118791	.1025856	-.0114205	.1025973	.0989175	.1472334
widowed	.4338646	.8465428	.4426263	.848064	.2572019	.9188834
cse	.4634943***	.1108529	.4650806***	.1109241	.5375565***	.1620013
ogcse	.6123186***	.0947719	.6128904***	.0947939	.6212591***	.1363533
alevel	.6973391***	.1064922	.6984481***	.1065334	.7645647***	.1523536
diploma	.8512969***	.120699	.8513513***	.1207187	.7080635***	.1642849

degree	1.005687***	.1338836	1.006616***	.1339241	.9178875***	.1859627
waved5	-.495945***	.0680401	-.3904502*	.2355525	-.4264381	.3176864
waved6	-.6795342***	.0778583	-.6244465***	.1410704	-.685033***	.1912082
giniequiv			-.5751053	1.229682	-.1351103	1.662275
lninc					.4871503**	.2305905
giniatb					-12.04091	8.78102
_cons	.6808177**	.335379	.8410112*	.4796521	-.1403951	1.522357
/lnsig2u	.1190265	.1081706	.1195219	.1081785	.1231892	.1423917
sigma_u	1.06132	.0574018	1.061583	.0574202	1.063531	.075719
rho	.5297215	.0269471	.5298449	.0269483	.5307584	.0354632

Likelihood-ratio test of rho=0: chibar2(01) = 324.81 Prob >= chibar2 = 0.000

Likelihood-ratio test of rho=0: chibar2(01) = 324.92 Prob >= chibar2 = 0.000

Likelihood-ratio test of rho=0: chibar2(01) = 191.59 Prob >= chibar2 = 0.000

1.1.3.3 For women only

goodh	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	.0576482*	.0327201	.058731*	.032773	.0791285*	.0418224
prof	.0615937	.2025689	.0561953	.2030249	.183425	.2755411
intermed	.1023302	.0772319	.1019959	.0773568	.2815931***	.1023778
skillnm	.1099942*	.0632136	.1119302*	.0633509	.2295067***	.0822705
skillman	.0245872	.088374	.0286222	.0885603	.097452	.114861
unsklman	.013015	.1092003	.0199943	.1094549	.1412096	.1473495
child	-.0467814	.059485	-.0467145	.0596199	-.0018746	.0778407
single	-.0879589	.0672581	-.0871515	.0673974	.0005771	.089567
separated	-.399008***	.1233556	-.3967114***	.1236322	-.46373***	.1660527
divorced	-.0796593	.0779681	-.0804331	.0781412	-.0250719	.1071655
widowed	-.2605233	.3202317	-.2615759	.3204586	-.4161415	.4018594
cse	.4476357***	.0926077	.4400607***	.092924	.3218664***	.1253948
ogcse	.6615922***	.0813466	.6579882***	.0815723	.5345846***	.111619
alevel	.7560576***	.113187	.755516***	.1134812	.6747751***	.1515544
diploma	.9625898***	.1099769	.963704***	.1102835	.7097441***	.1464221
degree	1.046695***	.1285335	1.045197***	.1288884	.9279578***	.1818876
waved5	-.3156395***	.055639	-.7016024***	.2087357	-.5561963**	.2716909
waved6	-.3923948***	.0748878	-.5974765***	.1308723	-.5421504***	.1689526
giniequiv			2.099018*	1.093198	1.334128	1.440967
lninc					.5477906***	.2127971
giniatb					-5.384512	8.104643
_cons	.7487062***	.2872599	.1618983	.4191762	-1.98609	1.36908
/lnsig2u	.0605588	.0998286	.06865	.0998881	.0568174	.1306395
sigma_u	1.030742	.0514488	1.034921	.0516882	1.028816	.067202
rho	.5151351	.0249343	.5171558	.0249426	.5142005	.0326335

Likelihood-ratio test of rho=0: chibar2(01) = 366.12 Prob >= chibar2 = 0.000

Likelihood-ratio test of rho=0: chibar2(01) = 368.01 Prob >= chibar2 = 0.000

Likelihood-ratio test of rho=0: chibar2(01) = 214.24 Prob >= chibar2 = 0.000

1.2. Using relative deprivation as relative income measure

1.2.1 Pooled OLS model

1.2.1.1 Entire sample

goodh	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	.0143151***	.0035162	-.0044557	.0124737	-.0042753	.015837
prof	.0261792**	.0123326	.0251599**	.0123627	.0176767	.016414
intermed	.0240722***	.0086143	.0228525***	.0086638	.0358076***	.0110442
skillnm	.0229702***	.0080245	.0224104***	.0080387	.0278139***	.0103551
skillman	.0067597	.0086013	.0062852	.0086094	.0180363	.0109962
unsklman	-.0099587	.0154771	-.0089375	.0154765	-.0198137	.0208804
child	.0009501	.0061317	.0016178	.0061434	.004197	.0078161
single	-.0041264	.0059799	-.0035939	.0059872	.0031995	.0074452
separated	-.0524042***	.0174457	-.0518426***	.0174418	-.0549574**	.0226916
divorced	-.0139103	.0100393	-.0133957	.0100463	-.0066909	.0130534
widowed	-.016902	.0483527	-.0167608	.0482691	-.0303729	.0648128
cse	.0776549***	.0110943	.0773824***	.0111025	.0680019***	.0149235
ogcse	.1016049***	.0096782	.1009363***	.0096973	.0867273***	.0131904
alevel	.1113628***	.0107176	.1105185***	.0107403	.1013824***	.0142381
diploma	.1297546***	.0107538	.1288784***	.0107765	.0999376***	.0146953
degree	.1396821***	.0112984	.1390234***	.0113101	.1175948***	.0151685
north	-.0023352	.0156257	-.0061797	.0158209	-.0251615	.0206501
yorkhumb	-.0157031	.0112913	-.0190691*	.0114794	-.0207448	.0147277
eastmids	-.0041312	.01181	-.0066855	.0119045	-.0061844	.0150995
eastang	.0165838	.0106756	.0140788	.0107855	.0019173	.0137735
sthwest	-.0003263	.0100316	-.0024811	.010114	-.0156396	.0135088
wmids	-.0093906	.0074393	-.0102695	.0074467	-.0164709*	.0093412
nwest	-.0048888	.0116421	-.0076651	.0117528	-.0134645	.0158715
wales	.0134218	.0169608	.0099409	.0171164	-.0158993	.0229932
scot	.0114619	.01636	.008509	.0164961	-.0312863	.0201342
nwestatb	.0201877*	.0113342	.0194151*	.0113434	.0202693	.01565
northatb	.001788	.0148585	.0014211	.01486	.0129538	.0193497
ewridatb	.009272	.0110816	.008059	.011108	.0228151	.0147745
nmidsatb	.0142949	.0114537	.0138466	.0114522	.0182588	.01472
eastatb	.0171407*	.0096403	.0173434*	.0096441	.0068217	.0124532
southatb	-.0060513	.0110346	-.0059714	.0110331	-.0056049	.0144338
swestatb	.0183098	.0114359	.0177938	.0114405	.023472	.0149894
midsatb	.0185315**	.0086784	.0164949*	.0087799	.0268461**	.0112411
walesatb	.0105979	.0167345	.0098109	.0167339	.029867	.0225624
scotatb	.0060027	.0159662	.0054573	.0159665	.0382338*	.0195912
men	.0047485	.0050263	.0035851	.0050719	.0032673	.0063716
waved5	-.0549525***	.0063777	-.0442342***	.0095094	-.0384561***	.0120161
waved6	-.071107***	.0080597	-.045912**	.0180638	-.0462802**	.0228199
rdepequiv			-.0600256	.0380567	-.0576237	.0484838
lninc					.0189017	.0396618
rdepatb					-.1033207	.0960714
_cons	.6704774***	.0325428	.8505631***	.1193413	.7743495***	.2568677

1.2.1.2 For men only

goodh	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	.0174091***	.0053105	-.012499	.0176158	-.0141122	.0196731
prof	.0369257**	.0160367	.0353722**	.0160943	.0116946	.0215899
intermed	.034845***	.0129604	.0332609**	.0130129	.0359198**	.016507
skillnm	.0255524*	.0134091	.0242775*	.0134638	.0180785	.0170915
skillman	.0118952	.0118393	.0112366	.0118565	.013817	.0151248
unsklman	-.0059978	.0226113	-.003596	.0226356	-.0532593*	.0321076
child	.0107545	.0088643	.0110756	.0088659	.0117353	.0112082
single	.0026856	.0085325	.0035146	.0085391	.0079383	.0107712
separated	-.0142956	.0242978	-.0132627	.0242996	-.0150944	.0301443
divorced	-.0000404	.0162979	.0010314	.0163138	.01303	.0210484
widowed	.0327306	.0946567	.0332193	.0935471	-.018197	.1293321
cse	.0767508***	.0166904	.0763571***	.0167033	.0869227***	.0228642
ogcse	.0953675***	.0144913	.0943332***	.0145307	.0927325***	.0201996
alevel	.1057729***	.0153037	.1045113***	.0153386	.1058398***	.0209817
diploma	.1202221***	.0157861	.1187908***	.0158333	.1020033***	.0221389
degree	.1301698***	.016246	.129486***	.0162587	.1183355***	.0224211
north	-.0057238	.0203981	-.0115816	.0207379	-.0617098**	.0259625
yorkhumb	-.0108283	.0157625	-.0161539	.0160147	-.0068548	.019274
eastmids	-.0086533	.0164457	-.0127366	.0165756	-.0203923	.0211421
eastang	.0081409	.0159086	.004338	.0160284	-.0048462	.0202449
sthwest	.0085573	.0139589	.0053523	.0140548	-.0057019	.0181586
wmids	-.0003965	.010148	-.0017497	.0101535	-.0121212	.0128172
nwest	-.0069181	.0177972	-.0108818	.0179613	-.0341465	.0253621
wales	.0080688	.0242121	.0035185	.024408	-.0361459	.0340641
scot	.002223	.0253708	-.0022376	.0255806	-.0446851	.0308255
nwestatb	.0105543	.0175104	.0090707	.0175176	-.0043456	.0247708
northatb	.0211645	.0191489	.0204977	.0191643	.0441318*	.0225839
ewridatb	-.0105169	.0155402	-.0126613	.0155874	-.0138036	.0202035
nmidsatb	.0128725	.0157989	.0118676	.0157895	.0311084	.0191145
eastatb	.0232074*	.0131509	.0232934*	.0131516	.0056624	.0167985
southatb	.0129572	.0149087	.0129639	.0148952	.0120521	.0194781
swestatb	-.0020272	.0170645	-.0026144	.0170679	.0037721	.0214945
midsatb	.0152102	.0120065	.0120127	.0121192	.0113809	.0156004
walesatb	.0221125	.0235466	.0200266	.0235166	.0292771	.0332754
scotatb	.0252649	.0244954	.0241132	.0244775	.0568181*	.0297511
waved5	-.0696045***	.0094373	-.054752***	.0128191	-.0467523***	.0152495
waved6	-.0946323***	.0111853	-.0539365**	.0256147	-.0561384*	.0290572
rdepequiv			-.0986292*	.0553919	-.082682	.0633071
lninc					-.0206757	.0558365
rdepatb					-.1689465	.1367855
_cons	.648367***	.0499032	.9348072***	.1687983	1.084233***	.3376605

1.2.1.3 For women only

goodh	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.

lnallinc	.0099304**	.0049664	-.0023898	.0178256	.0037314	.0231057
prof	.0148386	.0224763	.0140861	.0224986	.0257023	.0271158
intermed	.0168482	.0117676	.0158902	.0118663	.0350272*8	.0151732
skillnm	.0210233**	.0101801	.0206469**	.010194	.0341022***	.0131894
skillman	.0020607	.0147589	.0017492	.0147639	.0146772	.0187876
unsklman	-.0174768	.0212472	-.0172023	.0212362	.0020324	.0273421
child	-.0068302	.0086228	-.0061704	.0086744	.0002651	.0110058
single	-.0113702	.0085512	-.0111235	.0085562	-.0020266	.010532
separated	-.0793876***	.0244576	-.0791254***	.0244512	-.0843431***	.032388
divorced	-.0217717*	.0127978	-.0215591*	.0128051	-.0183562	.0167473
widowed	-.0323399	.0553677	-.0322911	.0553384	-.0405516	.0748117
cse	.0776036***	.0148691	.0773925***	.0148821	.0553817***	.0196871
ogcse	.1059531***	.0130391	.1054749***	.0130595	.081396***	.0174319
alevel	.1156233***	.0154776	.115011***	.0155131	.0989553***	.0199295
diploma	.1386733***	.0148615	.1380939***	.0148769	.102583***	.0198703
degree	.1479066***	.0159229	.147251***	.0159502	.1195112***	.0209545
north	.0026431	.0232119	.0000676	.023456	.006922	.0304243
yorkhumb	-.0197805	.0160377	-.0220226	.0163262	-.0345526	.0218675
eastmids	.0046854	.0169506	.0030732	.0170774	.0059078	.0217042
eastang	.023565	.0144361	.0218536	.0146263	.0070474	.0188916
sthwest	-.0079547	.014235	-.009488	.0143891	-.0234475	.0197158
wmids	-.0169257	.0108248	-.0174898	.0108378	-.0212509	.0135495
nwest	-.0022365	.0154435	-.0042505	.0156066	.0045116	.0204687
wales	.0202579	.0238192	.0176397	.0240635	.0044954	.0314605
scot	.0170333	.0214478	.0150038	.0216241	-.0239809	.0266851
nwestatb	.0273997*	.0149017	.0270077*	.014918	.0382215*	.0204873
northatb	-.0185545	.0222301	-.0188181	.0222316	-.0129847	.0295666
ewridatb	.029587*	.0156998	.0288689*	.0157349	.0573893***	.0213453
nmidsatb	.0142029	.0164731	.0139944	.016474	.0063347	.0223593
eastatb	.0110693	.0140651	.011297	.0140744	.0076248	.0185109
southatb	-.023908	.0160649	-.0238187	.0160679	-.0193448	.0209599
swestatb	.0370364**	.0153738	.0366506**	.0153902	.0427861**	.0210626
midsatb	.0213714*	.0125493	.0199988	.0127276	.0422533***	.0162719
walesatb	-.001428	.0237842	-.0016356	.0237894	.0301258	.0309882
scotatb	-.0069832	.0211411	-.0072281	.021144	.0280876	.0263411
waved5	-.0432603***	.0087586	-.0354766**	.0141838	-.0344345*	.0180451
waved6	-.0476918***	.0118537	-.0312741	.0258167	-.0389263	.0331052
rdepequiv			-.039325	.0542746	-.0297596	.0704479
lninc					.0614188	.0570392
rdepatb					-.0294828	.1360765
_cons	.7069193***	.0459803	.8249049***	.1700844	.4675779	.3768823

1.2.2 Panel data model

1.2.2.1 Entire sample

goodh	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	.0096429***	.0033635	.0065451	.0117895	.0076057	.0154098
prof	.019203	.0125005	.0190516	.0125264	.0109314	.0167461

intermed	.0188462**	.0086281	.0186824**	.0086581	.0332601***	.0110476
skillnm	.0167062**	.0080305	.0166414**	.0080366	.0264135**	.0103788
skillman	.0067898	.0084914	.0067359	.0084936	.0185998*	.0108045
unsklman	-.0003162	.014657	-.0001523	.0146645	-.0054212	.0197143
child	.0010461	.0060091	.0011607	.0060213	.0054009	.0076466
single	-.0026067	.0059689	-.0025351	.0059751	.0048392	.0074069
separated	-.044598***	.0166528	-.0445148***	.0166534	-.0536151**	.0217498
divorced	-.005691	.0098697	-.0056094	.0098797	.0033085	.0128454
widowed	-.0264036	.0474306	-.0263691	.047423	-.0478831	.0625953
cse	.0866108***	.0133382	.0865549***	.0133443	.074055***	.0178137
ogcse	.1132123***	.0115637	.1130815***	.0115802	.0965246***	.0156495
alevel	.124153***	.0128299	.1239968***	.0128483	.1139036***	.0169012
diploma	.1445946***	.0127478	.1444283***	.012766	.1120228***	.0173511
degree	.1563489***	.0132581	.156222***	.0132684	.1314791***	.0177944
north	-.0023099	.0177149	-.0029244	.0178551	-.0225414	.0229242
yorkhumb	-.005008	.0112774	-.0055342	.0114288	-.0094031	.0146004
eastmids	-.002554	.0120378	-.0029828	.0121257	.0005735	.0153926
eastang	.0192307*	.0107891	.0188167*	.0108916	.0128102	.0139013
sthwest	.0065733	.0101812	.0062382	.0102484	-.001295	.0135939
wmids	-.0091853	.0066083	-.0093032	.0066154	-.0137695*	.0083491
nwest	-.0055116	.0126184	-.0059529	.0127047	-.010318	.0173737
wales	.0176254	.0188652	.017072	.0189781	-.014864	.025372
scot	.0132143	.0176846	.0127518	.0177947	-.0194808	.0213272
nwestatb	.0197403	.0130614	.0196093	.0130649	.0184581	.0182186
northatb	-.0031958	.0175639	-.0032616	.0175652	.0067991	.0224829
ewridatb	.0026844	.0130564	.0024697	.0130771	.0146549	.0171075
nmidsatb	.0087147	.0133989	.0086469	.0133998	.0122218	.0170907
eastatb	.0159239	.0118769	.0159581	.0118783	.0036797	.0149791
southatb	-.0102049	.0135551	-.0101932	.0135537	-.0131912	.0175914
swestatb	.0127473	.0135475	.0126577	.0135491	.0144019	.0174363
midsatb	.0173627	.0107469	.017024	.0108244	.0250672*	.0138223
walesatb	.0045724	.0195525	.0044346	.0195544	.0280368	.0259702
scotatb	.0033857	.0179939	.0032889	.0179911	.0286672	.0217343
men	.0050819	.0059855	.0048945	.0060133	.0067996	.0074826
waved5	-.0521401***	.0057934	-.0503711***	.0088017	-.0468***	.0113248
waved6	-.0708998***	.0075402	-.0667391***	.0169894	-.0677912***	.0220335
rdepequiv			-.0099012	.0359188	-.0085801	.0467583
lninc					.0108039	.0480566
rdepatb					-.1253353	.1155848
_cons	.7005129***	.0320005	.7302137***	.1128987	.6894754**	.292632
sigma_u	.18433763		.18426565		.16806084	
sigma_e	.26880943		.26879094		.26244146	
rho	.31984868		.31970868		.29082018	

(fraction of variance due to u_i)

1.2.2.2 For men only

		Robust		Robust		Robust
goodh	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.

lnallinc	.0105237**	.0050907	.0017703	.0163427	.0027205	.0194919
prof	.0295547*	.0161499	.0291606*	.0161962	-.0019792	.0218485
intermed	.0278267**	.01294	.0274673**	.0129728	.0229679	.0164809
skillnm	.0183817	.0134697	.0181053	.0135065	.0090422	.0171281
skillman	.0104076	.0116378	.0102903	.0116458	.0091977	.0147869
unsklman	.0011663	.0217206	.0018344	.0217532	-.042845	.0304755
child	.0036685	.0086466	.0037968	.0086493	.0082424	.0109472
single	-.0009211	.0084309	-.0007629	.0084354	.0031192	.0105674
separated	-.0218261	.0235727	-.0215284	.0235787	-.0257419	.0293867
divorced	.0002118	.0160714	.0005011	.0160861	.0131202	.0207475
widowed	.041497	.0788021	.0415328	.0785615	.0008147	.1106722
cse	.0844312***	.0199722	.0843242***	.0199767	.0933697***	.0265976
ogcse	.1056772***	.017242	.1053314***	.0172671	.1004397***	.0234126
alevel	.1168474***	.0182187	.1164453***	.0182373	.1171379***	.0243095
diploma	.1338053***	.0186996	.1333385***	.0187316	.1137067***	.0257058
degree	.1446062***	.0189686	.1443701***	.0189749	.131825***	.0257401
north	-.0022581	.0231387	-.0039482	.0233823	-.0597513**	.0296506
yorkhumb	-.0023009	.0157265	-.0037636	.0159287	.0048829	.0192177
eastmids	-.0056935	.0167189	-.0068879	.0168561	-.0071514	.0215519
eastang	.0125504	.0156982	.0114322	.0158081	.0084084	.0198235
sthwest	.0100989	.0140245	.0092051	.0140927	.0078995	.0180123
wmids	-.0005744	.0091234	-.0008777	.0091265	-.0084598	.0116619
nwest	-.0104028	.0187444	-.0114946	.0188712	-.0324084	.0268832
wales	.014725	.0263669	.0134703	.0265203	-.0379697	.0367876
scot	.0032214	.0268662	.0019888	.0270287	-.0335457	.0303787
nwestatb	.0150187	.0194996	.0145592	.0194919	-.0021557	.027828
northatb	.0173939	.022678	.0172251	.022681	.0410373	.0271685
ewridatb	-.0127087	.0183194	-.0133689	.0183325	-.0195092	.0230537
nmidsatb	.0075001	.0185341	.0072163	.0185285	.0232273	.0218858
eastatb	.0218228	.016251	.0218483	.0162507	-.0012347	.0200228
southatb	.0089114	.0184731	.0089106	.0184677	.0055341	.0237301
swestatb	-.0061955	.0199541	-.006374	.0199513	-.0057431	.0240813
midsatb	.0143982	.0150819	.0134476	.0151507	.0091712	.0190717
walesatb	.01589	.0270599	.0152442	.0270256	.0329413	.0371439
scotatb	.0238899	.0269112	.0235305	.0269014	.0492709	.0304699
waved5	-.0620246***	.0086855	-.0577025***	.0117503	-.0530972***	.0145472
waved6	-.0873398***	.0105638	-.0754465***	.0236638	-.0812952***	.0284802
rdepequiv			-.0289093	.0516064	-.0143015	.0616931
lninc					-.0302815	.067124
rdepatb					-.201257	.1640548
_cons	.7031377***	.0487641	.7869372***	.1566231	.9733127**	.3909534
sigma_u	.18122664		.18113547		.15662209	
sigma_e	.26392254		.26390217		.25682534	
rho	.32042606		.32024056		.27108576	

(fraction of variance due to u_i)

1.2.2.3 For women only

		Robust		Robust		Robust
goodh	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.

lnallinc	.0075975	.0047787	.0070663	.0171097	.0124559	.0224699
prof	.0077637	.0230512	.0077385	.0230733	.0255179	.0278407
intermed	.0142783	.0118951	.0142434	.0119576	.0421195***	.01522
skillnm	.0165931	.010129	.0165818	.0101321	.0374946***	.0131565
skillman	.0033694	.0143835	.0033568	.0143818	.0155173	.0181651
unsklman	-.0050353	.019906	-.0050254	.0199041	.0174601	.025797
child	-.0010039	.0085067	-.0009764	.0085464	.0048926	.0108052
single	-.0077714	.0086817	-.0077642	.0086837	.0038979	.0107124
separated	-.0618655***	.0232071	-.0618576***	.0232073	-.0736772**	.0308215
divorced	-.010521	.0125932	-.0105128	.0126041	-.0039316	.0165216
widowed	-.045425	.0557441	-.0454183	.0557462	-.0684423	.0738534
cse	.0874115***	.0179166	.0873979***	.0179319	.061424***	.023975
ogcse	.1183291***	.015603	.1183027***	.0156294	.0926543***	.0210658
alevel	.1302404***	.0185552	.1302082***	.0185952	.1124501***	.0241578
diploma	.1536856***	.0175934	.1536541***	.0176094	.1133131***	.0237368
degree	.1664906***	.0187468	.1664555***	.0187801	.1334049***	.0250209
north	-.000674	.0264367	-.0007791	.0266047	.0093167	.0334786
yorkhumb	-.0070754	.0160562	-.0071692	.0162956	-.0239364	.021696
eastmids	.0037919	.0172708	.00372	.0173805	.006042	.0220516
eastang	.0250117*	.0148998	.0249375*	.0150765	.0155924	.0195774
sthwest	.0033648	.0146018	.0033013	.0147339	-.0095723	.0201382
wmids	-.0162196*	.009535	-.0162402*	.0095499	-.0191063	.011924
nwest	-.0005099	.0170733	-.0005957	.0172127	.0090913	.0229073
wales	.0216277	.0270016	.0215172	.027188	.0090162	.0352565
scot	.0197257	.0234625	.0196419	.0236182	-.0115263	.029541
nwestatb	.0230296	.0176051	.0230135	.0176172	.0327431	.024465
northatb	-.0244747	.0264016	-.0244892	.0264114	-.0221701	.0341319
ewridatb	.0190343	.0185081	.0190015	.0185548	.0474369*	.0251277
nmidsatb	.0092232	.019225	.009216	.0192299	.0025868	.0261767
eastatb	.0099758	.0172696	.0099861	.0172735	.0076785	.0224201
southatb	-.0280672	.0196289	-.028063	.0196286	-.0288921	.0256104
swestatb	.0306558*	.0184001	.0306391*	.0184169	.0341525	.0252704
midsatb	.0202509	.0153279	.0201917	.0154834	.040547**	.0200444
walesatb	-.0068459	.0281804	-.0068547	.0281897	.0223543	.0364897
scotatb	-.0115171	.0242084	-.0115282	.0242091	.015665	.0306315
waved5	-.0448372***	.0078912	-.0445009***	.013264	-.0449464***	.0170058
waved6	-.0554212***	.0110771	-.0547118**	.0246292	-.0593075*	.0319332
rdepequiv			-.0016966	.0519401	.0084407	.0681271
lninc					.051421	.069298
rdepatb					-.0491838	.1640162
_cons	.7137497***	.0454156	.7188374***	.1636303	.4169449	.4283195
sigma_u	.18656819		.18654164		.17700877	
sigma_e	.2733674		.27336518		.26733015	
rho	.31776984		.31771165		.30479439	

(fraction of variance due to u_i)

1.2.3 Probit model

1.2.3.1 Entire sample

goodh	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	.076206***	.0239765	.0144796	.0770884	.033418	.099999
prof	.1604306	.1102725	.1579539	.1102565	.0638979	.1419465
intermed	.1353454**	.0578231	.1321308**	.0579177	.2408846***	.0773925
skillnm	.1257428**	.0529241	.1246793**	.0529087	.1762073**	.0696489
skillman	.0415528	.0543886	.0403465	.0543759	.1134791	.0731294
unsklman	.0298875	.0831136	.0334769	.083182	.0030734	.1118418
child	-.0251527	.0430707	-.0231001	.0431083	.0014619	.0576754
single	-.0251784	.0488236	-.0236371	.0488361	.040483	.0651997
separated	-.3026938***	.0945169	-.3009099***	.0944993	-.3546269***	.1272661
divorced	-.0517448	.0619003	-.0503072	.0618904	.0213245	.0862882
widowed	-.1365243	.2984781	-.1357756	.2984064	-.2581564	.3661999
cse	.4722781***	.0719905	.4712113***	.0719371	.4274913***	.1002618
ogcse	.6504686***	.0619379	.6475609***	.0619662	.5829753***	.0866807
alevel	.733399***	.0761872	.729843***	.0762253	.7216847***	.1053177
diploma	.9161521***	.0810551	.9122364***	.0810986	.7068104***	.1085808
degree	1.040086***	.0923766	1.036551***	.0923753	.9225571***	.1292795
north	-.024747	.1245864	-.0373418	.1253958	-.178617	.1705221
yorkhumb	-.0372426	.0849943	-.0479932	.0859017	-.0830701	.1204323
eastmids	-.0190535	.0919147	-.0280165	.0924824	-.0110825	.1245494
eastang	.148839	.0924295	.1406595	.0928789	.092283	.1172909
sthwest	.0190691	.0790536	.0122057	.0794249	-.0283518	.1086845
wmids	-.0766274	.0529123	-.0795633	.0530242	-.1266854*	.0706274
nwest	-.0546415	.1036704	-.0636048	.1041426	-.0871813	.1423178
wales	.1150931	.1407167	.1038778	.1412386	-.1385295	.1950525
scot	.104527	.1310389	.0952125	.1313935	-.1700403	.1811322
nwestatb	.1731024	.1054915	.1702247	.1054598	.1475257	.1453657
northatb	.0053018	.1223968	.0041629	.122313	.1030109	.1727806
ewridatb	.0325779	.0947183	.0283711	.0947779	.1363684	.1357001
nmidsatb	.0815339	.0999622	.0802547	.0999065	.1211456	.1379074
eastatb	.1071409	.0863714	.1078702	.0863075	.0276567	.1119825
southatb	-.0525461	.0893286	-.0520995	.0892612	-.0844986	.1225736
swestatb	.136517	.1044319	.13478	.1043706	.1426005	.1408878
midsatb	.135968*	.078246	.1293773*	.0785789	.2005491*	.1095569
walesatb	.0503028	.1439701	.0473646	.1438949	.2436305	.2021004
scotatb	.0245048	.1294379	.0222754	.1293481	.2526313	.1837682
men	.0333177	.0427595	.0290479	.0430298	.0428627	.0576789
waved5	-.3979672***	.0443561	-.3628307***	.0607877	-.3555661***	.0795763
waved6	-.5358324***	.0544795	-.4529507***	.1123144	-.4950113***	.1454507
rdepequiv			-.1987312	.2355053	-.1548284	.3069478
lninc					.2667617	.4399033
rdepatb					-.588467	.9306467
_cons	.5630155***	.2175348	1.155232	.7358847	-.2549492	2.499298
lnsig2u	.0859578	.0733898	.0832217	.0734913	.0773541	.0964756
sigma_u	1.043916	.0383064	1.042489	.0383069	1.039435	.0501401
rho	.5214762	.0183136	.5207934	.018341	.5193289	.0240829

Likelihood-ratio test of rho=0: chibar2(01) = 689.69 Prob >= chibar2 = 0.000

Likelihood-ratio test of rho=0: chibar2(01) = 686.54 Prob >= chibar2 = 0.000

Likelihood-ratio test of rho=0: chibar2(01) = 400.97 Prob >= chibar2 = 0.000

1.2.3.2 For men only

goodh	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	.0827604**	.0375078	-.0306437	.1205289	.0063647	.1707336
prof	.240263*	.1397698	.2363182*	.1396265	-.0237092	.1826059
intermed	.193245**	.08985	.1884285**	.0898374	.1647563	.1250699
skillnm	.1512447	.1001039	.1488001	.1000014	.063681	.1351467
skillman	.0639771	.0760446	.0625584	.0759306	.0451111	.1073941
unsklman	.0049774	.1293396	.0135473	.1294325	-.2550097	.1765067
child	.0013212	.0644162	.0022911	.0643135	.0237816	.088814
single	.0062308	.0724977	.0090357	.072461	.047253	.0980594
separated	-.1578951	.1483589	-.1536061	.1482336	-.1755201	.2038682
divorced	-.0060779	.1026801	-.0023499	.102625	.0900988	.1480905
widowed	.4201844	.8390947	.4212896	.8395756	.1761205	.9240026
cse	.4835579***	.1121987	.481541***	.1119517	.5930601***	.1647528
ogcse	.6278196***	.0951036	.6223993***	.0950054	.6445557***	.1377284
alevel	.7066118***	.1068689	.6998434***	.1067996	.7831454***	.1540547
diploma	.8591966***	.1210923	.8517063***	.1210077	.7427834***	.1661967
degree	1.015887***	.1341327	1.010139***	.1339153	.9674044***	.1886688
north	-.0702907	.1905896	-.0924879	.1915449	-.5698892**	.2816233
yorkhumb	-.0111307	.1269874	-.0307774	.128324	.077286	.1889453
eastmids	-.0365606	.1348834	-.0520458	.1355957	-.106054	.1858675
eastang	.0961512	.1384839	.0813189	.1390385	.0922322	.1821307
sthwest	.0502508	.1195318	.0382417	.119931	.0691087	.1681005
wmids	.0041477	.0798353	-.0007816	.0799691	-.0748078	.1073597
nwest	-.0813	.1541616	-.095211	.154518	-.2582282	.2169956
wales	.0703318	.2065874	.0554753	.2067146	-.3389155	.2937069
scot	.0441688	.2107863	.0281571	.2109279	-.3339018	.3109313
nwestatb	.1378664	.1587502	.1306874	.1585718	.001379	.2222357
northatb	.1745121	.188951	.172119	.1885689	.4379491	.287704
ewridatb	-.0699985	.1393213	-.0784631	.1392973	-.1213409	.2031202
nmidsatb	.0724584	.1482705	.0683176	.1480514	.2477942	.2123552
eastatb	.1730147	.1291535	.1734814	.128894	-.0034602	.1660375
southatb	.0709656	.1357111	.0711146	.1354402	.0122073	.1882238
swestatb	.0000879	.1542857	-.0020022	.15397	-.0157867	.2135004
midsatb	.0971091	.1135679	.0848211	.1140345	.0681871	.1621099
walesatb	.1541962	.213756	.1423808	.2135621	.3082103	.3077484
scotatb	.1773089	.2085931	.1715883	.2081831	.4765263	.3179352
waved5	-.4872795***	.0699561	-.4318448***	.0893974	-.4275659***	.1238296
waved6	-.6704023***	.0794528	-.5153707***	.1750806	-.634519***	.2465161
rdepequiv			-.3773274	.3796503	-.1349587	.5323744
lninc					-.1626475	.6252943
rdepatb					-1.515644	1.352145
_cons	.5657008	.3454473	1.651015	1.149615	2.409434	3.654748
/lnsig2u	.1096112	.108622	.1022777	.1089809	.1147981	.1443364
sigma_u	1.056335	.0573706	1.052469	.0573495	1.059078	.0764318
rho	.5273754	.0270741	.5255472	.0271741	.528668	.0359655

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Likelihood-ratio test of rho=0: chibar2(01) =   319.50 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) =   315.90 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) =   185.91 Prob >= chibar2 = 0.000
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1.2.3.3 For women only

goodh	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	.0597524*	.0327518	.0213561	.102196	.0596962	.1260454
prof	.0647811	.2032602	.0629883	.2032674	.1882518	.276026
intermed	.1073329	.0773308	.1048533	.0775638	.2867818***	.1023239
skillnm	.1195583*	.0634138	.1186936*	.0634355	.2392572***	.0822284
skillman	.0223531	.0885354	.021126	.0885689	.1002484	.1150224
unsklman	.02024	.1094091	.021377	.1094295	.1369893	.1472704
child	-.0462257	.0595618	-.0441805	.0597616	.0000659	.0781748
single	-.0793218	.0674186	-.0786157	.0674297	.0059284	.0894663
separated	-.3909928***	.1236779	-.3902373***	.1236737	-.4510677***	.166091
divorced	-.0839964	.077991	-.0834884	.0779803	-.0349295	.1068126
widowed	-.2707582	.3199601	-.2700674	.3199308	-.3995462	.3992804
cse	.4571004***	.0937905	.456366***	.0937719	.3302561***	.1267415
ogcse	.6597579***	.0815785	.657828***	.0816788	.5347809***	.1120327
alevel	.7580096***	.1134344	.7557189***	.1135307	.6841302***	.1513257
diploma	.9573954***	.109857	.954801***	.1099861	.699201***	.1456187
degree	1.049218***	.1287893	1.046277***	.1289301	.9104817***	.1825955
north	.0094969	.1650668	.001564	.1662285	.0699826	.2172825
yorkhumb	-.0585641	.1148041	-.0653664	.1160573	-.1875086	.1589079
eastmids	.0273885	.1266967	.021683	.1274852	.050747	.1691947
eastang	.1902835	.124054	.1850582	.1247217	.0968278	.1536407
sthwest	-.0065002	.1055607	-.0110928	.1061707	-.0832344	.1438584
wmids	-.1305374*	.0710464	-.1324109*	.0712057	-.1677719	.0944857
nwest	-.0312342	.1400012	-.0376059	.1408758	.0612797	.1896637
wales	.1609977	.1924304	.1525229	.1935471	.0509836	.2630314
scot	.1361668	.1675016	.1299851	.1681651	-.0860016	.2228523
nwestatb	.202685	.140914	.2014549	.1408957	.2657165	.192598
northatb	-.1346193	.1609933	-.1354314	.1609599	-.0800313	.2192772
ewridatb	.1421375	.1298902	.1397859	.1299868	.3470948*	.1842046
nmidsatb	.0822971	.1355614	.0819011	.1355306	.0469091	.1826219
eastatb	.0456528	.1159378	.0464564	.1159133	.0407365	.1515496
southatb	-.1517469	.1187455	-.1512598	.118712	-.1435342	.1621731
swestatb	.2627505*	.1422913	.2616373*	.1422766	.2637764	.1872864
midsatb	.1623445	.1080005	.1582717	.1084534	.3152885**	.1488466
walesatb	-.0436094	.1948242	-.0436499	.1947649	.1966174	.269477
scotatb	-.0762813	.1655234	-.0772294	.1654761	.1376473	.2255161
waved5	-.3349922***	.0581102	-.3108583***	.0840476	-.3269078***	.1068027
waved6	-.4127982***	.0769185	-.3618118**	.1496977	-.4119533**	.1847161
rdepequiv			-.1236162	.3114349	-.0711531	.3912009
lninc					.7304707	.6224947
rdepatb					.3416448	1.290231
_cons	.6830292**	.2967048	1.050979	.9740818	-3.023575	3.479362
/lnsig2u	.0476385	.1005888	.0464909	.1006462	.0235821	.1329127
sigma_u	1.024105	.0515068	1.023518	.0515066	1.011861	.0672446

rho	.5119074	.0251329	.5116206	.0251479	.5058953	.0332235

Likelihood-ratio test of rho=0: chibar2(01) = 356.83 Prob >= chibar2 = 0.000

Likelihood-ratio test of rho=0: chibar2(01) = 356.12 Prob >= chibar2 = 0.000

Likelihood-ratio test of rho=0: chibar2(01) = 201.03 Prob >= chibar2 = 0.000

1.3 Using deprivation from the mean as relative income measure

1.3.1 Pooled OLS model

1.3.1.1 Entire sample

goodh	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	.0143151***	.0035162	.0138969***	.0048462	.0119611**	.0059001
prof	.0261792	.0123326	.0260868**	.0123633	.0187005	.0160786
intermed	.0240722***	.0086143	.0239773***	.0086578	.0371683***	.0107909
skillnm	.0229702***	.0080245	.0229658***	.0080255	.0296724***	.0101125
skillman	.0067597	.0086013	.006779	.0086023	.0212378**	.0107941
unsklman	-.0099587	.0154771	-.0099149	.0154755	-.0143805	.0202049
child	.0009501	.0061317	.0008414	.0061743	.0053787	.0076493
single	-.0041264	.0059799	-.0040689	.0060024	.0026697	.007412
separated	-.0524042***	.0174457	-.0524072***	.0174461	-.0500612**	.0217313
divorced	-.0139103	.0100393	-.013882	.0100421	-.0047914	.0124383
widowed	-.016902	.0483527	-.0169362	.0483532	-.0164645	.0622435
cse	.0776549***	.0110943	.0776548***	.0110947	.0718543	.0144576
ogcse	.1016049***	.0096782	.1016056***	.0096786	.0906161	.0127508
alevel	.1113628***	.0107176	.1113568***	.0107178	.1024559	.0138511
diploma	.1297546***	.0107538	.1297441***	.0107534	.1074245	.0142479
degree	.1396821***	.0112984	.1395788***	.0113299	.1260056	.0147411
north	-.0023352	.0156257	-.0023783	.015637	-.0132827	.0196352
yorkhumb	-.0157031	.0112913	-.015766	.0112983	-.0162187	.0140763
eastmids	-.0041312	.01181	-.004156	.0118071	-.0013657	.0145393
eastang	.0165838	.0106756	.0165463	.0106803	.0100115	.0131441
sthwest	-.0003263	.0100316	-.0003909	.0100447	-.0109396	.0129267
wmids	-.0093906	.0074393	-.0093854	.0074393	-.0127516	.0091627
nwest	-.0048888	.0116421	-.0049252	.011645	-.0138906	.0148986
wales	.0134218	.0169608	.0133437	.0169714	-.0015477	.02314
scot	.0114619	.01636	.0114581	.0163612	-.0132095	.0194671
nwestatb	.0201877*	.0113342	.0201715*	.011333	.0340747**	.0155723
northatb	.001788	.0148585	.0017748	.0148562	.0268064	.0212657
ewridatb	.009272	.0110816	.0092676	.0110818	.0342261**	.015027
nmidsatb	.0142949	.0114537	.0143032	.0114543	.0288933**	.0144838
eastatb	.0171407*	.0096403	.0171639*	.0096459	.010182	.012196
southatb	-.0060513	.0110346	-.0060503	.0110351	-.009958	.0143154
swestatb	.0183098	.0114359	.0183155	.0114369	.0301917**	.0150922
midsatb	.0185315**	.0086784	.0184911	.0086806	.0388907***	.0115808
walesatb	.0105979	.0167345	.0105954	.0167352	.0299054	.0235386
scotatb	.0060027	.0159662	.0059757	.0159657	.0425591**	.0201424
men	.0047485	.0050263	.0046614	.0050649	.0006366	.0062715
waved5	-.0549525***	.0063777	-.0557279	.0091484	-.0624827***	.0113419
waved6	-.071107***	.0080597	-.0714085	.0085951	-.0777809***	.010638

depmean			.0008337	.006418	.0068305	.007877
lninc					.2710246**	.1092425
depmeanatb					-.2029807**	.1016234
_cons	.6704774***	.0325428	.6741352***	.0438962	-.4691295	.4516696

1.3.1.2 For men only

goodh	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	.0174091***	.0053105	.0129498*	.0073149	.0030169	.0083595
prof	.0369257**	.0160367	.036301**	.0160445	.0256888	.021239
intermed	.034845***	.0129604	.0337957***	.0130215	.0479527***	.0163863
skillnm	.0255524*	.0134091	.0254818*	.0134107	.0273002	.0170294
skillman	.0118952	.0118393	.0120254	.0118429	.0265481*	.0150587
unsklman	-.0059978	.0226113	-.0063429	.0226276	-.037126	.0314261
child	.0107545	.0088643	.0094879	.0090023	.0084469	.0110707
single	.0026856	.0085325	.003427	.0085747	.0076688	.0107617
separated	-.0142956	.0242978	-.0143712	.0242884	-.0170363	.0292769
divorced	-.0000404	.0162979	.0002515	.0163049	.0090994	.0201979
widowed	.0327306	.0946567	.031963	.0944541	.0150682	.1163496
cse	.0767508***	.0166904	.0766516***	.0166951	.0761314***	.0221627
ogcse	.0953675***	.0144913	.0952121***	.0144964	.0892546***	.0193669
alevel	.1057729***	.0153037	.1054767***	.0153116	.0989413***	.0202462
diploma	.1202221***	.0157861	.1198075***	.0157974	.10028***	.0213398
degree	.1301698***	.016246	.1285803***	.0164318	.1122186***	.0218099
north	-.0057238	.0203981	-.005835	.020401	-.0305569	.0259463
yorkhumb	-.0108283	.0157625	-.0115078	.0157852	.0015903	.018881
eastmids	-.0086533	.0164457	-.0088456	.0164443	-.0091146	.0201764
eastang	.0081409	.0159086	.0077423	.0159104	.0090926	.0194345
sthwest	.0085573	.0139589	.0078107	.0139836	.007244	.0172182
wmids	-.0003965	.010148	-.0003126	.0101449	-.0066334	.0126898
nwest	-.0069181	.0177972	-.007351	.0178288	-.0296051	.023557
wales	.0080688	.0242121	.0073383	.0242686	-.0026815	.0333122
scot	.002223	.0253708	.0022174	.0253858	-.0148553	.0296303
nwestatb	.0105543	.0175104	.0106641	.0175239	.0104602	.0240804
northatb	.0211645	.0191489	.0208335	.0191339	.0485173*	.0278111
ewridatb	-.0105169	.0155402	-.0103553	.0155458	-.0047394	.0207714
nmidsatb	.0128725	.0157989	.0129714	.0158004	.0377692**	.0192005
eastatb	.0232074*	.0131509	.0235464*	.0131704	.0127738	.0164371
southatb	.0129572	.0149087	.0130698	.0149113	-.0012517	.0198774
swestatb	-.0020272	.0170645	-.0018258	.0170777	.0086621	.0214888
midsatb	.0152102	.0120065	.0150364	.0120011	.0264435*	.0158651
walesatb	.0221125	.0235466	.0220022	.0235639	.0176992	.0340714
scotatb	.0252649	.0244954	.0249891	.0244952	.0539173*	.029612
waved5	-.0696045***	.0094373	-.0796591***	.0153096	-.0929896***	.0190166
waved6	-.0946323***	.0111853	-.0979076***	.0120938	-.1060187***	.0150204
depmean			.008711	.0097848	.0213547*	.0118336
lninc					.2741342*	.1540277
depmeanatb					-.2178059	.1431271
_cons	.648367***	.0499032	.6873549***	.0668364	-.3822116	.6375508

1.3.1.3 For women only

goodh	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	.0099304**	.0049664	.0120602*	.0066	.0153318*	.0082602
prof	.0148386	.0224763	.0157293	.0226144	.0147092	.0272295
intermed	.0168482	.0117676	.0174051	.011842	.0291698**	.014703
skillnm	.0210233**	.0101801	.0210543**	.0101807	.0320753**	.0127791
skillman	.0020607	.0147589	.0021875	.0147644	.0094724	.0183707
unsklman	-.0174768	.0212472	-.0178543	.0212506	-.0013175	.0263035
child	-.0068302	.0086228	-.0063301	.0086311	.0033686	.0106877
single	-.0113702	.0085512	-.0114609	.0085568	-.0030667	.0104597
separated	-.0793876***	.0244576	-.079442***	.0244574	-.0750996**	.0310735
divorced	-.0217717*	.0127978	-.0218827*	.0128002	-.0132635	.0158793
widowed	-.0323399	.0553677	-.0321109	.0554026	-.0290388	.0735181
cse	.0776036***	.0148691	.0775815***	.0148689	.0677619***	.0191033
ogcse	.1059531***	.0130391	.1059432***	.0130386	.0889449***	.0169899
alevel	.1156233***	.0154776	.1156282***	.0154783	.1027***	.0195613
diploma	.1386733***	.0148615	.1387205***	.0148581	.1151782***	.0194245
degree	.1479066***	.0159229	.1483209***	.0159114	.1374533***	.0203563
north	.0026431	.0232119	.002978	.0232374	.0060782	.0287383
yorkhumb	-.0197805	.0160377	-.0194385	.0160473	-.0317476	.0205404
eastmids	.0046854	.0169506	.0047399	.0169433	.0074883	.0210678
eastang	.023565	.0144361	.0237582*	.0144523	.0106502	.0180211
sthwest	-.0079547	.014235	-.007617	.0142584	-.0272073	.0189934
wmids	-.0169257	.0108248	-.0169521	.0108248	-.0186804	.0131874
nwest	-.0022365	.0154435	-.0020866	.0154328	.0013973	.0192792
wales	.0202579	.0238192	.0206697	.0238059	.0035925	.0325791
scot	.0170333	.0214478	.0170804	.0214423	-.0126064	.025811
nwestatb	.0273997*	.0149017	.0276288*	.0149199	.0493332**	.0206535
northatb	-.0185545	.0222301	-.0185632	.0222309	.0029696	.0314995
ewridatb	.029587*	.0156998	.0296935*	.015708	.0695166***	.0214916
nmidsatb	.0142029	.0164731	.0141929	.0164732	.0179731	.0216366
eastatb	.0110693	.0140651	.010979	.0140671	.0074162	.0181224
southatb	-.023908	.0160649	-.0238788	.0160649	-.0168	.0204091
swestatb	.0370364**	.0153738	.0370523**	.0153776	.0497732**	.0211917
midsatb	.0213714*	.0125493	.021702*	.0125555	.0510815***	.0169114
walesatb	-.001428	.0237842	-.0014208	.0237852	.0368698	.0330451
scotatb	-.0069832	.0211411	-.006854	.0211462	.0332147	.0276215
waved5	-.0432603***	.0087586	-.0396046***	.0118079	-.0440686***	.0145458
waved6	-.0476918***	.0118537	-.0455663***	.0129517	-.0521078***	.015957
depmean			-.0048336	.0094488	-.0030056	.011662
lninc					.2449963	.1552524
depmeanatb					-.166789	.1448307
_cons	.7069193***	.0459803	.6885085***	.0596413	-.4113054	.6417185

1.3.2 Panel data model

1.3.2.1 Entire sample

goodh	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	.0096429***	.0033635	.0088927*	.0046136	.008323	.0056976
prof	.019203	.0125005	.0190743	.0125153	.0113113	.0163862
intermed	.0188462**	.0086281	.0186905**	.0086641	.0340495***	.0108056
skillnm	.0167062**	.0080305	.0167104**	.0080308	.0283619***	.010127
skillman	.0067898	.0084914	.0068227	.0084926	.0221827**	.0106127
unsklman	-.0003162	.014657	-.0002193	.0146565	-7.30e-06	.0189849
child	.0010461	.0060091	.0008389	.0060554	.0062422	.007487
single	-.0026067	.0059689	-.0024801	.005999	.0038011	.0073984
separated	-.044598***	.0166528	-.0446098***	.0166535	-.047036**	.0207964
divorced	-.005691	.0098697	-.0056303	.0098746	.0045918	.0123119
widowed	-.0264036	.0474306	-.0264527	.0474268	-.0358233	.0596061
cse	.0866108***	.0133382	.0866139***	.013339	.0788762***	.017441
ogcse	.1132123***	.0115637	.1132192***	.0115649	.1006743***	.0152645
alevel	.124153***	.0128299	.1241503***	.0128307	.113779***	.0166367
diploma	.1445946***	.0127478	.1445801***	.0127482	.1210189***	.0169715
degree	.1563489***	.0132581	.156162***	.0132834	.1410069***	.0173914
north	-.0023099	.0177149	-.0023794	.0177228	-.0143527	.0219979
yorkhumb	-.005008	.0112774	-.0051172	.0112812	-.0066012	.0140001
eastmids	-.002554	.0120378	-.0026147	.0120329	.0039631	.0148276
eastang	.0192307*	.0107891	.0191648*	.0107938	.0187892	.0133316
sthwest	.0065733	.0101812	.0064735	.0101889	.002295	.0130248
wmids	-.0091853	.0066083	-.0091781	.0066083	-.0116913	.0081488
nwest	-.0055116	.0126184	-.0055675	.0126207	-.0137843	.0163989
wales	.0176254	.0188652	.0174919	.0188688	-.0048355	.0255571
scot	.0132143	.0176846	.0132087	.0176868	-.0043275	.0207591
nwestatb	.0197403	.0130614	.0197059	.0130603	.0335699*	.0183306
northatb	-.0031958	.0175639	-.0032289	.0175621	.0226533	.0249943
ewridatb	.0026844	.0130564	.0026695	.0130569	.026507	.0176003
nmidsatb	.0087147	.0133989	.0087361	.0133995	.023573	.0170583
eastatb	.0159239	.0118769	.0159662	.011882	.0069463	.0149027
southatb	-.0102049	.0135551	-.0101985	.0135567	-.018919	.0176815
swestatb	.0127473	.0135475	.012752	.0135484	.0216473	.0178037
midsatb	.0173627	.0107469	.0172967	.0107486	.0370978***	.0143656
walesatb	.0045724	.0195525	.0045632	.019554	.0297342	.0271481
scotatb	.0033857	.0179939	.003338	.0179931	.0349918	.0226557
men	.0050819	.0059855	.0049315	.0060122	.0032182	.0074449
waved5	-.0521401***	.0057934	-.0535063***	.0083784	-.0589126***	.0104022
waved6	-.0708998***	.0075402	-.0714229***	.0080059	-.0766731***	.0099228
depmean			.0014825	.0060114	.0057034	.0074192
lninc					.3074818**	.1316293
depmeanatb					-.2372207*	.1227306
_cons	.7005129***	.0320005	.7070495***	.0423193	-.5994998	.5433427
sigma_u	.18433763		.18435634		.17967741	
sigma_e	.26880943		.26881109		.26315559	
rho	.31984868		.31989015		.31795956	

(fraction of variance due to u_i)

1.3.2.2 For men only

goodh	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	.0105237**	.0050907	.0054753	.00693	-.0007826	.008052
prof	.0295547*	.0161499	.0291086*	.0161517	.0104697	.0214891
intermed	.0278267**	.01294	.0268117**	.012986	.0335722**	.0163503
skillnm	.0183817	.0134697	.0184824	.0134721	.0179362	.0170299
skillman	.0104076	.0116378	.0105988	.0116415	.020645	.0146949
unsklman	.0011663	.0217206	.0007185	.0217376	-.0265834	.0296851
child	.0036685	.0086466	.0021545	.0087659	.0040672	.010766
single	-.0009211	.0084309	-.000052	.0084798	.0019158	.0105723
separated	-.0218261	.0235727	-.0219454	.0235654	-.0291103	.0284555
divorced	.0002118	.0160714	.0005384	.016081	.0086492	.0200092
widowed	.041497	.0788021	.041049	.0784781	.028241	.0968361
cse	.0844312***	.0199722	.0843488***	.0199774	.0803165***	.0263006
ogcse	.1056772***	.017242	.1055101***	.0172493	.0958728***	.0228079
alevel	.1168474***	.0182187	.1165303***	.0182251	.1081687***	.0238626
diploma	.1338053***	.0186996	.1333191***	.0187095	.1124282***	.0251483
degree	.1446062***	.0189686	.1427085***	.0191215	.1259425***	.0252876
north	-.0022581	.0231387	-.0022419	.0231358	-.0323035	.0298831
yorkhumb	-.0023009	.0157265	-.0030538	.0157463	.0112447	.0188402
eastmids	-.0056935	.0167189	-.0060472	.0167149	.0026074	.0205468
eastang	.0125504	.0156982	.0120885	.0156993	.0210903	.0190699
sthwest	.0100989	.0140245	.0093591	.01404	.0185663	.0171817
wmids	-.0005744	.0091234	-.0004435	.0091189	-.0050383	.0114174
nwest	-.0104028	.0187444	-.0108442	.0187743	-.0309641	.0251521
wales	.014725	.0263669	.01398	.0264268	-.0077325	.0359436
scot	.0032214	.0268662	.0033462	.0268782	-.0053897	.0301071
nwestatb	.0150187	.0194996	.0151401	.0195158	.0147753	.0276219
northatb	.0173939	.022678	.0168945	.0226597	.0485326	.0333669
ewridatb	-.0127087	.0183194	-.0125532	.0183221	-.0101151	.0242701
nmidsatb	.0075001	.0185341	.0076889	.0185367	.0294324	.0224544
eastatb	.0218228	.016251	.0221844	.0162691	.0068697	.0200366
southatb	.0089114	.0184731	.0090534	.0184782	-.0101321	.0246587
swestatb	-.0061955	.0199541	-.0059808	.0199669	-.0004194	.0248141
midsatb	.0143982	.0150819	.0142408	.0150756	.023893	.0198278
walesatb	.01589	.0270599	.0157092	.0270903	.0235493	.0385222
scotatb	.0238899	.0269112	.0234738	.0269084	.0470618	.0318415
waved5	-.0620246***	.0086855	-.0734298***	.014227	-.0817794***	.0177871
waved6	-.0873398***	.0105638	-.0910822***	.0114294	-.0983427***	.0142583
depmean			.0098937	.0091801	.0179369	.0112307
lninc					.3309244*	.1888879
depmeanatb					-.2704903	.1759158
_cons	.7031377***	.0487641	.747154***	.0638387	-.5805099	.7814078
sigma_u	.18122664		.18128085		.17358794	
sigma_e	.26392254		.26390727		.25831466	
rho	.32042606		.32058151		.31109861	

(fraction of variance due to u_i)

1.3.2.3 For women only

goodh	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	.0075975	.0047787	.008951	.0063092	.0115078	.0079591
prof	.0077637	.0230512	.0082005	.0231324	.0133253	.027872
intermed	.0142783	.0118951	.0146136	.0119529	.0359423**	.0147952
skillnm	.0165931	.010129	.0166038	.0101293	.0359613***	.0127583
skillman	.0033694	.0143835	.0034735	.0143916	.0139565	.017814
unsklman	-.0050353	.019906	-.0053284	.0199221	.0147116	.0247143
child	-.0010039	.0085067	-.0006384	.0085324	.0082515	.0105288
single	-.0077714	.0086817	-.0078806	.0086917	.0019564	.0106901
separated	-.0618655***	.0232071	-.0618874***	.0232071	-.0609265**	.0295082
divorced	-.010521	.0125932	-.0106217	.0125965	-.0001693	.0157771
widowed	-.045425	.0557441	-.0452922	.0557611	-.0579516	.0721979
cse	.0874115***	.0179166	.0873983***	.0179166	.0770292***	.023329
ogcse	.1183291***	.015603	.1183169***	.015603	.101488***	.0205827
alevel	.1302404***	.0185552	.1302451***	.0185556	.1154722***	.0238743
diploma	.1536856***	.0175934	.1537211***	.0175908	.128101***	.0232817
degree	.1664906***	.0187468	.1667679***	.0187397	.1535305***	.0243336
north	-.000674	.0264367	-.0004609	.0264536	.0046937	.0318062
yorkhumb	-.0070754	.0160562	-.006863	.0160562	-.0231435	.0204737
eastmids	.0037919	.0172708	.0038468	.0172605	.0058263	.0214156
eastang	.0250117*	.0148998	.0251272*	.01491	.0164821	.0187723
sthwest	.0033648	.0146018	.0035531	.0146147	-.0129936	.0193408
wmids	-.0162196*	.009535	-.0162215*	.0095352	-.0177076	.0116112
nwest	-.0005099	.0170733	-.0004301	.0170663	.0029952	.0216602
wales	.0216277	.0270016	.0218663	.0269847	.001418	.0366491
scot	.0197257	.0234625	.019777	.0234582	-.0036038	.0284186
nwestatb	.0230296	.0176051	.0231886	.0176219	.0450099*	.0247078
northatb	-.0244747	.0264016	-.0244769	.0264023	-.0044752	.036777
ewridatb	.0190343	.0185081	.0191129	.0185175	.0601634**	.0253254
nmidsatb	.0092232	.019225	.0092147	.0192246	.0163133	.0255592
eastatb	.0099758	.0172696	.0099092	.0172712	.0062906	.0221706
southatb	-.0280672	.0196289	-.0280604	.0196281	-.0266446	.025131
swestatb	.0306558*	.0184001	.0306758*	.0184033	.0415752	.0254261
midsatb	.0202509	.0153279	.0204451	.0153334	.0500551**	.0207922
walesatb	-.0068459	.0281804	-.0068233	.0281871	.03139	.0386317
scotatb	-.0115171	.0242084	-.0114581	.0242089	.0236287	.0320008
waved5	-.0448372***	.0078912	-.0425357***	.010807	-.0465146***	.0132839
waved6	-.0554212***	.0110771	-.0540865***	.0120711	-.0568814***	.0148769
depmean			-.0030602	.0089327	-.0020595	.0109892
lninc					.2688535	.1844884
depmeanatb					-.1897046	.1723655
_cons	.7137497***	.0454156	.7020615***	.0578863	-.4948073	.7611577
sigma_u	.18656819		.18657601		.18436743	
sigma_e	.2733674		.27338719		.26754733	
rho	.31776984		.31775661		.32197034	

(fraction of variance due to u_i)

1.3.3 Probit model

1.3.3.1 Entire sample

goodh	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	.076143***	.0229685	.0919228***	.0321185	.0873568**	.0415787
prof	.159467	.1052489	.1627513	.1053621	.0684343	.1305625
intermed	.1342298**	.0552903	.1376932**	.0555223	.2388482***	.0710059
skillnm	.1251711**	.0505829	.1251051**	.0505872	.1800504***	.0640906
skillman	.0401469	.05207	.0395481	.05208	.1293857*	.0669562
unsklman	.0230404	.0797332	.0207333	.0797948	.0209342	.1027244
child	-.021924	.041206	-.0176652	.0416416	.0142895	.0537299
single	-.0255084	.0464956	-.0279275	.0466339	.0236362	.0601366
separated	-.2930822***	.0906953	-.2929052***	.0906981	-.3041848***	.116588
divorced	-.0548514	.0592549	-.0559107	.0592696	.0161777	.0778769
widowed	-.1291885	.2843448	-.1290185	.2842012	-.1714351	.3434259
cse	.4437542***	.066829	.4438581***	.0668313	.4110658***	.0884059
ogcse	.6110854***	.05705	.6113872***	.0570554	.5526148***	.0760507
alevel	.6892568***	.0703488	.6899638***	.0703633	.6497958***	.0922743
diploma	.8602428***	.0745013	.8613158***	.0745282	.7067438***	.0962976
degree	.9749282***	.0849228	.9795935***	.0851997	.9189797***	.1143783
north	-.0233063	.1174526	-.0218931	.1174538	-.0993069	.1505014
yorkhumb	-.0440671	.0809388	-.0415154	.0810212	-.067693	.1086229
eastmids	-.0213159	.0875195	-.0194926	.0875607	.0064152	.1144174
eastang	.1401548	.088062	.141415	.0880896	.1243921	.1077863
sthwest	.0135038	.0751493	.01561	.0752058	-.0149222	.0978003
wmids	-.0728199	.0512258	-.0730537	.0512372	-.1034045	.0666058
nwest	-.0521877	.0977159	-.0508583	.0977186	-.1065127	.1275664
wales	.1047843	.1327281	.1074251	.1327657	-.046107	.1706059
scot	.0967581	.123305	.0970141	.1233041	-.0511969	.1572981
nwestatb	.1634475*	.0988588	.1643191*	.0988522	.2382565*	.1353578
northatb	.0073296	.1148254	.0082193	.1148207	.1747715	.1645321
ewridatb	.03699	.0888234	.0373089	.0888227	.2082781*	.1256908
nmidsatb	.0806412	.0937099	.0800427	.0937085	.1894135	.1262197
eastatb	.1034799	.0806528	.1026853	.080662	.0466386	.1009065
southatb	-.0487202	.0833035	-.0487109	.0833091	-.1051144	.1093918
swestatb	.1320818	.0976859	.1321916	.0976892	.1808009	.1283216
midsatb	.1305774*	.073091	.132079*	.0731292	.2575348**	.1008571
walesatb	.0527901	.1351863	.0534356	.1351768	.2220313	.1812702
scotatb	.0261069	.1214399	.027156	.1214486	.2513487	.1641944
men	.0314663	.0400495	.0349731	.0403585	.0172328	.0516642
waved5	-.3821866***	.0426792	-.35474***	.0579036	-.4100284***	.0749397
waved6	-.5116962***	.0521264	-.5022618***	.0538386	-.5578116***	.0683818
depmean			-.0319447	.0455604	.004838	.0598242
lninc					1.820258**	.8457399
depmeanatb					-1.322802	.8255938
_cons	.5078207**	.2074191	.3711583	.2842265	-7.419333**	3.467401
/lnsig2u	-.1371394	.0517202	-.1369636	.0517085	-.1287009	.0652563

	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
sigma_u	.9337284	.0241463	.9338105	.024143	.9376763	.0305946
rho	.4657688	.0128694	.4658125	.0128667	.4678691	.0162467

Likelihood-ratio test of rho=0: chibar2(01) = 669.22 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) = 669.45 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) = 417.69 Prob >= chibar2 = 0.000

1.3.3.2 For men only

goodh	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	.0827604**	.0375078	.0703983	.0530833	.0196696	.072425
prof	.240263*	.1397698	.2387601*	.1398337	.0722033	.1745318
intermed	.193245**	.08985	.1905332**	.090211	.2501431**	.1182165
skillnm	.1512447	.1001039	.1512969	.100095	.1266309	.1275765
skillman	.0639771	.0760446	.0642447	.0760471	.1281933	.1010534
unsklman	.0049774	.1293396	.004534	.1293589	-.153301	.1691472
child	.0013212	.0644162	-.0021561	.0652773	.0036556	.0862166
single	.0062308	.0724977	.0083574	.0727636	.0337671	.0946592
separated	-.1578951	.1483589	-.1576637	.1483821	-.1919898	.188555
divorced	-.0060779	.1026801	-.0054819	.1026946	.0544297	.1364786
widowed	.4201844	.8390947	.4216696	.8403195	.354827	.8944834
cse	.4835579***	.1121987	.4832926***	.1121968	.4812701***	.1525748
ogcse	.6278196***	.0951036	.6271244***	.0951172	.5881816***	.1294805
alevel	.7066118***	.1068689	.7053758***	.1069175	.6890188***	.1446934
diploma	.8591966***	.1210923	.8575209***	.1211751	.7149875***	.1578923
degree	1.015887***	.1341327	1.011047***	.1348926	.9045242***	.1790809
north	-.0702907	.1905896	-.0702591	.1906099	-.2987664	.2531663
yorkhumb	-.0111307	.1269874	-.0128906	.127091	.1243691	.1771338
eastmids	-.0365606	.1348834	-.0375147	.1349163	-.0192236	.1776298
eastang	.0961512	.1384839	.0945011	.1385399	.1830022	.1754026
sthwest	.0502508	.1195318	.0485003	.1196471	.147949	.1592589
wmids	.0041477	.0798353	.0046022	.0798391	-.0463457	.1037408
nwest	-.0813	.1541616	-.0817773	.1541853	-.2207091	.2028678
wales	.0703318	.2065874	.0695123	.2066277	-.0714908	.2722856
scot	.0441688	.2107863	.0447912	.2107612	-.0581474	.2773089
nwestatb	.1378664	.1587502	.137487	.158764	.1208405	.2175724
northatb	.1745121	.188951	.17302	.1890245	.4372784	.2751601
ewridatb	-.0699985	.1393213	-.0699952	.1393124	-.0564015	.2001182
nmidsatb	.0724584	.1482705	.0727287	.1482774	.2855372	.2051626
eastatb	.1730147	.1291535	.1739791	.1291886	.0575116	.1610119
southatb	.0709656	.1357111	.0713678	.1357127	-.0913837	.1769092
swestatb	.0000879	.1542857	.0003814	.1542746	.0232154	.2086226
midsatb	.0971091	.1135679	.0967242	.1135686	.1784537	.1570672
walesatb	.1541962	.213756	.1526034	.213815	.1984726	.292279
scotatb	.1773089	.2085931	.1758683	.208604	.393902	.2852247
waved5	-.4872795***	.0699561	-.5140583***	.1072554	-.58668***	.1423134
waved6	-.6704023***	.0794528	-.6782723***	.0829817	-.7522733***	.1077154
depmean			.024538	.0744531	.0838362	.1002787
lninc					2.490369*	1.315552
depmeanatb					-1.98959	1.267327
_cons	.5657008	.3454473	.6726779	.4745187	-9.324137*	5.415075

/lnsig2u	.1096112	.108622	.1093723	.1086222	.1404685	.1383969
sigma_u	1.056335	.0573706	1.056209	.0573639	1.072759	.0742333
rho	.5273754	.0270741	.5273159	.0270745	.5350595	.0344291

Likelihood-ratio test of rho=0: chibar2(01) = 319.50 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) = 319.45 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) = 202.84 Prob >= chibar2 = 0.000

1.3.3.3 For women only

goodh	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	.0597524*	.0327518	.0887287**	.0442178	.1075606*	.0558554
prof	.0647811	.2032602	.0763888	.203622	.0843941	.2647939
intermed	.1073329	.0773308	.1149147	.0777591	.2523622**	.0991618
skillnm	.1195583*	.0634138	.1197602*	.0634243	.2319984***	.0799184
skillman	.0223531	.0885354	.0241115	.0885615	.0893573	.1111846
unsklman	.02024	.1094091	.0144423	.109568	.1207312	.1404302
child	-.0462257	.0595618	-.0382406	.0600865	.0259349	.0765395
single	-.0793218	.0674186	-.0812928	.0674665	-.0117821	.0868958
separated	-.3909928***	.1236779	-.3910345***	.1237136	-.3853084**	.1625544
divorced	-.0839964	.077991	-.0860203	.0779967	-.0133519	.1021932
widowed	-.2707582	.3199601	-.2701204	.3197896	-.3457539	.3939334
cse	.4571004***	.0937905	.4572045***	.0937966	.406153***	.1223888
ogcse	.6597579***	.0815785	.6603521***	.081593	.5701488***	.1074916
alevel	.7580096***	.1134344	.7589307***	.1134498	.6738056***	.1445197
diploma	.9573954***	.109857	.9597346***	.1099292	.7825851***	.1409645
degree	1.049218***	.1287893	1.057452***	.1291672	1.052095***	.1779206
north	.0094969	.1650668	.0139799	.1651091	.0439069	.207412
yorkhumb	-.0585641	.1148041	-.0532194	.11493	-.1791548	.1515734
eastmids	.0273885	.1266967	.0305581	.1267554	.0505653	.1651948
eastang	.1902835	.124054	.19155	.1240477	.1086908	.1490325
sthwest	-.0065002	.1055607	-.0026442	.1056201	-.1113317	.1365634
wmids	-.1305374*	.0710464	-.1307537*	.0710719	-.1540679*	.0927002
nwest	-.0312342	.1400012	-.0279335	.1399986	.0120265	.1825491
wales	.1609977	.1924304	.1675404	.1925293	.0019313	.2421818
scot	.1361668	.1675016	.1384053	.1674751	-.0309897	.2099966
nwestatb	.202685	.140914	.2052068	.1408907	.3217232*	.1942616
northatb	-.1346193	.1609933	-.1348608	.1609901	-.0258808	.2319566
ewridatb	.1421375	.1298902	.1432066	.1298728	.4154502**	.1837652
nmidsatb	.0822971	.1355614	.0812959	.1355501	.1130942	.1804837
eastatb	.0456528	.1159378	.0446105	.1159549	.0217858	.1464254
southatb	-.1517469	.1187455	-.15131	.1187617	-.1275475	.1579775
swestatb	.2627505*	.1422913	.2631912*	.1422768	.2912929	.1831274
midsatb	.1623445	.1080005	.1669164	.1081296	.337**	.1500359
walesatb	-.0436094	.1948242	-.0440773	.1947784	.2304107	.2577329
scotatb	-.0762813	.1655234	-.0755474	.1654837	.1369301	.2244131
waved5	-.3349922***	.0581102	-.2883259***	.0753273	-.3410727***	.0969573
waved6	-.4127982***	.0769185	-.388231***	.080989	-.4331006***	.1020118
depmean			-.0666969	.0687049	-.0460622	.0904963

lninc					1.283634	1.268608
depmeanatb					-.7062219	1.253542
_cons	.6830292**	.2967048	.4347031	.3905418	-5.540607	5.183276
/lnsig2u	.0476385	.1005888	.0477818	.1005717	.0461553	.1294736
sigma_u	1.024105	.0515068	1.024179	.0515017	1.023346	.0662481
rho	.5119074	.0251329	.5119432	.0251286	.5115368	.0323512

Likelihood-ratio test of rho=0: chibar2(01) = 356.83 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) = 357.03 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) = 213.61 Prob >= chibar2 = 0.000

2 Modelling of Longstanding illness

2.1 Using Gini as relative income measure

2.1.1 Pooled OLS model

2.1.1.1 Entire sample

lli	Coef.	Robust Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	-.009621**	.0039399	-.0096232**	.0039399	-.0128149**	.0051519
prof	-.0053682	.0148322	-.0052375	.0148235	-.0215797	.0184421
intermed	-.0132496	.0087971	-.0131844	.0087921	-.0160689	.0114592
skillnm	-.0099983	.0078122	-.0099874	.0078106	-.0164477	.0101531
skillman	-.0092268	.0084855	-.0092493	.0084865	-.0064552	.0111342
unsklman	.0094898	.0148162	.0094699	.0148173	.0273403	.0206289
child	-.0253789***	.0064178	-.0253791***	.006418	-.0342209***	.0083411
single	.0024089	.0059681	.0024069	.0059683	-.0034684	.0076246
separated	.0082179	.0171182	.0082048	.0171143	.018575	.0232026
divorced	-.0305785***	.0105101	-.030523***	.0105109	-.0512139***	.0138111
widowed	.0119231	.0543006	.0119772	.0543256	-.0585777	.058549
cse	-.0315347***	.0100043	-.0313888***	.0100055	-.0386764***	.013765
ogcse	-.0346337***	.0087998	-.0345688***	.0088009	-.0458242***	.0122501
alevel	-.0305644***	.0103884	-.0304911***	.0103902	-.0383475***	.014083
diploma	-.0388224***	.0105568	-.0388114***	.0105575	-.0545218***	.0144099
degree	-.0506838***	.0113652	-.0506126***	.0113648	-.0600225	.0155231
men	.009672*	.0054948	.0096563*	.0054953	.0078878	.0070184
waved5	.1271167***	.0061865	.1355886***	.0247866	.1303788	.0318433
waved6	.237711***	.0087225	.2421644***	.01533	.2468971	.0198463
giniequiv			-.0460312	.1299084	-.0050551	.1675737
lninc					-.0112638	.0175412
giniatb					.5156411	.6813685
_cons	.166952***	.0342639	.1796547***	.0501114	.2172824*	.1230972

2.1.1.2 For men only

lli	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.

lnallinc	-.0173086***	.0064178	-.0172989***	.0064184	-.0226068***	.0083611
prof	-.0302725	.0192211	-.0304843	.0192037	-.0496717*	.0245307
intermed	-.0423713***	.013813	-.0425525***	.0138008	-.0446476**	.0182163
skillnm	-.0271332*	.0143054	-.0271685*	.0143039	-.0433936**	.0183431
skillman	-.0332901***	.0121778	-.0333323***	.0121752	-.0308217*	.0162246
unsklman	-.0177459	.0216579	-.0178856	.0216671	.0184318	.0312918
child	-.0268286***	.0098936	-.0268307***	.0098934	-.0439946***	.0129624
single	-.0030556	.0091608	-.0030645	.0091593	-.0154192	.011742
separated	.0254132	.0277656	.0253894	.0277724	.0415422	.0375565
divorced	-.0294606	.0181012	-.0294963	.0180976	-.0396217	.0244781
widowed	.0638723	.1462369	.0634556	.1462388	.0443842	.1685002
cse	-.0496715***	.0160482	-.0497866***	.0160605	-.057387**	.0227867
ogcse	-.0522438***	.0139794	-.0522629***	.0139803	-.0669102***	.01992
alevel	-.0408865***	.0152611	-.0409741***	.0152703	-.04416	.0213568
diploma	-.0599229***	.016231	-.0599083***	.0162288	-.0726347	.0225701
degree	-.0526821***	.0171649	-.05273***	.0171673	-.0530621	.0239285
waved5	.1427596***	.0099962	.1334719***	.0367099	.1300645***	.0471344
waved6	.239627***	.0126054	.2347506***	.0224411	.2404338***	.0293806
giniequiv			.0504444	.191513	.0868997	.2457414
lninc					-.0096364	.0268635
giniatb					.4690642	.9909364
_cons	.278794***	.0564834	.2648685***	.0774651	.3231297*	.1873178

2.1.1.3 For women only

lli	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0076107	.0051874	-.0075993	.0051864	-.0082706	.0067479
prof	.0168805	.0270146	.017091	.0270203	.0004241	.0316791
intermed	.0099854	.011632	.0099378	.0116317	.0048249	.0150968
skillnm	.0032269	.0095003	.0031723	.0095017	-.0019599	.0124421
skillman	.0184473	.0138907	.0183028	.0138872	.0207866	.0181481
unsklman	.0275924	.0205436	.0272399	.0205662	.0282471	.027618
child	-.0198994**	.0087008	-.0199198**	.0086996	-.0219363**	.0111381
single	.0075759	.008034	.0075594	.0080325	.0081956	.0101681
separated	-.0076629	.0214664	-.0077765	.0214476	-.0051546	.0290843
divorced	-.0327345**	.0129921	-.0325492**	.0129956	-.0607785***	.0166842
widowed	.0013183	.0583261	.0012775	.0584145	-.0843246	.0604724
cse	-.0172504	.0127784	-.0167891	.0127624	-.0243171	.0171814
ogcse	-.0204111*	.0112706	-.0201463*	.0112646	-.0296805*	.0154553
alevel	-.0231843	.0146533	-.0230766	.0146499	-.0371972*	.0193004
diploma	-.0227329	.0140467	-.0226166	.0140456	-.0406338**	.0189148
degree	-.0529952***	.0152652	-.0527404***	.0152574	-.0721131***	.0204345
waved5	.1152104***	.0079925	.1371683***	.0337458	.1369361***	.0433591
waved6	.2398471***	.0124167	.2513924***	.0212072	.2564656***	.0271019
giniequiv			-.1192231	.1769579	-.1028814	.2292808
lninc					-.0105426	.0230243
giniatb					.531778	.9384386
_cons	.1228874***	.0458012	.1556938**	.0678769	.1699262	.163989

2.1.2 Panel data model

2.1.2.1 Entire sample

lli	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.00728*	.0038647	-.0072859*	.003865	-.0109835**	.0050563
prof	-.0001314	.0149863	-.0000145	.0149792	-.0125387	.0187984
intermed	-.0113688	.0089028	-.0113088	.0088988	-.0145444	.0116066
skillnm	-.008166	.0079378	-.0081738	.0079383	-.016113	.0103134
skillman	-.0065148	.008534	-.0065321	.0085347	-.0036451	.0111852
unsklman	.0082862	.0145339	.0082684	.0145342	.0244413	.0202397
child	-.0233436***	.0064188	-.0233401***	.006419	-.0333044***	.0083405
single	.0038773	.0059937	.0038521	.0059954	-.0038386	.0076432
separated	.0054049	.016832	.0053956	.0168281	.0168229	.022773
divorced	-.0306532***	.0104877	-.0306039***	.0104888	-.0537597***	.0137788
widowed	-.0107269	.0534637	-.0106831	.0534906	-.0734542	.0590847
cse	-.0335215***	.0113618	-.0333842***	.0113608	-.0400579***	.0153773
ogcse	-.0368664***	.0099481	-.0368043***	.0099487	-.0480141***	.0136405
alevel	-.0314724***	.0117679	-.0314017***	.0117689	-.0393017***	.0157143
diploma	-.0418721***	.0118543	-.0418633***	.0118549	-.0585182***	.0159543
degree	-.0555553***	.0126501	-.0554848***	.0126489	-.0651533***	.0170808
men	.0086172	.0061743	.0086013	.006175	.0059918	.0077631
waved5	.1262686***	.0058574	.1346436***	.0235744	.1322208***	.0302188
waved6	.2371191***	.0083921	.2415175***	.0146395	.2471824***	.0189287
giniequiv			-.045547	.1238017	.01494	.1592935
lninc					-.0136413	.0197828
giniatb					.6089628	.7678809
_cons	.1469392***	.0338653	.1595628***	.0488418	.2084974	.1352317
sigma_u	.16059177		.16060411		.14251571	
sigma_e	.30184639		.30185682		.30055316	
rho	.22061168		.22062621		.18357005	

(fraction of variance due to u_i)

2.1.2.2 For men only

lli	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0142171**	.0062613	-.0141957**	.006262	-.0211807***	.008209
prof	-.0221458	.0194256	-.0224998	.019413	-.0380253	.0250927
intermed	-.0353994**	.0140127	-.0357188**	.0140074	-.0398571**	.0184996
skillnm	-.0246287*	.0145268	-.0246408*	.0145283	-.0422636**	.0185672
skillman	-.0264289**	.0122103	-.0265302**	.0122075	-.0259588	.0162628
unsklman	-.012207	.0213172	-.0124801	.0213306	.0175334	.0305274
child	-.023093**	.0097303	-.023091**	.0097299	-.0412634***	.0128008
single	.0029041	.0091176	.0029503	.009122	-.0098805	.0117137

	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
separated	.0359463	.0268431	.0359178	.0268524	.0521337	.0364019
divorced	-.026125	.0177039	-.0261742	.0177001	-.0405671*	.0239661
widowed	.0077915	.1354825	.0068814	.1354889	-.0272695	.1530321
cse	-.0503288***	.0185111	-.0505217***	.0185202	-.0576031**	.0256069
ogcse	-.053726***	.0160442	-.0537566***	.0160439	-.0683232***	.0224128
alevel	-.0395345**	.0175249	-.0396738**	.0175298	-.042937*	.0240437
diploma	-.0626785***	.0184561	-.0626489***	.0184541	-.0763286***	.02523
degree	-.05654***	.0194656	-.0566239***	.0194661	-.0570633**	.0266839
waved5	.1423827***	.0094034	.1261713***	.0345753	.1310795***	.0442351
waved6	.2384636***	.0120739	.2299698***	.021216	.2398171***	.0277194
giniequiv			.0881346	.1810519	.0906969	.2315005
lninc					-.0096001	.0309496
giniatb					.6257015	1.135954
_cons	.2436578***	.0554982	.2192413***	.0749269	.2868276	.209646
sigma_u	.18004145		.1800741		.15838339	
sigma_e	.30213293		.30215039		.30143893	
rho	.2620463		.26209407		.21634447	

(fraction of variance due to u_i)

2.1.2.3 For women only

lli	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0064391	.0051299	-.0064419	.0051291	-.0070878	.0066469
prof	.0205219	.0272852	.0207452	.0272934	.0071671	.0319157
intermed	.0091333	.0118046	.0090504	.0118055	.0044425	.0153232
skillnm	.003782	.0096279	.0036751	.0096319	-.0021787	.0126206
skillman	.0180186	.0139119	.0178163	.0139083	.0227459	.0181301
unsklman	.0229466	.0201613	.0225101	.0201797	.0238481	.0272569
child	-.0188796**	.0087567	-.0188827**	.0087556	-.0217464*	.0111712
single	.0065349	.0081037	.0064595	.0081025	.0041628	.010218
separated	-.017697	.021292	-.0178154	.0212692	-.0142786	.0287096
divorced	-.0341656***	.0130747	-.0339584***	.0130779	-.0637655***	.01678
widowed	-.0142797	.0582034	-.0144142	.0583189	-.0893253	.0631485
cse	-.0198202	.0142199	-.0192879	.0142015	-.0260079	.0189658
ogcse	-.0226771*	.0125016	-.0223661*	.0124952	-.031851*	.0169676
alevel	-.02549	.0163001	-.0253459	.0162974	-.0392422*	.0212741
diploma	-.0246326	.0155092	-.0244911	.0155083	-.0433916**	.0206903
degree	-.0572926***	.0166363	-.0569799***	.0166277	-.0768474***	.0221542
waved5	.1144175***	.0076458	.140952***	.0324258	.1399406***	.0415757
waved6	.2407207***	.0120611	.2546763***	.020477	.2586674***	.0261236
giniequiv			-.1442049	.1702222	-.1219385	.2199655
lninc					-.013771	.025385
giniatb					.5595978	1.038118
_cons	.1158935**	.0455489	.15577**	.066648	.1824942	.1763425
sigma_u	.13975633		.13981221		.12597189	
sigma_e	.30129541		.30128747		.29937294	
rho	.1770619		.17718612		.15042616	

(fraction of variance due to u_i)

2.1.3 Probit model

2.1.3.1 Entire sample

lli	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	-.0388346*	.0218897	-.0388293*	.0218902	-.0549643*	.0284862
prof	-.0335338	.0926475	-.033271	.0926958	-.1038067	.1251775
intermed	-.0726649	.0540669	-.0725171	.0540938	-.102312	.0713863
skillnm	-.0645617	.051336	-.0644932	.0513427	-.1239301*	.067416
skillman	-.0442455	.0530544	.0338203	.0825421	-.027882	.070058
unsklman	.0338189	.082541	.0338203	.0825421	.1112167	.1088325
child	-.1120981***	.0401977	-.1121022***	.0401979	-.1668586***	.0532976
single	.0394632	.0469028	.0394883	.0469038	-.0250255	.0619917
separated	.0607817	.0916296	.0607627	.091632	.1099566	.1214936
divorced	-.1510689***	.0575323	-.1509905***	.0575392	-.2974944***	.0802695
widowed	-.1278338	.2695939	-.1277053	.2695789	-.5249073	.3732192
cse	-.2186582***	.0686454	-.218362***	.0687301	-.2595655***	.0948155
ogcse	-.233571***	.0585062	-.2334346***	.0585278	-.3050628***	.081304
alevel	-.2002687***	.0691502	-.2001122***	.0691739	-.2393501***	.0939342
diploma	-.275381***	.0716443	-.2753638***	.0716453	-.3794698***	.0984212
degree	-.3524835***	.079016	-.3522808***	.0790505	-.4277866***	.1104555
men	.0524597	.0377753	.0524437	.0377757	.0344916	.0501888
waved5	1.018496***	.045788	1.030494***	.1453021	1.010217***	.1915381
waved6	1.573952***	.0546682	1.580248***	.0906891	1.603878***	.1188476
giniequiv			-.0653385	.7510092	.1097652	.999582
lninc					-.1044315	.1353714
giniatb					3.841	5.281566
_cons	-1.741281***	.195815	-1.723397***	.2839118	-1.372826	.8825851
/lnsig2u	-.1807008	.0553167	-.1807	.0553182	-.1783817	.0726444
sigma_u	.913611	.025269	.9136114	.0252696	.914671	.0332229
rho	.4549473	.0137169	.4549475	.0137173	.4555225	.0180174

Likelihood-ratio test of rho=0: chibar2(01) = 579.13 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) = 579.10 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) = 347.69 Prob >= chibar2 = 0.000

2.1.3.2 For men only

lli	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	-.0348929	.0225217	-.0348885	.022522	-.0531939*	.0292319
prof	-.0205713	.0958752	-.0203062	.0959221	-.0924917	.1289535
intermed	-.0714691	.0560799	-.0713186	.0561065	-.1025105	.0737946
skillnm	-.075244	.0527868	-.0751729	.0527935	-.1341202*	.0693257
skillman	-.0271517	.0537149	-.0271467	.0537155	-.0163409	.0704994
unsklman	.0363163	.0853941	.0363158	.085395	.1150549	.11217

child	-.1175031***	.0415995	-.1175039***	.0415996	-.1725315	.0550238
single	.0431458	.0487968	.0431693	.0487975	-.0253504	.0642403
separated	.0605669	.0946844	.060547	.0946868	.111165	.1253365
divorced	-.1604237***	.0596119	-.1603395***	.0596193	-.3116728***	.0830384
widowed	-.1662932	.2805256	-.1661629	.2805078	-.5708466	.3867765
cse	-.2291291***	.0724249	-.2288201***	.0725112	-.2704188***	.0997441
ogcse	-.2430607***	.0616882	-.2429173***	.0617103	-.3161237***	.085505
alevel	-.199622***	.0725175	-.19946***	.0725411	-.2422858**	.0982008
diploma	-.2896164***	.0755564	-.2895957***	.0755571	-.3968778***	.1035888
degree	-.3662661***	.0832159	-.3660515***	.0832516	-.4455169***	.116111
waved5	1.056855***	.0486661	1.069321***	.1510453	1.044111***	.1982505
waved6	1.632371***	.0595423	1.638907***	.0957618	1.657875***	.124867
giniequiv			-.0679201	.7789426	.1222992	1.032371
lninc					-.1118406	.142319
giniatb					4.00865	5.550271
_cons	-1.836807***	.2049911	-1.818203***	.2958348	-1.429854	.9260042
/lnsig2u	.0000821	.0752288	.0000673	.0752294	-.0109983	.0971536
sigma_u	1.000041	.037616	1.000034	.037616	.9945159	.0483104
rho	.5000205	.0188072	.5000168	.0188074	.4972504	.0242877

Likelihood-ratio test of rho=0: chibar2(01) = 595.44 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) = 595.40 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) = 356.67 Prob >= chibar2 = 0.000

2.1.3.3 For women only

lli	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	-.0375818	.0314192	-.0373157	.0314405	-.0435741	.0403661
prof	.1275634	.1762641	.130554	.1763186	.0322048	.2419388
intermed	.0499268	.075111	.0501228	.0751541	.0089562	.0985895
skillnm	.0121489	.0644409	.0123602	.0644829	-.0433015	.083771
skillman	.1280852	.0903016	.1268757	.0903786	.1615875	.1164797
unsklman	.1189927	.1098084	.1170522	.1098876	.0933363	.1452808
child	-.078983	.0580981	-.079615	.0581374	-.0828155	.076622
single	.0628433	.0683748	.0624603	.0684138	.0325146	.0915916
separated	-.0651539	.1300848	-.065831	.1301886	-.0642705	.1762176
divorced	-.1840744**	.0749703	-.1829365**	.075017	-.3783066***	.1061814
widowed	-.1545021	.3082598	-.1549015	.3080852	-.6020572	.4443915
cse	-.1393147	.0935	-.1335339	.0937731	-.1697108	.1275666
ogcse	-.1483484*	.0804806	-.1451817*	.0806176	-.2034427*	.1111754
alevel	-.1656466	.1058659	-.1639371	.105956	-.2384869*	.1414622
diploma	-.1623233	.0999953	-.1610239	.1000815	-.2724815**	.1378943
degree	-.3945103***	.1165186	-.3904299***	.1166658	-.5440654***	.1662174
waved5	.9868643***	.0648873	1.164831***	.2048549	1.157434***	.2684149
waved6	1.639558***	.0843305	1.733621***	.1333813	1.768936***	.1732713
giniequiv			-.9662431	1.052499	-.8128353	1.401649
lninc					-.1438205	.1960532
giniatb					3.310113	7.570146
_cons	-1.946334***	.2821309	-1.684088***	.4008287	-1.208369	1.258765

/lnsig2u	-.150667	.1121381	-.1485788	.1121159	-.1158623	.143993
sigma_u	.9274342	.0520003	.928403	.0520444	.9437149	.0679441
rho	.4624044	.027876	.4629235	.0278748	.4710668	.0358777

Likelihood-ratio test of rho=0: chibar2(01) = 240.95 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) = 241.40 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) = 149.40 Prob >= chibar2 = 0.000

2.2. Using relative deprivation as relative income measure

2.2.1 Pooled OLS model

2.2.1.1 Entire sample

lli	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0097005**	.0039475	-.0042169	.0125467	-.0171624	.0166758
prof	-.0059748	.0148484	-.005677	.0148713	-.0223448	.0184998
intermed	-.0138663	.0088184	-.01351	.0088651	-.0164409	.0115219
skillnm	-.0104603	.0078291	-.0102968	.0078473	-.0168482*	.010156
skillman	-.0093954	.0084896	-.0092568	.0084999	-.0060726	.0111256
unsklman	.010013	.0148173	.0097147	.0148256	.0286801	.0206296
child	-.02584***	.0064193	-.0260351***	.0064542	-.034535***	.0084085
single	.0022617	.0059727	.0021062	.0059821	-.0044366	.007644
separated	.0084229	.017142	.0082588	.0171481	.0177485	.0232398
divorced	-.030733***	.0105148	-.0308833***	.010519	-.0506412***	.0138139
widowed	.0139066	.0542419	.0138653	.0542004	-.0551413	.0586117
cse	-.0296949***	.0101317	-.0296153***	.0101334	-.0371398***	.0138914
ogcse	-.0336799***	.0088441	-.0334845***	.008842	-.0453899***	.0122789
alevel	-.0296858***	.0104217	-.0294392***	.0104203	-.0385608***	.0140728
diploma	-.0378501***	.0105869	-.0375941***	.0105912	-.0544877***	.0144288
degree	-.0498775***	.0114176	-.0496851***	.0114173	-.0608182***	.015576
north	-.0071642	.0171628	-.0060411	.0173574	-.0072076	.02283
yorkhumb	-.0134629	.0117863	-.0124796	.0119669	-.0213388	.0156792
eastmids	.0101333	.0134629	.0108795	.0135483	.0148042	.0173949
eastang	-.0015991	.0121249	-.0008673	.0122446	.0025554	.0154167
sthwest	.0015328	.0113361	.0021623	.0114309	.0070448	.0151877
wmids	-.001047	.0074375	-.0007903	.0074386	-.0010299	.0096284
nwest	-.003759	.0133532	-.0029479	.0135055	-.0127559	.0184503
wales	-.0022929	.0200532	-.001276	.0201666	.0121795	.0265274
scot	.0072717	.0176143	.0081344	.0177151	.0354596	.0230921
nwestatb	.0042973	.0129097	.004523	.0129061	.007742	.0180357
northatb	.0001417	.01617	.0002489	.0161698	-.0044817	.0215219
ewridatb	-.0105114	.0114443	-.0101571	.011482	-.0287971*	.0153035
nmidsatb	.000897	.0125432	.001028	.0125458	-.0030237	.0164501
eastatb	-.0063923	.0103449	-.0064515	.0103445	-.0231396*	.0131122
southatb	-.0080492	.0110974	-.0080725	.011097	-.0220491	.0146454
swestatb	.00106	.0126157	.0012107	.0126215	-.0148838	.0164194
midsatb	-.0080186	.0089266	-.0074236	.009046	-.0280583**	.0119595
walesatb	.0267629	.0198415	.0269928	.0198473	-.0158974	.0260023
scotatb	-.004982	.0168821	-.0048227	.0168812	-.0457193**	.0221815
men	.009886*	.0055041	.0102259*	.0055411	.0079375	.0070788

waved5	.126867***	.0064055	.1237358***	.0093754	.1316753***	.0122856
waved6	.2374421***	.0088897	.2300817***	.0182087	.2517521***	.0241259
rdepequiv			.0175355	.0375602	-.0140977	.0496782
lninc					.018835	.044881
rdepatb					.0738039	.1010098
_cons	.1693893***	.0354	.1167803	.1191878	.1649251	.2861759

2.2.1.2 For men only

lli	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0165055***	.0064294	.003913	.0204315	-.0249052	.0271548
prof	-.0303644	.0192667	-.0293038	.0193001	-.0494502**	.0245858
intermed	-.0423964***	.0138802	-.0413149***	.0139187	-.0451407**	.018318
skillnm	-.0273879*	.0143826	-.0265175*	.0144117	-.0457609**	.0183667
skillman	-.03339***	.0121943	-.0329404***	.0122051	-.0307053*	.0162105
unsklman	-.0171624	.0216898	-.0188022	.0217475	.0159727	.0313061
child	-.0270297***	.0099024	-.0272489***	.0099179	-.0445068***	.0129714
single	-.0021409	.0091762	-.0027068	.0091878	-.0169212	.0117588
separated	.024185	.0277601	.0234799	.0278398	.0382604	.0376339
divorced	-.0308728*	.0181086	-.0316045*	.0181491	-.0401929*	.0244244
widowed	.0665086	.1487637	.066175	.1475871	.0544911	.1755192
cse	-.047275***	.0162216	-.0470062***	.0162194	-.0591924***	.0229005
ogcse	-.0507416***	.0140362	-.0500355***	.0140395	-.0680725***	.0199505
alevel	-.0391856**	.015355	-.0383243**	.0153523	-.0471627**	.0213984
diploma	-.0584607***	.0163106	-.0574835***	.0163084	-.0743394***	.0226046
degree	-.0514508***	.0172481	-.0509839***	.017241	-.0593077**	.0239849
north	-.007318	.0246726	-.0033189	.024978	.0024669	.0326349
yorkhumb	-.0119553	.0173503	-.0083195	.0176891	-.036529	.0227504
eastmids	.0359109*	.020208	.0386985*	.0203756	.0499232*	.0264492
eastang	.0006513	.01816	.0032476	.0183255	.0038464	.0229077
sthwest	.0015132	.0171703	.0037012	.0173356	-.0036238	.022701
wmids	-.0051472	.0108146	-.0042233	.0108203	-.0011891	.0140315
nwest	-.006094	.0204305	-.0033879	.0206129	.0007668	.028882
wales	.0090786	.0298676	.0121852	.0300437	.0022505	.0421506
scot	-.0003612	.0287368	.0026841	.0288673	.0244469	.0368392
nwestatb	.0184547	.0201846	.0194675	.0201896	.0447717	.0283981
northatb	-.0057709	.0232807	-.0053156	.0232712	-.0094531	.0302942
ewridatb	-.0047709	.0170841	-.0033069	.0171504	.0000592	.0232123
nmidsatb	-.0057564	.0188295	-.0050704	.0188346	-.0037883	.024175
eastatb	-.0209134	.0147669	-.0209722	.0147661	-.0384657**	.0184365
southatb	-.0114257	.0160141	-.0114303	.0160077	-.0346023*	.0208049
swestatb	.0047483	.019497	.0051492	.0194981	.0077409	.0251283
midsatb	-.0022482	.0130067	-.0000652	.0132086	-.0159328	.0174463
walesatb	.0219767	.0294599	.0234008	.029464	.0168444	.0418039
scotatb	.0012169	.0276582	.0020032	.0276402	-.0275496	.0357512
waved5	.1398188***	.0103498	.1296789***	.0141229	.1450899***	.0187967
waved6	.2364025***	.0129013	.2086192***	.0289628	.2501392***	.0387438
rdepequiv			.0673349	.0613249	-.010714	.0809333
lninc					.166123**	.0705275

rdepatb					.4272652***	.1581689
_cons	.2720526***	.0581796	.0764977	.1935633	-.4992469	.4461022

2.2.1.3 For women only

lli	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0082034	.0051991	-.0019797	.01557	-.0074233	.0205923
prof	.0163811	.027053	.0167613	.0270769	.0007713	.0320624
intermed	.0088591	.0116546	.0093431	.0117462	.0037881	.0152319
skillnm	.0023301	.009519	.0025202	.0095499	-.0025846	.0124253
skillman	.0177566	.0139144	.017914	.0139241	.0204677	.0181446
unsklman	.0275166	.020596	.0273779	.0205897	.0294872	.0276348
child	-.0201713**	.0087058	-.0205046**	.0087959	-.0223391**	.0112954
single	.0070406	.0080546	.006916	.0080619	.0077434	.0102267
separated	-.0076921	.0215265	-.0078246	.0215186	-.0058687	.0292174
divorced	-.0323886**	.0130083	-.032496**	.0129992	-.0593923***	.0167066
widowed	.0038787	.0581211	.0038541	.0581055	-.0873969	.0601406
cse	-.0164308	.0129836	-.0163242	.0129856	-.0235544	.0174925
ogcse	-.0201608*	.0113463	-.0199193*	.0113342	-.0302892*	.0155954
alevel	-.0231329	.0146856	-.0228235	.0146866	-.0364821*	.0193002
diploma	-.0220873	.0140822	-.0217946	.0140967	-.0394**	.0189882
degree	-.0533019***	.0153636	-.0529707***	.0153705	-.0671675***	.0206629
north	-.0112513	.0237654	-.0099503	.0239978	-.017391	.0312687
yorkhumb	-.0150683	.0160529	-.0139357	.0162497	-.0065105	.0216568
eastmids	-.0199956	.0178314	-.0191813	.017913	-.0243993	.0227061
eastang	-.0049244	.0162964	-.0040599	.0164702	.000901	.0208398
sthwest	-.0000338	.0151407	.0007408	.0152511	.0166748	.0204526
wmids	.0016231	.0102439	.001908	.0102391	-.0004742	.013244
nwest	-.0017962	.0177027	-.0007788	.0179251	-.0228728	.024135
wales	-.0160474	.0269504	-.0147248	.0270705	.0203071	.0341784
scot	.010757	.0221356	.0117822	.0222444	.0406361	.0295085
nwestatb	-.0083966	.0168082	-.0081986	.0168047	-.0204385	.0234723
northatb	.0076477	.0224111	.0077809	.0224129	.0011251	.0298392
ewridatb	-.0171316	.015383	-.0167689	.0154299	-.0556571***	.0200938
nmidsatb	.0059585	.0167528	.0060638	.0167556	.0001427	.022544
eastatb	.0086165	.014506	.0085015	.0145069	-.005433	.0186503
southatb	-.0042669	.0153664	-.004312	.0153684	-.0176745	.0206416
swestatb	-.003393	.0165132	-.0031981	.0165203	-.0362705*	.0215375
midsatb	-.0137396	.0122912	-.0130462	.012426	-.037862**	.0164745
walesatb	.0295144	.0267163	.0296193	.026728	-.0500018	.0328973
scotatb	-.0094501	.0211651	-.0093263	.0211657	-.0581956**	.0281552
waved5	.1163739***	.0082798	.1124419***	.0126291	.1178209***	.0162386
waved6	.2415639***	.012611	.2332704***	.0231431	.2458634***	.030146
rdepequiv			.0198654	.0479743	.0045207	.0632316
lninc					-.1161146**	.0556982
rdepatb					-.2440056**	.1269783
_cons	.1330127***	.0473451	.0734113	.1482797	.76424**	.3605178

2.2.2 Panel data model

2.2.2.1 Entire sample

		Robust		Robust		Robust
lli	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	-.0073233*	.0038693	-.0053188	.0122698	-.0203887	.0163811
prof	-.0004822	.0149999	-.0003802	.0150213	-.0133049	.0188563
intermed	-.0118143	.0089201	-.0116997	.0089582	-.015006	.0116616
skillnm	-.0083684	.0079514	-.0083197	.0079665	-.0163371	.0103155
skillman	-.0065464	.0085389	-.0065073	.0085468	-.0033366	.0111787
unsklman	.0089533	.0145352	.0088449	.0145423	.0262582	.0202306
child	-.0237704***	.0064213	-.023844***	.0064568	-.0334416***	.008408
single	.0038471	.0059975	.0037966	.0060045	-.0043009	.007654
separated	.0056694	.0168461	.0056133	.0168514	.016254	.0227879
divorced	-.0308156***	.0104906	-.0308707***	.0104965	-.0532432***	.0137778
widowed	-.0091023	.0534081	-.0091178	.0533907	-.0705963	.0592072
cse	-.0317818***	.0115095	-.0317489***	.0115124	-.0387502**	.0155314
ogcse	-.0359168***	.0099969	-.0358376***	.0099954	-.0477446***	.0136829
alevel	-.0305332***	.0118031	-.0304373***	.011802	-.0396133**	.0157079
diploma	-.0410545***	.0118849	-.0409529***	.0118914	-.0588409***	.0159775
degree	-.0548584***	.0127128	-.0547817***	.0127135	-.0662187***	.0171484
north	-.0104262	.0187016	-.0100244	.0188671	-.0073837	.0243759
yorkhumb	-.0123716	.0119316	-.0120282	.0120969	-.0194317	.0157759
eastmids	.0128592	.0136423	.0131342	.0137264	.0183408	.0175025
eastang	.0023873	.0122746	.0026539	.012397	.0044048	.0155968
sthwest	.0032032	.0115211	.0034222	.0116078	.0075457	.0153173
wmids	-.0017704	.006819	-.0016894	.0068229	-.0030256	.0089075
nwest	-.0040195	.0142991	-.0037309	.0144344	-.0147437	.0196267
wales	-.0032866	.0215319	-.0029254	.0216279	.0134577	.028241
scot	.005132	.0190059	.0054362	.0190846	.032073	.0245194
nwestatb	.0055353	.0144015	.0056194	.0143963	.0090646	.0199257
northatb	.0042309	.0181676	.0042725	.0181667	-.0038081	.0236412
ewridatb	-.0117034	.012708	-.0115656	.0127454	-.0306134*	.016729
nmidsatb	-.0001298	.0139405	-.0000836	.0139421	-.0037206	.0181042
eastatb	-.0054736	.0119187	-.0054957	.0119179	-.0220307	.0147403
southatb	-.0048122	.0127267	-.00482	.0127266	-.0175341	.0165885
swestatb	.0000436	.0142805	.000102	.0142862	-.0156569	.0182725
midsatb	-.0063905	.0103351	-.0061717	.0104377	-.0268453**	.0135435
walesatb	.0316041	.0220206	.0316921	.0220246	-.0147966	.0283292
scotatb	-.0022462	.0186341	-.0021852	.0186339	-.0431019*	.0241365
men	.0088285	.0061852	.0089513	.0062142	.0057093	.0078197
waved5	.1259071***	.0060506	.1247619***	.0089878	.1343198***	.0118427
waved6	.2367167***	.008541	.234025***	.0177034	.257573***	.0235452
rdepequiv			.0064092	.0366741	-.0306006	.0487427
lninc					.0204645	.0502976
rdepatb					.0837368	.1135517
_cons	.1477641***	.0351072	.1285434	.1166918	.1893023	.3094848
sigma_u	.16062514		.16060786		.14269478	
sigma_e	.30186331		.30187027		.30048084	
rho	.22066386		.22061892		.18401899	

(fraction of variance due to u_i)

2.2.2.2 For men only

lli	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0135961**	.0062629	-.0063315	.0200464	-.0391983	.0270464
prof	-.0222397	.0194735	-.0219092	.0195023	-.0378612	.0251444
intermed	-.0355356**	.0140749	-.0352257**	.0141013	-.0405542**	.0185828
skillnm	-.0246248*	.0145884	-.024381*	.0146141	-.0439822**	.018579
skillman	-.026461**	.0122269	-.0263603**	.0122348	-.0257646	.0162543
unsklman	-.0118575	.0213555	-.0124253	.021409	.0170321	.0305098
child	-.0232493**	.0097445	-.0233513**	.0097647	-.0414853***	.0128305
single	.0039443	.0091358	.0037954	.0091403	-.0105264	.0117126
separated	.0351144	.0268397	.0348605	.0268869	.049568	.0363671
divorced	-.0272116	.0176952	-.0274596	.0177301	-.0403631*	.0239133
widowed	.0065413	.1377247	.0065631	.1373277	-.0240713	.1604685
cse	-.0481165***	.0187244	-.0480282***	.0187225	-.0601037**	.02575
ogcse	-.0520266***	.0161049	-.0517473***	.0161093	-.069946***	.0224145
alevel	-.03758**	.0176354	-.0372557**	.0176315	-.0464053*	.0240694
diploma	-.0612013***	.0185441	-.0608221***	.0185436	-.078941***	.0252513
degree	-.055375***	.0195678	-.0551852***	.0195618	-.0642193**	.0267434
north	-.0112951	.0270888	-.0098875	.02739	.005497	.0356687
yorkhumb	-.0066253	.0175169	-.0054068	.0178273	-.031475	.0228253
eastmids	.0392903*	.0204158	.0402752**	.0205684	.0509858*	.0264694
eastang	.0037616	.0184112	.0046838	.0185808	.0056169	.0233179
sthwest	.0035415	.0173579	.0042867	.0175083	-.0027513	.0229323
wmids	-.0062897	.0097121	-.0060259	.009721	-.004771	.0127442
nwest	-.0109611	.0217273	-.010038	.0218819	-.0087039	.0305025
wales	.005359	.0327788	.0064109	.032917	.0040365	.0453683
scot	-.0078062	.0308989	-.0067655	.0309813	.0147324	.038392
nwestatb	.0227237	.0226054	.0230933	.0226091	.0505575	.0315778
northatb	-.0039786	.0266477	-.0038349	.026639	-.0143866	.0342686
ewridatb	-.0090113	.0191172	-.0084631	.0191741	-.0070243	.0254817
nmidsatb	-.0100479	.0210071	-.0098039	.0210093	-.0069308	.0266769
eastatb	-.017478	.0175029	-.0175022	.0174987	-.0350104*	.0211941
southatb	-.0098949	.0186372	-.0098945	.0186324	-.0309322	.0239102
swestatb	.004785	.0223336	.0049335	.0223348	.006851	.0283003
midsatb	.0002674	.0154117	.0010526	.0155756	-.0148191	.0200746
walesatb	.0322824	.0336887	.0328057	.0336935	.0155184	.046169
scotatb	.0089511	.0304218	.0092377	.0304204	-.0204625	.0383214
waved5	.1393036***	.0096896	.13571***	.0134399	.1541025***	.0181266
waved6	.2351562***	.0123089	.2252792***	.0282006	.2706257***	.0382291
rdepequiv			.0239962	.0601612	-.0614844	.0804325
lninc					.1793262**	.0815267
rdepatb					.4580376**	.1824325
_cons	.2374676***	.0573707	.1679261	.1901715	-.4387618	.4962671
sigma_u	.18016763		.18000681		.15748093	
sigma_e	.30213664		.30210463		.30104392	

rho	.26231258		.26200809		.21485525	
	(fraction of variance due to u_i)					

2.2.2.3 For women only

lli	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0068969	.0051396	.0027233	.0152511	-.0043467	.0201322
prof	.0204172	.0273258	.0209581	.0273416	.0073529	.0322654
intermed	.0083681	.0118215	.0090601	.0119053	.0038786	.0154402
skillnm	.0031653	.0096431	.0034227	.0096708	-.002561	.0126038
skillman	.0176148	.0139372	.0178497	.013947	.0228132	.0181437
unsklman	.0232961	.0202043	.0230819	.0201952	.0256776	.0272644
child	-.0191351**	.008763	-.0196509**	.0088505	-.0223187**	.0113328
single	.0061127	.0081127	.0059449	.0081192	.0040692	.0102631
separated	-.0174158	.0213263	-.0176218	.0213194	-.0142791	.0288163
divorced	-.0338419***	.0130866	-.034021***	.0130779	-.0625874***	.0168003
widowed	-.0118678	.0580393	-.0119601	.0580061	-.0916871	.0629001
cse	-.0190373	.0144483	-.0188437	.014451	-.0254548	.0192996
ogcse	-.0224959*	.0125813	-.0220839*	.0125694	-.0325815*	.0171241
alevel	-.0254591	.016328	-.0249454	.016332	-.0386834*	.0212619
diploma	-.0241582	.0155392	-.0236638	.0155567	-.0423721**	.0207466
degree	-.0577408***	.0167488	-.0571921***	.0167547	-.0719704***	.0223706
north	-.0133653	.0255947	-.0114112	.025782	-.018793	.032858
yorkhumb	-.017109	.0162694	-.0154113	.0164523	-.0068565	.0218426
eastmids	-.0172638	.0181098	-.0159762	.0181978	-.0183384	.0229737
eastang	-.0011982	.0164747	.0001422	.0166513	.0020953	.0210011
sthwest	.0010606	.0153959	.0022115	.0155012	.0167534	.020586
wmids	.001247	.0095869	.0016455	.0095849	-.0012958	.0124719
nwest	.0004405	.0189199	.0019979	.0191258	-.0209772	.0255798
wales	-.0153336	.0283207	-.0133193	.028439	.0222521	.0357136
scot	.0113931	.0236891	.0129415	.0237855	.0401977	.0313923
nwestatb	-.0088605	.018542	-.0085524	.0185405	-.0210902	.0255677
northatb	.012702	.0246471	.0129521	.0246557	.0049135	.0320649
ewridatb	-.01613	.0168637	-.015532	.0169142	-.0537949**	.0217874
nmidsatb	.0069762	.0184446	.007128	.0184471	.0006079	.0245799
eastatb	.0078786	.0162239	.0076967	.0162261	-.0059195	.0204864
southatb	-.0002187	.017274	-.0002823	.0172782	-.0125257	.0229263
swestatb	-.0047515	.0183731	-.004438	.0183793	-.0361893	.0236157
midsatb	-.0128787	.0138716	-.011804	.0139875	-.036329**	.018282
walesatb	.0305762	.0287892	.0307504	.0288049	-.0484597	.0349972
scotatb	-.0092037	.0231286	-.0090045	.0231294	-.0568275*	.0305644
waved5	.1155886***	.0079184	.1095055***	.0122183	.1161124***	.0157176
waved6	.2423372***	.0122503	.2295196***	.0225602	.2435935***	.0293242
rdepequiv			.030718	.0470022	.0098728	.0619815
lninc					-.1189696**	.0604229
rdepatb					-.2438637*	.1389558
_cons	.123431***	.0472031	.0313117	.1454326	.7533484**	.3796918
sigma_u	.13989817		.13995511		.12553276	

sigma_e	.30137649	.30136641	.29951573
rho	.1772792	.17740771	.14941453
	(fraction of variance due to u_i)		

2.2.3 Probit model

2.2.3.1 Entire sample

lli	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	-.0389242*	.0219512	-.0069943	.0736227	-.0977691	.0935748
prof	-.0360017	.0928176	-.0346859	.0928599	-.1101235	.1255722
intermed	-.0759446	.0541962	-.0743088	.0543102	-.10536	.0717006
skillnm	-.0657348	.0514529	-.065469	.0514504	-.1247206*	.0675788
skillman	-.0445778	.0531043	-.044223	.0531063	-.0236292	.0702484
unsklman	.0375284	.0826444	.0354878	.0827581	.1195093	.1093014
child	-.1136069***	.0402567	-.1141152***	.0402705	-.1676***	.053407
single	.0409252	.0470157	.0400288	.047061	-.0267927	.0622561
separated	.0613578	.0917703	.0605202	.0917862	.1025172	.1218098
divorced	-.1533828***	.0576501	-.1542134***	.0576786	-.2960331***	.080498
widowed	-.118087	.2699008	-.1185695	.2700229	-.5092232	.3729951
cse	-.2087356***	.0694224	-.2083972***	.0694234	-.2507809***	.096068
ogcse	-.2271656***	.0587027	-.2258199***	.0587721	-.2993553***	.0819101
alevel	-.1940384***	.0693825	-.1923954***	.0694711	-.237337**	.0945085
diploma	-.2711477***	.0717933	-.2695045***	.0718779	-.3789541***	.0988298
degree	-.350139***	.079268	-.3487173***	.0793231	-.432765***	.1113432
north	-.0776575	.111452	-.0710158	.1124044	-.0447479	.151235
yorkhumb	-.0707216	.0812885	-.0650018	.0822631	-.0667229	.1140427
eastmids	.0886122	.0832729	.0932016	.0838845	.1498537	.1120039
eastang	-.0033871	.0837223	.0004407	.0841541	.0340122	.105569
sthwest	-.0002074	.0714278	.0030557	.0717955	.0235692	.0978108
wmids	-.0350339	.0562933	-.0330456	.0564714	-.0103441	.0740014
nwest	-.0447089	.08971	-.040145	.090266	-.0897469	.1224493
wales	-.0372189	.1193871	-.031241	.1200942	.0834755	.1675814
scot	.0127045	.1140127	.0180786	.1146148	.1818905	.1558267
nwestatb	.0481259	.0903693	.049628	.0904209	.0560343	.1237953
northatb	.0278333	.1087663	.028347	.1087699	-.0253571	.1504958
ewridatb	-.0739905	.088669	-.0722942	.0887505	-.2262941*	.1257544
nmidsatb	-.0268617	.0898443	-.0261292	.0898561	-.0773511	.1213209
eastatb	-.0266627	.0768833	-.0272643	.0768929	-.1526182	.1006077
southatb	-.0403996	.0824683	-.0406486	.0824665	-.1170983	.1125019
swestatb	.008153	.0914852	.0090159	.0915077	-.0935432	.1231078
midsatb	-.0338494	.0736655	-.0309794	.0739402	-.1843234*	.1014148
walesatb	.1985107	.1213842	.1999228	.1214082	-.0916504	.1722076
scotatb	-.0022662	.1135042	-.0013882	.1135113	-.2516703	.1580709
men	.0530742	.0378569	.0552769	.0381656	.0309324	.0506094
waved5	1.011307***	.0470669	.9929962***	.0618994	1.052358***	.0799692
waved6	1.567036***	.0557267	1.523938***	.1098992	1.668829***	.1405214
rdepequiv			.1032273	.2269365	-.1409265	.2903244
lninc					.1450883	.3647018
rdepatb					.6117218	.7990125
_cons	-1.727323***	.2024022	-2.034015***	.7047608	-1.776422	2.110178

/lnsig2u	-.1805045	.0553166	-.1806873	.0553316	-.1800274	.0728779
sigma_u	.9137007	.0252714	.9136171	.0252759	.9139187	.0333022
rho	.454996	.0137171	.4549507	.0137206	.4551143	.0180726

Likelihood-ratio test of rho=0: chibar2(01) = 578.50 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) = 578.25 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) = 344.93 Prob >= chibar2 = 0.000

2.2.3.2 For men only

lli	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	-.0767473**	.0350242	.0369086	.1135959	-.1395583	.1517671
prof	-.1774838	.1248625	-.1733216	.1248474	-.2508932	.1677787
intermed	-.2093909**	.0866353	-.2040478**	.0867166	-.2459199**	.1160587
skillnm	-.1585387	.0976142	-.1560648	.0975882	-.2910142**	.1299867
skillman	-.1700949**	.0761727	-.1694661**	.0761199	-.1631362	.102691
unsklman	-.0828951	.1358869	-.0919621	.1360199	.0942207	.1792814
child	-.1183659*	.0618788	-.1169503*	.0618447	-.2238982***	.0822292
single	.0270143	.0717525	.0228523	.0718421	-.0801277	.0938289
separated	.2108614	.1411364	.2088315	.1409757	.2705967	.183569
divorced	-.1356547	.0991628	-.1389224	.0991526	-.2289842*	.1366461
widowed	-.1470261	.617331	-.1479024	.6191483	-.3913382	.749414
cse	-.315521***	.115056	-.3137152***	.1149627	-.3936653**	.1623027
ogcse	-.3423768***	.0962372	-.3374848***	.0962427	-.4446908***	.1354226
alevel	-.2518877**	.1052677	-.2459696**	.1053044	-.2880554**	.1456012
diploma	-.437515***	.1168284	-.4303189***	.1168909	-.5529214***	.1613396
degree	-.3583459***	.1221241	-.3533513***	.1220823	-.4254545**	.1699002
north	-.1074989	.1773921	-.08592	.1784747	.0310157	.2489086
yorkhumb	-.0470289	.1258064	-.0274175	.1271712	-.1956209	.1776695
eastmids	.2351529*	.1249767	.2509595*	.1258406	.3447996**	.1676573
eastang	.0228092	.1302317	.0368242	.1308662	.1043548	.1638981
sthwest	-.0239481	.1115501	-.0138275	.1119327	-.0548602	.1495163
wmids	-.127801	.0858881	-.1216968	.0861099	-.0947086	.1124968
nwest	-.1092622	.1422458	-.0944661	.1428233	-.0703511	.1957923
wales	-.0121048	.1834795	.0035477	.1839156	.0419733	.2574924
scot	-.0877745	.1906596	-.0686009	.1913692	.05436	.264689
nwestatb	.1743305	.1454363	.1804486	.1454305	.3354889*	.1990667
northatb	-.0228425	.1742725	-.0202045	.1741594	-.0921545	.2481932
ewridatb	-.0548666	.1381903	-.0474141	.1382894	-.0283395	.1924343
nmidsatb	-.1055303	.1409886	-.101264	.1409361	-.1410237	.1883853
eastatb	-.1183945	.1230075	-.1201307	.1229279	-.2681959*	.1576775
southatb	-.0968262	.1333186	-.0977263	.1332196	-.2479342	.1823893
swestatb	.0479657	.1455312	.0499201	.1454579	.0430417	.1911794
midsatb	.0353065	.1140045	.0457031	.1143845	-.0811993	.1569417
walesatb	.2101346	.1895498	.2196766	.1895672	.0722945	.2670015
scotatb	.0788456	.1895736	.082509	.1894622	-.0893122	.2685311
waved5	1.121894***	.0759453	1.065113***	.0927205	1.154248***	.1229805
waved6	1.630618***	.0876279	1.473027***	.1725499	1.706461***	.2308369
rdepequiv			.3878161	.3677248	-.106042	.4872796

lninc					1.260995**	.5352696
rdepatb					3.190455***	1.205737
_cons	-1.296853***	.3286261	-2.387507**	1.088975	-7.153898**	3.14124
/lnsig2u	.1515196	.1028694	.1485239	.1029493	.0964675	.1346903
sigma_u	1.078703	.0554828	1.077089	.0554428	1.049416	.0706731
rho	.5378076	.0255703	.5370629	.0255959	.5240982	.0335944

Likelihood-ratio test of rho=0: chibar2(01) = 354.92 Prob >= chibar2 = 0.000

Likelihood-ratio test of rho=0: chibar2(01) = 353.86 Prob >= chibar2 = 0.000

Likelihood-ratio test of rho=0: chibar2(01) = 201.90 Prob >= chibar2 = 0.000

2.2.3.3 For women only

lli	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	-.0391844	.0314859	.0196562	.1066911	-.0379819	.1302399
prof	.1266038	.1764974	.1294641	.1765981	.0390443	.2412247
intermed	.0449397	.0752138	.0482978	.07544	.0048048	.0986417
skillnm	.0082022	.0646063	.0086994	.0646121	-.0444374	.0837726
skillman	.1262376	.0903918	.1272623	.0904167	.1599278	.1164878
unsklman	.1223274	.1099753	.1200963	.1100627	.1115835	.1452992
child	-.0816081	.058197	-.0834976	.0582991	-.0881948	.0767771
single	.0592464	.0685634	.0584417	.0686044	.0262631	.0915824
separated	-.0624407	.1302518	-.0641662	.1303397	-.0637659	.1758316
divorced	-.1837499**	.0751281	-.1852478**	.0752014	-.3680674***	.1062541
widowed	-.1408488	.3091065	-.1421744	.3093683	-.6234926	.4457588
cse	-.1348383	.0945947	-.1341681	.094626	-.1689244	.1288163
ogcse	-.1474014*	.0807976	-.144759*	.0809401	-.2098318*	.1117143
alevel	-.1661787	.1062437	-.1630315	.1064047	-.232987*	.1414953
diploma	-.1597769	.1000942	-.1571425	.1002151	-.2626052*	.1375
degree	-.3979844***	.1169312	-.3945589***	.1170944	-.5027806***	.1668066
north	-.0942613	.1556419	-.0816695	.1571924	-.1027751	.2050052
yorkhumb	-.1003918	.1149804	-.0894549	.1165661	.0482942	.1606865
eastmids	-.0730612	.1230217	-.0647433	.1239	-.0559294	.165644
eastang	-.0325198	.1172558	-.0256501	.1179227	-.0261536	.1485479
sthwest	.0045747	.1000218	.011381	.1007612	.0916592	.1403342
wmids	.0407371	.0792726	.0445978	.0795875	.0657182	.1042171
nwest	.0003267	.1252846	.009715	.1263591	-.114091	.1696775
wales	-.0952521	.1715563	-.0818925	.1731033	.1482633	.2381512
scot	.0665894	.1523476	.0769502	.1534288	.2546162	.205371
nwestatb	-.0529678	.1254184	-.0508906	.1254807	-.1648113	.1727461
northatb	.1020624	.1515027	.103317	.1515602	.0117695	.2055067
ewridatb	-.1082787	.127211	-.1057591	.1273383	-.4404304**	.184204
nmidsatb	.0387949	.1278556	.0396858	.1279025	-.0078463	.173799
eastatb	.0576723	.1076775	.0563166	.1077312	-.0476851	.1432589
southatb	.0080904	.1145347	.0076449	.1145619	-.057479	.155316
swestatb	-.0237081	.1284707	-.0217695	.1285599	-.2308009	.1766877
midsatb	-.095903	.1063889	-.0903416	.106861	-.2830309*	.1456514
walesatb	.2053789	.1729933	.2057166	.1730098	-.3031963	.245791
scotatb	-.0462593	.1525949	-.0451897	.1526332	-.366808*	.2098025
waved5	.999201***	.0673189	.9623454***	.0924905	1.017501***	.1176523

waved6	1.653805***	.0861899	1.575548***	.1601985	1.694006***	.1985451
rdepequiv			.1865839	.3224587	.0172794	.4009606
lninc					-1.031835*	.5737684
rdepatb					-1.982556	1.217321
_cons	-1.921271***	.2912647	-2.484821**	1.01932	3.632926	3.251837
/lnsig2u	-.1545932	.1124497	-.153701	.112439	-.1397719	.145729
sigma_u	.9256153	.0520426	.9260283	.0520608	.9325002	.0679462
rho	.4614285	.0279451	.4616502	.0279444	.4651138	.0362549

Likelihood-ratio test of rho=0: chibar2(01) = 238.85 Prob >= chibar2 = 0.000

Likelihood-ratio test of rho=0: chibar2(01) = 238.99 Prob >= chibar2 = 0.000

Likelihood-ratio test of rho=0: chibar2(01) = 143.58 Prob >= chibar2 = 0.000

2.3 Using deprivation from the mean as relative income measure

2.3.1 Pooled OLS model

2.3.1.1 Entire sample

lli	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0097005**	.0039475	-.0169823***	.004731	-.0215788***	.0060687
prof	-.0059748	.0148484	-.0075836	.014907	-.028463	.0182375
intermed	-.0138663	.0088184	-.0155197*	.0088598	-.0210639*	.0113026
skillnm	-.0104603	.0078291	-.0105381	.0078279	-.013533	.0100058
skillman	-.0093954	.0084896	-.0090587	.0084926	-.0079925	.0109123
unsklman	.010013	.0148173	.0107759	.0148231	.0192941	.019764
child	-.02584***	.0064193	-.0277316***	.006517	-.0348069***	.008317
single	.0022617	.0059727	.0032615	.0059916	-.006603	.007557
separated	.0084229	.017142	.0083694	.0171358	.0090665	.0221255
divorced	-.030733***	.0105148	-.0302393***	.0105151	-.037652***	.013423
widowed	.0139066	.0542419	.0133115	.0542041	-.0682067	.0560511
cse	-.0296949***	.0101317	-.0296958***	.0101312	-.0358456***	.0135022
ogcse	-.0336799***	.0088441	-.0336682***	.0088431	-.0431367***	.0119534
alevel	-.0296858***	.0104217	-.0297905***	.0104203	-.0307362**	.0137928
diploma	-.0378501***	.0105869	-.0380329***	.0105838	-.0425028***	.0141542
degree	-.0498775***	.0114176	-.0516754***	.0114395	-.0532365***	.0152954
north	-.0071642	.0171628	-.0079138	.0171771	-.0229905	.021507
yorkhumb	-.0134629	.0117863	-.0145585	.0118065	-.0274256*	.0150859
eastmids	.0101333	.0134629	.0097018	.0134592	.0172262	.0170399
eastang	-.0015991	.0121249	-.0022524	.0121349	.0042247	.0150466
sthwest	.0015328	.0113361	.0004091	.011366	.0008578	.0146147
wmids	-.001047	.0074375	-.000956	.0074362	-.0004909	.0094158
nwest	-.003759	.0133532	-.0043923	.0133627	-.002043	.017862
wales	-.0022929	.0200532	-.0036542	.0200471	-.0012589	.0256509
scot	.0072717	.0176143	.0072057	.0176082	.0259203	.0217623
nwestatb	.0042973	.0129097	.0040156	.0129107	.0005772	.0181249
northatb	.0001417	.01617	-.0000887	.0161616	.008009	.022438
ewridatb	-.0105114	.0114443	-.0105877	.0114445	-.0242085	.0155481
nmidsatb	.000897	.0125432	.0010423	.0125416	-.0046907	.0163893
eastatb	-.0063923	.0103449	-.0059885	.0103445	-.0268767**	.0128552

southatb	-.0080492	.0110974	-.0080312	.0110898	-.0168273	.0145144
swestatb	.00106	.0126157	.0011594	.0126225	-.0137845	.0162664
midsatb	-.0080186	.0089266	-.008721	.0089379	-.0271175**	.012111
walesatb	.0267629	.0198415	.0267187	.019802	.0005554	.0259452
scotatb	-.004982	.0168821	-.0054522	.0168689	-.0359066	.0218381
men	.009886	.0055041	.00837	.0055702	.0079777	.0070275
waved5	.126867***	.0064055	.1133649***	.0094806	.1136967***	.0120308
waved6	.2374421***	.0088897	.2321932***	.0095782	.2367297***	.0121158
depmean			.0145181**	.0071344	.0188756**	.009141
lninc					-.0089472	.1062618
depmeanatb					-.0070451	.1003967
_cons	.1693893***	.0354	.2330829	.0423231	.3491013	.4390357

2.3.1.2 For men only

lli	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0165055***	.0064294	-.0218883***	.0081548	-.0297705***	.0101409
prof	-.0303644	.0192667	-.0311185	.0193012	-.0550528**	.0241765
intermed	-.0423964***	.0138802	-.0436629***	.0139573	-.0512315***	.0180755
skillnm	-.0273879*	.0143826	-.0274731*	.0143846	-.0424087**	.0182443
skillman	-.03339***	.0121943	-.0332329***	.0122015	-.0365788**	.0159141
unsklman	-.0171624	.0216898	-.0175789	.0217015	.0059246	.0303789
child	-.0270297***	.0099024	-.0285586***	.0101082	-.0385139***	.0129625
single	-.0021409	.0091762	-.001246	.0092254	-.0165265	.0116298
separated	.024185	.0277601	.0240938	.0277608	.0278753	.0351803
divorced	-.0308728*	.0181086	-.0305205*	.0181117	-.027463	.023381
widowed	.0665086	.1487637	.0655821	.1483768	.0118603	.1574685
cse	-.047275***	.0162216	-.0473948***	.0162205	-.0438782**	.0220369
ogcse	-.0507416***	.0140362	-.0509292***	.0140335	-.0544632***	.019117
alevel	-.0391856**	.015355	-.0395431***	.0153537	-.0275486	.0207589
diploma	-.0584607***	.0163106	-.0589612***	.0163151	-.0510516**	.021998
degree	-.0514508***	.0172481	-.0533696***	.0173264	-.0465589**	.023234
north	-.007318	.0246726	-.0074522	.0246763	-.0212164	.0301745
yorkhumb	-.0119553	.0173503	-.0127755	.0173727	-.0498981**	.0214372
eastmids	.0359109*	.020208	.0356788*	.0201898	.0527039**	.0256607
eastang	.0006513	.01816	.0001702	.0181662	.0045293	.0225019
sthwest	.0015132	.0171703	.000612	.017234	-.0061051	.0218748
wmids	-.0051472	.0108146	-.0050459	.010814	-.0025902	.013671
nwest	-.006094	.0204305	-.0066166	.0204509	.0109375	.0274213
wales	.0090786	.0298676	.0081969	.0299382	-.0082284	.0390663
scot	-.0003612	.0287368	-.0003679	.0287367	.0132069	.0353695
nwestatb	.0184547	.0201846	.0185871	.020189	.0024528	.027933
northatb	-.0057709	.0232807	-.0061705	.0232746	-.0338308	.0315236
ewridatb	-.0047709	.0170841	-.0045758	.0170927	-.0125334	.0237193
nmidsatb	-.0057564	.0188295	-.0056371	.0188258	-.0166367	.0241302
eastatb	-.0209134	.0147669	-.0205042	.0147748	-.0427799**	.0182261
southatb	-.0114257	.0160141	-.0112899	.0160137	-.0188313	.0208786
swestatb	.0047483	.019497	.0049914	.0195073	-.0115022	.025041
midsatb	-.0022482	.0130067	-.002458	.0130163	-.0379772**	.0175464

walesatb	.0219767	.0294599	.0218435	.0294234	.0126415	.0401516
scotatb	.0012169	.0276582	.000884	.0276488	-.0448516	.0351956
waved5	.1398188***	.0103498	.1276819***	.0175302	.1273839***	.0222526
waved6	.2364025***	.0129013	.2324489***	.0139851	.2348541***	.0177003
depmean			.010515	.0115278	.0147753	.0145774
lninc					-.3754926**	.1680557
depmeanatb					.3542956**	.1595757
_cons	.2720526***	.0581796	.3191142***	.0729347	1.950181***	.6953963

2.3.1.3 For women only

lli	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0082034	.0051991	-.0131767**	.0057481	-.0142911*	.0075446
prof	.0163811	.027053	.0143014	.0272926	-.0068922	.031883
intermed	.0088591	.0116546	.0075587	.0117333	.0011231	.0148985
skillnm	.0023301	.009519	.0022576	.0095175	.0026565	.0121923
skillman	.0177566	.0139144	.0174605	.0139248	.0255871	.0179379
unsklman	.0275166	.020596	.0283982	.020626	.0212686	.0262379
child	-.0201713**	.0087058	-.0213391**	.0087688	-.0246742**	.0110589
single	.0070406	.0080546	.0072523	.0080561	.0041945	.0101245
separated	-.0076921	.0215265	-.007565	.0215107	-.0138121	.0280934
divorced	-.0323886**	.0130083	-.0321295**	.0130037	-.0468593***	.0164319
widowed	.0038787	.0581211	.003344	.058114	-.0957503	.0584088
cse	-.0164308	.0129836	-.0163791	.0129844	-.0303008*	.0171516
ogcse	-.0201608*	.0113463	-.0201377*	.0113466	-.0347631**	.0153621
alevel	-.0231329	.0146856	-.0231443	.014687	-.0371409*	.0190017
diploma	-.0220873	.0140822	-.0221974	.0140776	-.0344974*	.0187614
degree	-.0533019***	.0153636	-.0542692***	.0153927	-.0593198***	.0206952
north	-.0112513	.0237654	-.0120333	.0238068	-.0288104	.0300081
yorkhumb	-.0150683	.0160529	-.0158669	.0160896	-.0060559	.0211077
eastmids	-.0199956	.0178314	-.0201229	.0178418	-.0247811	.0222015
eastang	-.0049244	.0162964	-.0053756	.0163214	.0030077	.0202075
sthwest	-.0000338	.0151407	-.0008221	.0151699	.0083507	.0196594
wmids	.0016231	.0102439	.0016846	.0102418	.0007288	.0129779
nwest	-.0017962	.0177027	-.0021462	.0177067	-.013162	.023685
wales	-.0160474	.0269504	-.017009	.0268862	.002972	.0341155
scot	.010757	.0221356	.0106471	.0221352	.0294059	.0276213
nwestatb	-.0083966	.0168082	-.0089314	.0168217	.0026198	.0239558
northatb	.0076477	.0224111	.007668	.0224094	.0520744*	.0314107
ewridatb	-.0171316	.015383	-.0173802	.0153795	-.0345952*	.0201785
nmidsatb	.0059585	.0167528	.0059818	.0167578	.0093021	.0222351
eastatb	.0086165	.014506	.0088274	.0145063	-.0091787	.0181279
southatb	-.0042669	.0153664	-.0043352	.0153573	-.0200365	.0203026
swestatb	-.003393	.0165132	-.0034299	.0165196	-.0169986	.0212887
midsatb	-.0137396	.0122912	-.0145115	.012293	-.0144087	.0166854
walesatb	.0295144	.0267163	.0294978	.0266603	-.0136701	.0339687
scotatb	-.0094501	.0211651	-.0097517	.0211635	-.0199488	.0277974
waved5	.1163739***	.0082798	.1078379***	.0117698	.1117877***	.0150089
waved6	.2415639***	.012611	.2366008***	.0142735	.2436906***	.0179893

depmean			.0112864	.0104621	.0135189	.0135543
lninc					.3485671***	.1309049
depmeanatb					-.3626583***	.1213795
_cons	.1330127***	.0473451	.1760021***	.052238	-1.184713**	.5415544

2.3.2 Panel data model

2.3.2.1 Entire sample

lli	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0073233*	.0038693	-.0137305***	.0046275	-.0181639***	.0059136
prof	-.0004822	.0149999	-.0016692	.0150449	-.0165418	.0185878
intermed	-.0118143	.0089201	-.0131813	.0089538	-.0176845	.0114375
skillnm	-.0083684	.0079514	-.0083576	.00795	-.0117423	.0101763
skillman	-.0065464	.0085389	-.006255	.0085416	-.0043624	.0109499
unsklman	.0089533	.0145352	.0097396	.0145445	.0177199	.0193657
child	-.0237704***	.0064213	-.0255153***	.0065219	-.0342528***	.0083166
single	.0038471	.0059975	.0048621	.0060178	-.0065722	.0075893
separated	.0056694	.0168461	.0055755	.0168393	.0069772	.0215921
divorced	-.0308156***	.0104906	-.0303226***	.0104917	-.040111***	.0134127
widowed	-.0091023	.0534081	-.0095258	.0533664	-.0856732	.0564235
cse	-.0317818***	.0115095	-.0317688***	.011508	-.0378523**	.0154769
ogcse	-.0359168***	.0099969	-.0358796***	.0099951	-.0451367***	.0136328
alevel	-.0305332***	.0118031	-.0305856***	.0118002	-.0308252*	.0157771
diploma	-.0410545***	.0118849	-.0411982***	.0118794	-.0464115***	.0160197
degree	-.0548584***	.0127128	-.0564656***	.0127232	-.0581869***	.0171911
north	-.0104262	.0187016	-.0110392	.0187131	-.0232661	.0233605
yorkhumb	-.0123716	.0119316	-.013323	.0119495	-.02288	.0152163
eastmids	.0128592	.0136423	.0123724	.0136428	.0223843	.0172109
eastang	.0023873	.0122746	.0018106	.0122842	.0079185	.0153225
sthwest	.0032032	.0115211	.0023012	.0115432	.0029481	.0147824
wmids	-.0017704	.006819	-.0017025	.0068183	-.0027792	.00859
nwest	-.0040195	.0142991	-.0045282	.0143103	-.0040065	.0192263
wales	-.0032866	.0215319	-.0044515	.0215246	.0021242	.0276098
scot	.005132	.0190059	.0050838	.0189997	.0228894	.0233794
nwestatb	.0055353	.0144015	.00526	.0144027	.002792	.0204336
northatb	.0042309	.0181676	.0039721	.0181607	.0089563	.0252722
ewridatb	-.0117034	.012708	-.0118059	.0127063	-.0269425	.0173857
nmidsatb	-.0001298	.0139405	.0000446	.0139381	-.0077532	.0183881
eastatb	-.0054736	.0119187	-.0051113	.0119162	-.0262513*	.014852
southatb	-.0048122	.0127267	-.004766	.0127176	-.011666	.0168936
swestatb	.0000436	.0142805	.0001051	.0142864	-.0163469	.0185558
midsatb	-.0063905	.0103351	-.0069697	.0103444	-.0252103*	.0141163
walesatb	.0316041	.0220206	.0315394	.0219825	.0017847	.028774
scotatb	-.0022462	.0186341	-.0026584	.0186192	-.0333965	.0242105
men	.0088285	.0061852	.0075243	.0062319	.006176	.007904
waved5	.1259071***	.0060506	.1141442***	.0089814	.1146887***	.0113412
waved6	.2367167***	.008541	.2321803***	.0091822	.23626***	.0115735
depmean			.0127228*	.0068376	.0165907*	.0086984
lninc					-.0240633	.1230642

depmeanatb					.0036752	.1160551
_cons	.1477641***	.0351072	.2036651***	.0416646	.3856664	.507579
sigma_u	.16062514		.16056161		.16381029	
sigma_e	.30186331		.30187285		.30157897	
rho	.22066386		.22051695		.22782282	

(fraction of variance due to u_i)

2.3.2.2 For men only

lli	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0135961**	.0062629	-.0180699**	.0078625	-.0278518***	.0098032
prof	-.0222397	.0194735	-.0226734	.0194946	-.0388613	.0247616
intermed	-.0355356**	.0140749	-.0364642***	.0141277	-.0418635**	.0182871
skillnm	-.0246248*	.0145884	-.0245613*	.0145907	-.0374565**	.0184468
skillman	-.026461**	.0122269	-.0262963**	.0122352	-.0281829*	.0159206
unsklman	-.0118575	.0213555	-.0122456	.021368	.0088211	.0295838
child	-.0232493**	.0097445	-.0245803**	.0099556	-.0372456***	.012773
single	.0039443	.0091358	.0047103	.0091679	-.0099699	.0115847
separated	.0351144	.0268397	.0350139	.0268381	.0408977	.0338228
divorced	-.0272116	.0176952	-.0269212	.0176991	-.0281527	.0229554
widowed	.0065413	.1377247	.006082	.1372902	-.0663231	.1403496
cse	-.0481165***	.0187244	-.048197***	.0187236	-.0436727*	.025329
ogcse	-.0520266***	.0161049	-.0521792***	.0161017	-.0544584**	.021938
alevel	-.03758**	.0176354	-.0378676**	.0176295	-.023733	.0238831
diploma	-.0612013***	.0185441	-.0616334***	.0185417	-.0530596**	.0250513
degree	-.055375***	.0195678	-.0570494***	.0196232	-.0508817*	.0263728
north	-.0112951	.0270888	-.0113052	.0270919	-.0164305	.0334418
yorkhumb	-.0066253	.0175169	-.0072991	.017538	-.0371118*	.0216497
eastmids	.0392903*	.0204158	.0389946*	.0204036	.0576671**	.0257841
eastang	.0037616	.0184112	.0033507	.0184171	.0103369	.0230048
sthwest	.0035415	.0173579	.002868	.0174045	-.0028525	.0220291
wmids	-.0062897	.0097121	-.0061784	.0097116	-.0054767	.0122435
nwest	-.0109611	.0217273	-.011361	.0217493	.0043824	.0292695
wales	.005359	.0327788	.004684	.0328345	-.0030858	.0426689
scot	-.0078062	.0308989	-.0077158	.0309001	.0059042	.0370599
nwestatb	.0227237	.0226054	.0228325	.022611	.0049908	.031624
northatb	-.0039786	.0266477	-.0043998	.0266483	-.0416247	.0362309
ewridatb	-.0090113	.0191172	-.0088663	.019125	-.0233803	.026641
nmidsatb	-.0100479	.0210071	-.0098888	.0210083	-.0244379	.0271256
eastatb	-.017478	.0175029	-.0171528	.0175083	-.0399003*	.0215855
southatb	-.0098949	.0186372	-.0097693	.0186366	-.014973	.0245476
swestatb	.004785	.0223336	.0049804	.0223422	-.0153948	.0287723
midsatb	.0002674	.0154117	.0001226	.015419	-.0369695*	.0207793
walesatb	.0322824	.0336887	.0321306	.0336498	.0127788	.0456315
scotatb	.0089511	.0304218	.0085987	.0304098	-.0391445	.0381805
waved5	.1393036***	.0096896	.1291764***	.0165802	.1281973***	.0210311
waved6	.2351562***	.0123089	.2318313***	.0133761	.2343565***	.0169485
depmean			.0087788	.0109999	.014722	.0138523

lninc					-.410495**	.1988192
depmeanatb					.3895234**	.1891739
_cons	.2374676***	.0573707	.276495***	.0707957	2.063928**	.8204737
sigma_u	.18016763		.18016331		.17877982	
sigma_e	.30213664		.30216307		.30244396	
rho	.26231258		.26226945		.25894061	
	(fraction of variance due to u_i)					

2.3.2.3 For women only

lli	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0068969	.0051396	-.0100287*	.0056811	-.0099613	.0073819
prof	.0204172	.0273258	.0192675	.0274956	.0023397	.0317833
intermed	.0083681	.0118215	.0075733	.0118914	.0018925	.0151347
skillnm	.0031653	.0096431	.0031306	.0096422	.002864	.0123979
skillman	.0176148	.0139372	.0173975	.0139504	.026909	.0178637
unsklman	.0232961	.0202043	.0239371	.0202454	.0169603	.025878
child	-.0191351**	.008763	-.0199382**	.0088298	-.024332**	.0111065
single	.0061127	.0081127	.0063107	.0081191	-.0003146	.0102053
separated	-.0174158	.0213263	-.0173388	.0213169	-.0254882	.0275955
divorced	-.0338419***	.0130866	-.0336317***	.0130805	-.0502887***	.0165453
widowed	-.0118678	.0580393	-.0121476	.0580418	-.1009717	.0615772
cse	-.0190373	.0144483	-.0190012	.0144456	-.033357*	.019456
ogcse	-.0224959*	.0125813	-.0224702*	.0125794	-.0376027**	.0173059
alevel	-.0254591	.016328	-.0254656	.0163253	-.0401204*	.0214899
diploma	-.0241582	.0155392	-.0242324	.0155303	-.0382177*	.0209857
degree	-.0577408***	.0167488	-.058363***	.0167649	-.0637467***	.0229188
north	-.0133653	.0255947	-.0138517	.0256259	-.0312179	.032110
yorkhumb	-.017109	.0162694	-.0176048	.0163006	-.0071685	.0212906
eastmids	-.0172638	.0181098	-.0173805	.0181197	-.0177992	.0225712
eastang	-.0011982	.0164747	-.0014851	.0164952	.0048912	.0205097
sthwest	.0010606	.0153959	.000593	.0154174	.0095788	.0199061
wmids	.001247	.0095869	.0012661	.0095869	-.0008675	.0120595
nwest	.0004405	.0189199	.000232	.0189225	-.0123195	.0254718
wales	-.0153336	.0283207	-.0159143	.0282761	.006161	.0360457
scot	.0113931	.0236891	.0112945	.0236865	.0284985	.0298514
nwestatb	-.0088605	.018542	-.0092124	.0185527	.0045256	.0267143
northatb	.012702	.0246471	.0126985	.0246427	.0575407*	.0347156
ewridatb	-.01613	.0168637	-.0163005	.0168592	-.0317421	.0224257
nmidsatb	.0069762	.0184446	.006995	.0184436	.0088549	.0248025
eastatb	.0078786	.0162239	.0080273	.0162181	-.0104506	.0204254
southatb	-.0002187	.017274	-.0002526	.0172633	-.0137793	.0232688
swestatb	-.0047515	.0183731	-.0047838	.0183744	-.0181581	.0239942
midsatb	-.0128787	.0138716	-.0133447	.0138717	-.0119399	.0191149
walesatb	.0305762	.0287892	.0305418	.0287502	-.0132793	.036609
scotatb	-.0092037	.0231286	-.0093645	.0231241	-.0185299	.0308817
waved5	.1155886***	.0079184	.1102294***	.0113305	.114908***	.0143234
waved6	.2423372***	.0122503	.2392129***	.0138586	.2462845***	.0173333

depmean			.0071059	.0101818	.0072434	.0130417
lninc					.3407517**	.1490908
depmeanatb					-.3603831***	.137458
_cons	.123431***	.0472031	.1504882***	.0519201	-1.180596*	.6163191
sigma_u	.13989817		.13971697		.14724186	
sigma_e	.30137649		.30137649		.30037428	
rho	.1772792		.17690147		.19373745	

(fraction of variance due to u_i)

2.3.3 Probit model

2.3.3.1 Entire sample

lli	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	-.0389242*	.0219512	-.1231225***	.0333952	-.1534532***	.0421029
prof	-.0360017	.0928176	-.0498948	.092966	-.1492038	.1203912
intermed	-.0759446	.0541962	-.0908996*	.0544247	-.1269691*	.0686755
skillnm	-.0657348	.0514529	-.0653939	.0514518	-.0912069	.0645924
skillman	-.0445778	.0531043	-.0423231	.0531017	-.0346186	.0671608
unsklman	.0375284	.0826444	.0435914	.08259	.0829502	.104657
child	-.1136069***	.0402567	-.127386***	.0404753	-.1793459***	.0514035
single	.0409252	.0470157	.0534688	.0472616	-.0370789	.0603034
separated	.0613578	.0917703	.0642376	.0918069	.0502584	.1163398
divorced	-.1533828***	.0576501	-.1472862**	.057709	-.2124642***	.0746862
widowed	-.118087	.2699008	-.1196739	.2696959	-.5547238	.3655543
cse	-.2087356***	.0694224	-.208098***	.0694033	-.2367109***	.0908436
ogcse	-.2271656***	.0587027	-.2298323***	.0587071	-.2793522***	.077487
alevel	-.1940384***	.0693825	-.1994188***	.0694305	-.1865346**	.0897131
diploma	-.2711477***	.0717933	-.277943***	.0718632	-.2997023***	.0935478
degree	-.350139***	.079268	-.3739905***	.0796718	-.3821154***	.1054241
north	-.0776575	.111452	-.0853488	.1114925	-.1468535	.1413048
yorkhumb	-.0707216	.0812885	-.0817421	.0814248	-.1152038	.1077854
eastmids	.0886122	.0832729	.0835973	.0833302	.1660991	.1073107
eastang	-.0033871	.0837223	-.0089141	.0837548	.0572408	.1006848
sthwest	-.0002074	.0714278	-.0115521	.0715296	-.0195531	.0923889
wmids	-.0350339	.0562933	-.0366862	.0563885	-.0135513	.0718936
nwest	-.0447089	.08971	-.0498527	.0897458	-.0313083	.1145289
wales	-.0372189	.1193871	-.0489604	.1195683	.0132109	.1565666
scot	.0127045	.1140127	.0126052	.1141048	.1241171	.1439962
nwestatb	.0481259	.0903693	.0437629	.0904008	.0089587	.1220187
northatb	.0278333	.1087663	.0250043	.1088012	.039889	.1546839
ewridatb	-.0739905	.088669	-.0762346	.088722	-.196406	.1234955
nmidsatb	-.0268617	.0898443	-.0274518	.0898981	-.1111274	.1181487
eastatb	-.0266627	.0768833	-.0217293	.0769175	-.1723893*	.0970759
southatb	-.0403996	.0824683	-.0404327	.0825487	-.0812586	.1073895
swestatb	.008153	.0914852	.0087859	.0915028	-.0885955	.1202627
midsatb	-.0338494	.0736655	-.0394882	.0737374	-.1776922*	.0997654
walesatb	.1985107	.1213842	.1929322	.1215518	-.0135781	.1662367
scotatb	-.0022662	.1135042	-.0077045	.1136168	-.1991018	.1518483
men	.0530742	.0378569	.0388766	.0381096	-.1991018	.1518483

	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
waved5	1.011307***	.0470669	.8867483***	.0600851	.8831531***	.0759781
waved6	1.567036***	.0557267	1.533285***	.0566418	1.554601***	.0710083
depmean			.1438354***	.0436754	.1758735***	.0556845
lninc					-.2001503	.8129089
depmeanatb					.0463285	.7836268
_cons	-1.727323***	.2024022	-.9991985***	.296135	.3763475	3.344218
/lnsig2u	-.1805045	.0553166	-.1791465	.0552321	-.1638257	.0683458
sigma_u	.9137007	.0252714	.9143213	.0252499	.9213523	.0314853
rho	.454996	.0137171	.4553328	.0136978	.4591349	.0169723

Likelihood-ratio test of rho=0: chibar2(01) = 578.50 Prob >= chibar2 = 0.000

Likelihood-ratio test of rho=0: chibar2(01) = 579.69 Prob >= chibar2 = 0.000

Likelihood-ratio test of rho=0: chibar2(01) = 378.10 Prob >= chibar2 = 0.000

2.3.3.2 For men only

lli	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	-.0767473**	.0350242	-.1588186***	.0520928	-.2171067***	.0676973
prof	-.1774838	.1248625	-.1872222	.1250707	-.2705943*	.1605896
intermed	-.2093909**	.0866353	-.2257372***	.0870661	-.2638095**	.1109354
skillnm	-.1585387	.0976142	-.1589652	.0977091	-.2312848*	.1230962
skillman	-.1700949**	.0761727	-.1694499**	.0761968	-.1832731*	.0980225
unsklman	-.0828951	.1358869	-.0855553	.1357671	.0559237	.1729015
child	-.1183659*	.0618788	-.1358519**	.0625182	-.211806***	.0796248
single	.0270143	.0717525	.0418049	.072285	-.0742813	.0911878
separated	.2108614	.1411364	.2125188	.1412804	.2079558	.1725993
divorced	-.1356547	.0991628	-.1317079	.099353	-.1583712	.126767
widowed	-.1470261	.617331	-.1498905	.618902	-.5056838	.7250962
cse	-.315521***	.115056	-.3162658***	.1151403	-.2950934*	.151978
ogcse	-.3423768***	.0962372	-.3472132***	.0963545	-.3590122***	.1279418
alevel	-.2518877**	.1052677	-.2609931**	.1054812	-.1652189	.1378539
diploma	-.437515***	.1168284	-.4490172***	.1171233	-.3968031***	.1518322
degree	-.3583459***	.1221241	-.3912254***	.1233242	-.3681783**	.162327
north	-.1074989	.1773921	-.1105915	.1775501	-.1403415	.2295464
yorkhumb	-.0470289	.1258064	-.0577679	.1261638	-.2795351*	.1700864
eastmids	.2351529*	.1249767	.2307732*	.1252358	.3718103**	.159497
eastang	.0228092	.1302317	.0148223	.1304497	.1199604	.1565373
sthwest	-.0239481	.1115501	-.0351048	.1117845	-.0753794	.1416373
wmids	-.127801	.0858881	-.1269026	.0860608	-.0987497	.1095204
nwest	-.1092622	.1422458	-.1143177	.1423888	-.0080711	.1818549
wales	-.0121048	.1834795	-.0165096	.1836591	-.0281702	.2424467
scot	-.0877745	.1906596	-.0859774	.1909161	-.0014928	.2406698
nwestatb	.1743305	.1454363	.1744843	.1455593	.0476542	.1946263
northatb	-.0228425	.1742725	-.028454	.1744194	-.2693472	.2475381
ewridatb	-.0548666	.1381903	-.0549059	.1384187	-.1214154	.1903398
nmidsatb	-.1055303	.1409886	-.1068783	.1412341	-.2767004	.1837835
eastatb	-.1183945	.1230075	-.1119014	.1231661	-.2860276*	.1521975
southatb	-.0968262	.1333186	-.0949927	.133532	-.1300646	.1718834
swestatb	.0479657	.1455312	.0516427	.1456802	-.090113	.1882072

midsatb	.0353065	.1140045	.0336189	.1141676	-.2301226	.1527557
walesatb	.2101346	.1895498	.1982138	.18991	.0358889	.2589501
scotatb	.0788456	.1895736	.0727554	.1898712	-.233421	.2486264
waved5	1.121894***	.0759453	.9665403***	.10488	.9460462***	.1341783
waved6	1.630618***	.0876279	1.591096***	.0894266	1.591755***	.1123642
depmean			.1455742**	.0688643	.1867756**	.089468
lninc					-2.665008**	1.20871
depmeanatb					2.511702**	1.147021
_cons	-1.296853***	.3286261	-.5880395	.465648	11.00101**	4.995463
/lnsig2u	.1515196	.1028694	.1552381	.1028817	.1314297	.1290521
sigma_u	1.078703	.0554828	1.080711	.0555927	1.067922	.0689088
rho	.5378076	.0255703	.5387318	.0255661	.5328102	.0321241

Likelihood-ratio test of rho=0: chibar2(01) = 354.92 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) = 355.77 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) = 222.30 Prob >= chibar2 = 0.000

2.3.3.3 For women only

lli	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
lnallinc	-.0391844	.0314859	-.1005722**	.0474493	-.1099873*	.0593474
prof	.1266038	.1764974	.1100872	.1766084	-.0329508	.2363814
intermed	.0449397	.0752138	.0332232	.0755109	-.0126694	.0954986
skillnm	.0082022	.0646063	.0080897	.0645435	-.0102684	.0808938
skillman	.1262376	.0903918	.1244799	.0902717	.1779456	.1123116
unsklman	.1223274	.1099753	.1273008	.109874	.0785165	.1393877
child	-.0816081	.058197	-.0904037	.0583504	-.112517	.0745699
single	.0592464	.0685634	.0641457	.0686593	.0038082	.089306
separated	-.0624407	.1302518	-.0592773	.1302161	-.120142	.1724002
divorced	-.1837499**	.0751281	-.177827**	.0751122	-.2796987***	.0993538
widowed	-.1408488	.3091065	-.1396197	.3084478	-.6661619	.4428723
cse	-.1348383	.0945947	-.133845	.0944556	-.2045897*	.1237181
ogcse	-.1474014*	.0807976	-.149412*	.0807093	-.2295471**	.1068569
alevel	-.1661787	.1062437	-.1690314	.1061613	-.2359797*	.136459
diploma	-.1597769	.1000942	-.1646522*	.1000733	-.2319638*	.1319192
degree	-.3979844***	.1169312	-.4118682***	.1172086	-.426578***	.1578403
north	-.0942613	.1556419	-.1017345	.1555555	-.1793646	.1952407
yorkhumb	-.1003918	.1149804	-.1087653	.1150053	.0210056	.1515013
eastmids	-.0730612	.1230217	-.0739547	.1228456	-.0622026	.1623336
eastang	-.0325198	.1172558	-.0356843	.117142	.0068177	.1428836
sthwest	.0045747	.1000218	-.0041855	.1000828	.0356522	.1331954
wmids	.0407371	.0792726	.0385708	.0793291	.057901	.101738
nwest	.0003267	.1252846	-.0033516	.1252073	-.0644562	.160647
wales	-.0952521	.1715563	-.106521	.17173	.0512162	.2237243
scot	.0665894	.1523476	.0645633	.1522586	.1777491	.1938806
nwestatb	-.0529678	.1254184	-.0592279	.1253702	.0343042	.1726223
northatb	.1020624	.1515027	.1015204	.1513831	.4056168*	.2217647
ewridatb	-.1082787	.127211	-.1112947	.1270967	-.2591972	.1821963
nmidsatb	.0387949	.1278556	.0373762	.1277136	.0714735	.171792
eastatb	.0576723	.1076775	.0604522	.1075774	-.0647329	.1399426

southatb	.0080904	.1145347	.0073228	.1144721	-.0689084	.1510933
swestatb	-.0237081	.1284707	-.0250805	.1283589	-.0768801	.1734049
midsatb	-.095903	.1063889	-.103772	.106446	-.0902104	.1473471
walesatb	.2053789	.1729933	.204001	.1729998	-.0609578	.2395389
scotatb	-.0462593	.1525949	-.0493505	.1525007	-.0687964	.21149
waved5	.999201***	.0673189	.9200349***	.081233	.9504289***	.1030666
waved6	1.653805***	.0861899	1.622439***	.0879317	1.679675***	.1115409
depmean			.1116382*	.0656103	.1283142	.0841519
lninc					2.766709**	1.300251
depmeanatb					-2.987342**	1.281795
_cons	-1.921271***	.2912647	-1.394932***	.4192905	-12.16363**	5.32208
/lnsig2u	-.1545932	.1124497	-.1578465	.1125401	-.0973177	.1400493
sigma_u	.9256153	.0520426	.9241108	.0519998	.952506	.0666989
rho	.4614285	.0279451	.4606201	.0279605	.4756898	.0349296

Likelihood-ratio test of rho=0: chibar2(01) = 238.85 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) = 238.04 Prob >= chibar2 = 0.000
Likelihood-ratio test of rho=0: chibar2(01) = 158.21 Prob >= chibar2 = 0.000

3 Modelling of Malaise Inventory

3.1 Using Gini as relative income measure

3.1.1 Pooled OLS model

3.1.1.1 Entire sample

malscore	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.190792***	.0312559	-.1907591***	.0312545	-.1821359***	.0397522
prof	-.4115003***	.1100005	-.4134777***	.1100045	-.3989254***	.1363346
intermed	-.287258***	.0752294	-.2882457***	.0752561	-.284057***	.0971161
skillnm	-.2817429***	.0727798	-.2819079***	.0727855	-.334363***	.0932404
skillman	-.0331119	.0763127	-.0327713	.0763098	.0195809	.0980995
unsklman	.2638937*	.1437142	.264195*	.1437007	.2494377	.1916926
child	.1437558***	.0550814	.1437586***	.0550856	.0979542	.0712693
single	.2407371***	.0551707	.2407682***	.0551743	.1167647*	.068795
separated	.9285802***	.1620139	.9287793***	.1620467	.8920565***	.2175025
divorced	.7386641***	.1015037	.7378245***	.1015192	.6746644***	.1369274
widowed	1.201895***	.4640562	1.201076***	.4636284	.4892284	.4564958
cse	-.7898413***	.0997802	-.7920491***	.099823	-.8754005***	.1385446
ogcse	-1.314403***	.0865842	-1.315386***	.0865746	-1.468361***	.1200131
alevel	-1.526045***	.093592	-1.527154***	.0935602	-1.720348***	.1270247
diploma	-1.598127***	.096611	-1.598294***	.0966064	-1.704221***	.1328206
degree	-1.687695***	.1008458	-1.688772***	.100833	-1.727462***	.1389109
men	-.9205362***	.0447965	-.9202974***	.044809	-.9762927***	.0564857
waved5	-.2466046***	.0562771	-.3747769*	.2023089	-.470641*	.264029
waved6	.7601462***	.0726706	.6927698***	.1254491	.6755179***	.1635678
giniequiv			.6964175	1.049233	.9163588	1.370848
lninc					-.4048307***	.1503389
giniatb					-4.895304	5.83167

_cons	5.96598***	.2800254	5.773797***	.3999746	8.34984***	1.043911

3.1.1.2For men only

malscore	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.233645***	.046236	-.2332341***	.0462152	-.2043346***	.0578101
prof	-.2540766*	.1379984	-.263082*	.1379959	-.1393439	.1674042
intermed	-.1299443	.1021714	-.137648	.1024156	-.0077563	.1274284
skillnm	-.2353072**	.1110885	-.2368096**	.1110714	-.1026323	.1351744
skillman	.0340448	.0956808	.0322479	.095726	.2229148*	.120508
unsklman	.4680886**	.1997451	.4621467**	.1997301	.5839642**	.2745081
child	-.0070905	.0743711	-.0071809	.074372	-.039752	.0969414
single	.2368927***	.0718318	.2365123***	.07182	.0967898	.0887769
separated	.5785864***	.2248141	.5775734***	.2251813	.744669**	.3249627
divorced	.3698985**	.1458223	.3683823**	.1457842	.1917135	.1838985
widowed	-.4848448	.5262434	-.5025703	.5295952	.0998786	.5788385
cse	-.455727***	.136337	-.4606239***	.1364363	-.6546266***	.1920816
ogcse	-.8805243***	.1149294	-.8813352***	.1149163	-1.245359***	.1603805
alevel	-.8956962***	.1219716	-.8994244***	.1219653	-1.304396***	.1676895
diploma	-1.11109***	.1264832	-1.110469***	.1264866	-1.411123***	.1733221
degree	-1.311329***	.1300974	-1.313365***	.1301014	-1.498996***	.1801825
waved5	.2339***	.0798269	-.1611078	.2665331	-.2733657	.3399659
waved6	1.189499***	.0960744	.9821071***	.1650128	.9619842***	.2146938
giniequiv			2.145401	1.399004	2.15347	1.762488
lninc					-.273073	.1983535
giniatb					-2.381821	7.513476
_cons	4.745426***	.4183323	4.153178***	.5523279	5.694724***	1.389225

3.1.1.3 For women only

malscore	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.1679516***	.0449469	-.1678681***	.0449514	-.1706665***	.0574298
prof	-.836108***	.1864818	-.8345699***	.1865542	-.821113***	.2355153
intermed	-.4391275***	.1086901	-.4394749***	.1086964	-.5152155***	.1428152
skillnm	-.3109***	.0956104	-.3112991***	.0956163	-.4742515***	.12363
skillman	.0994708	.1428623	.0984147	.1428384	.0331217	.1830919
unsklman	.2550187	.2033206	.2524434	.2036302	.1346103	.2649432
child	.1835658**	.080228	.1834169**	.0802228	.1132549	.1027723
single	.2911989***	.0828226	.2910782***	.0828163	.1748885*	.1038948
separated	1.158917***	.2295514	1.158087***	.2295605	.9597615***	.2900565
divorced	.964724***	.1359898	.9660774***	.136085	.9681141***	.1873984
widowed	1.601133***	.5372558	1.600835***	.5380993	.6212474	.5572238
cse	-1.025171***	.1407163	-1.021801***	.1407631	-.9960451***	.192606
ogcse	-1.61927***	.1243462	-1.617335***	.1243093	-1.584282***	.1707761
alevel	-2.176137***	.1397295	-2.175351***	.1397085	-2.126661***	.1871764

diploma	-1.915023***	.1428509	-1.914174***	.1428211	-1.853902***	.1980364
degree	-1.896939***	.1516918	-1.895078***	.1516313	-1.82987***	.2093891
waved5	-.5968721***	.0791237	-.4364772	.2983787	-.4704853	.3925322
waved6	.4605119***	.1111598	.5448466***	.1869352	.5492357**	.2419333
giniequiv			-.8708825	1.536733	-.7482533	2.047464
lninc					-.4804066**	.2240737
giniatb					-8.01994	8.829737
_cons	6.238969***	.4044611	6.478608***	.5836058	9.812018***	1.538069

3.1.2 Panel data model

3.1.2.1 Entire sample

malscore	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0674026**	.0269995	-.0672341**	.0269954	-.0713927**	.0339637
prof	-.1601792	.1023168	-.1619117	.1023285	-.1425246	.1457914
intermed	-.1450767**	.0684813	-.145949**	.0685038	-.0803468	.085417
skillnm	-.1502958**	.0663212	-.1496482**	.0663265	-.2096132***	.0790901
skillman	.0113034	.0687624	.011511	.0687626	.0344601	.0822914
unsklman	-.0071635	.1217252	-.0069218	.1216987	-.0778728	.1329743
child	.156302***	.0486508	.1560985***	.0486523	.15265**	.0611217
single	.1313717***	.0505761	.1324695***	.0505998	.0446657	.0669738
separated	.7282206***	.1353003	.7283598***	.135361	.7895122***	.1484031
divorced	.4832327***	.0884958	.4822988***	.0885138	.4276465***	.096505
widowed	1.013489**	.409443	1.012961**	.4090525	.8788626**	.4324318
cse	-.9134298***	.1307945	-.9157174***	.1308045	-.95961***	.1446968
ogcse	-1.510579***	.1126646	-1.511696***	.1126446	-1.643777***	.1241918
alevel	-1.753747***	.1221646	-1.755034***	.1221151	-1.913037***	.1436219
diploma	-1.870434***	.1242713	-1.870644***	.1242571	-1.954684***	.1467342
degree	-2.003273***	.1268232	-2.004644***	.126796	-2.008018***	.1614347
men	-.9436751***	.0576213	-.943375***	.0576285	-.9814043***	.0737565
waved5	-.335832***	.0443838	-.481228***	.1669011	-.4359003**	.2102578
waved6	.6688288***	.0600605	.592645***	.1034637	.6236925***	.1285903
giniequiv			.7923701	.8710745	.3730122	1.111258
lninc					-.4952904**	.2019372
giniatb					-4.640691	7.85025
_cons	5.111218***	.2543212	4.890519***	.3492577	8.091493***	1.300052
sigma_u	2.1713653		2.1713754		2.0591459	
sigma_e	2.0073938		2.0074292		1.9973662	
rho	.53917894		.5391725		.51522623	

(fraction of variance due to u_i)

3.1.2.2 For men only

malscore	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.

lnallinc	-.1357856***	.0399561	-.1353095***	.0399394	-.1294576***	.0505004
prof	-.0089314	.1280792	-.0171002	.1280872	.1156994	.156597
intermed	-.0465432	.0943645	-.0541148	.094486	.1144697	.1182691
skillnm	-.0760588	.1033648	-.0749077	.103333	-.0488981	.1248534
skillman	.0983266	.0863133	.0952157	.0863405	.2479685**	.1094331
unsklman	.313297*	.1713037	.3059409*	.1712821	.3571581	.2356144
child	.1041069	.0644129	.1041732	.0644169	.0883961	.0838689
single	.1970811***	.0651238	.1998634***	.0651931	.1238302	.0800744
separated	.4799051***	.1868353	.4794001***	.1871844	.6490854**	.2704799
divorced	.1716068	.1237699	.170213	.1237691	.0173675	.1588525
widowed	-.4049939	.5266393	-.4303867	.5289178	.1315622	.5839021
cse	-.5506152***	.1801063	-.5551095***	.1801413	-.6767038***	.2477367
ogcse	-1.046393***	.1505104	-1.047192***	.1504712	-1.33281***	.2067563
alevel	-1.07672***	.1595929	-1.079982***	.1595192	-1.398296***	.2164064
diploma	-1.31781***	.1649114	-1.317182***	.1649088	-1.545784***	.2241944
degree	-1.563112***	.1653747	-1.565388***	.1653465	-1.682462***	.2284333
waved5	.1099241*	.0637031	-.2777624	.2197158	-.2013859	.2776409
waved6	1.119484***	.0801882	.9169746***	.1352152	.9819272***	.1745774
giniequiv			2.111568	1.16399	1.444745	1.452516
lninc					-.3129213	.2695548
giniatb					-4.135037	9.959316
_cons	3.998327***	.3733773	3.412534***	.4786577	5.616967***	1.764372
sigma_u	2.0098198		2.0093706		1.8566007	
sigma_e	1.8531491		1.8529867		1.8128149	
rho	.54049047		.54042295		.51193094	

(fraction of variance due to u_i)

3.1.2.3 For women only

malscore	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0325857	.0391321	-.0326887	.039132	-.0381827	.0503438
prof	-.6052391***	.1768412	-.6047388***	.1768644	-.6392401***	.2173622
intermed	-.2819676***	.0985237	-.2824117***	.0985289	-.2723492**	.1299722
skillnm	-.2259094***	.0851498	-.226538***	.0851392	-.3391334***	.1110858
skillman	.0363192	.1251473	.0354756	.1251418	-.0825447	.157409
unsklman	-.1179623	.1700375	-.1194214	.1703011	-.2605006	.224432
child	.161416**	.0722811	.1615959**	.0722806	.1584562*	.091747
single	.198099**	.0783915	.1974146**	.0783911	.0893097	.0974064
separated	.9040397***	.1919115	.9037202***	.1918709	.869015***	.2466137
divorced	.7152256***	.1203791	.7159327***	.1204324	.7114611***	.1662766
widowed	1.437392***	.4804509	1.436488***	.4809422	1.139266**	.5616575
cse	-1.159442***	.1839954	-1.15779***	.1839762	-1.115218***	.2546545
ogcse	-1.826681***	.1613411	-1.825645***	.1612762	-1.81854***	.224695
alevel	-2.443946***	.1835126	-2.443326***	.1834655	-2.39059***	.2453464
diploma	-2.239072***	.1815528	-2.238514***	.1815088	-2.182197***	.2539864
degree	-2.26325***	.1896122	-2.262066***	.1895272	-2.176623***	.2639156
waved5	-.627805***	.0618719	-.540583**	.2449209	-.4590813	.317149
waved6	.3612455***	.0916457	.4070776***	.1545123	.4352425**	.1993216

giniequiv			-.4752633	1.268756	-1.022466	1.658627
lninc					-.5918739**	.3011513
giniatb					-5.979451	12.07635
_cons	5.321116***	.369736	5.453645***	.5116307	9.261825***	1.946237
sigma_u	2.3020594		2.3022912		2.2263308	
sigma_e	2.1250614		2.1252329		2.1332307	
rho	.53991659		.53992651		.52134565	

(fraction of variance due to u_i)

3.2. Using relative deprivation as relative income measure

3.2.1 Pooled OLS model

3.2.1.1 Entire sample

malscore	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.1933934***	.0313457	.1371957	.1039932	.0819884	.1271459
prof	-.4076187***	.1099343	-.3896674***	.1101387	-.3829153***	.1360831
intermed	-.2860846***	.0752852	-.2646023***	.0756256	-.2617873***	.0974177
skillnm	-.2901454***	.0728132	-.2802854***	.07295	-.3326377***	.0933276
skillman	-.029995	.0762356	-.0216385	.0763174	.0284121	.0980291
unsklman	.2592681*	.1437403	.2412822*	.1439067	.2229748	.1919545
child	.1399419**	.0551278	.1281814**	.0552702	.080515	.0716026
single	.2360674***	.0551323	.2266906***	.0551388	.0963313	.0689236
separated	.938646***	.1622434	.9287561***	.1625146	.8906204***	.2180707
divorced	.7303067***	.1015527	.7212434***	.1015158	.6607665***	.1371613
widowed	1.191998***	.4654029	1.189512***	.4639757	.4723963	.4608981
cse	-.8120281***	.1003341	-.8072283***	.1002994	-.8956722***	.1391993
ogcse	-1.320619***	.0866783	-1.308844***	.0866746	-1.462701***	.1205022
alevel	-1.520284***	.093759	-1.505413***	.0938411	-1.69956***	.1277581
diploma	-1.603076***	.0966207	-1.587643***	.0967141	-1.69828***	.132965
degree	-1.70046***	.1011291	-1.688861***	.1011468	-1.756029***	.1396428
north	-.0118685	.1311611	.0558408	.1328694	.0597191	.1757179
yorkhumb	-.0624359	.0963202	-.0031531	.0982158	-.1534493	.1306743
eastmids	.0179774	.10484	.0629637	.1057998	.1373331	.1383031
eastang	-.1367142	.1018468	-.0925962	.1027453	-.1337305	.1267161
sthwest	-.152754*	.0898426	-.1148037	.09074	-.2059687*	.119544
wmids	.0107778	.0681744	.0262564	.0682663	.0518588	.0863775
nwest	.0514819	.1103668	.1003767	.1115997	-.0289863	.1550093
wales	.0822381	.1565809	.1435442	.15796	.155575	.2096625
scot	-.2666954*	.1433224	-.2146894	.1445131	-.1925325	.1876584
nwestatb	-.0804637	.108431	-.066857	.1085033	.0803824	.1526973
northatb	.1202021	.1213683	.1266633	.1213625	.1898425	.160687
ewridatb	-.0360859	.0966034	-.014724	.0967459	.0139185	.1278728
nmidsatb	-.2045775**	.0991505	-.1966835**	.0990583	-.1020139	.1305599
eastatb	-.2505661***	.0836949	-.2541348***	.08369	-.2614309**	.1033694
southatb	-.0014855	.0961017	-.0028934	.0960624	.0547044	.1221061
swestatb	.0128023	.1097595	.0218902	.109766	.1659847	.1419414
midsatb	-.0838107	.0791969	-.0479425	.0801032	.0246402	.1051131

walesatb	-.1287818	.1500126	-.1149203	.1500411	-.0772669	.2009799
scotatb	.0305546	.1401435	.0401593	.1402459	.0724486	.1845796
men	-.9253402***	.044886	-.9048514***	.0452804	-.9616924***	.0570445
waved5	-.2505476***	.0584717	-.4393185***	.0815198	-.4552745***	.1022504
waved6	.7625428***	.0744701	.3188083**	.1520443	.4141808**	.1872915
rdepequiv			1.057167***	.3237515	.8550956**	.3970376
lninc					.3270826	.3649762
rdepatb					1.720822**	.8719341
_cons	6.093062***	.28892	2.921403***	.996798	1.786832	2.260688

3.2.1.2 For men only

malscore	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.2285866***	.0463821	.1663959	.1566121	.0928962	.179094
prof	-.2480802*	.138339	-.2275634	.1385956	-.1079322	.1675699
intermed	-.1253805	.102736	-.1044606	.1027827	.0158105	.1276539
skillnm	-.236841**	.1117438	-.2200045**	.1117199	-.100396	.1364035
skillman	.033766	.0956667	.0424633	.0956164	.2180162*	.1203281
unsklman	.4660316**	.1999289	.4343119**	.200731	.5383684**	.2751274
child	-.0088221	.0745179	-.0130627	.0745425	-.0482564	.0970828
single	.2383376***	.0718608	.2273902***	.0718684	.0835514	.0890173
separated	.5882533***	.2253213	.5746125**	.2264547	.748016**	.3277193
divorced	.3587809**	.1460026	.3446266**	.1458334	.1777339	.1845091
widowed	-.4858426	.5137898	-.4922968	.5187229	.1593434	.5358473
cse	-.471197***	.1373612	-.4659975***	.1373347	-.6896136***	.1939497
ogcse	-.8813413***	.1151271	-.8676821***	.115176	-1.23455***	.1611133
alevel	-.8882382***	.1225185	-.871577***	.1227364	-1.28384***	.1700978
diploma	-1.119988***	.1269087	-1.101086***	.1271013	-1.419176***	.1747984
degree	-1.314527***	.1306202	-1.305495***	.1305697	-1.517411***	.1815126
north	.149288	.1713964	.2266482	.1738831	.3290837	.2128984
yorkhumb	.1324499	.1256114	.202782	.1282503	.0749332	.1652366
eastmids	.1693782	.1349621	.2233043	.1365359	.2377413	.1749749
eastang	.0027773	.1331422	.0530007	.1342042	-.087502	.1590608
sthwest	.0720871	.1211169	.1144134	.1221955	.0322949	.1563012
wmids	.0220013	.0876875	.0398731	.0878268	.1047847	.1102844
nwest	.1768198	.1507878	.2291671	.1522154	.1818181	.2272938
wales	.1446256	.2197769	.2047194	.2220188	.1437596	.2899667
scot	-.045319	.2025739	.0135892	.204241	-.0103843	.2777266
nwestatb	-.0690946	.149234	-.0495015	.1494481	.2495375	.2204466
northatb	-.0585113	.1607129	-.0497051	.1606089	-.0568989	.192974
ewridatb	-.022201	.1281468	.0061186	.1282811	.1072076	.1676888
nmidsatb	-.2376489*	.1296222	-.2243773*	.1294429	-.1992585	.1605613
eastatb	-.1525769	.1092357	-.1537136	.1092704	-.0759742	.1297907
southatb	.1246846	.1335632	.1245963	.1335115	.2231949	.1615609
swestatb	-.0019306	.1454997	.0058243	.1454181	.1892135	.1842334
midsatb	.0069448	.1029078	.0491728	.1043954	.1804533	.1367819
walesatb	.0040006	.2093136	.031549	.2093953	.0595314	.2770127
scotatb	-.0693814	.1954981	-.0541721	.1957136	.0208367	.2692293
waved5	.2250213***	.0817499	.0288721	.1101393	-.0245356	.1336778

waved6	1.181438***	.0981886	.6439882***	.2244152	.7717572***	.2617254
rdepequiv			1.302549	.4940472	.9556567*	.5659577
lninc					.2965771	.4816284
rdepatb					1.365021	1.169389
_cons	4.68442***	.4317292	.9015389	1.494197	.1235663	3.031617

3.2.1.3 For women only

malscore	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.1740155***	.045137	.2311807	.141328	.1695546	.1800175
prof	-.821749***	.1876167	-.7970014***	.1879945	-.816662***	.2344063
intermed	-.4417474***	.1086234	-.4102378***	.1094578	-.4831424***	.1433851
skillnm	-.3237099***	.095564	-.3113312***	.0959218	-.4657503***	.1238674
skillman	.1039325	.1427791	.1141761	.1428855	.0471631	.1832363
unsklman	.2494061	.2035843	.240379	.2034687	.1171107	.2650562
child	.1786841**	.0802608	.156982*	.0807608	.0781637	.1037079
single	.2770088***	.0827692	.2688945***	.0827267	.1448103	.1040309
separated	1.166635***	.2297238	1.15801***	.2299066	.965809***	.2886785
divorced	.9600396***	.1361495	.9530464***	.1361617	.9600162***	.1880411
widowed	1.587374***	.5432546	1.585771***	.5411667	.5952092	.5700899
cse	-1.045606***	.1413808	-1.038664***	.1413041	-1.020233***	.1938919
ogcse	-1.621955***	.1244036	-1.606227***	.1243808	-1.58551***	.1722402
alevel	-2.165638***	.1400639	-2.145498***	.1401264	-2.10534***	.1874799
diploma	-1.914597***	.1427684	-1.895542***	.1429606	-1.855258***	.1982037
degree	-1.920864***	.1518454	-1.899302***	.1521072	-1.877075***	.2109161
north	-.1758311	.1952101	-.0911277	.1973958	-.130051	.2659271
yorkhumb	-.221112	.1431937	-.1473695	.1458314	-.3125499	.1987741
eastmids	-.1416352	.1592596	-.0886133	.160253	.090958	.212302
eastang	-.2592127*	.1497948	-.2029291	.1510957	-.1544082	.1899704
sthwest	-.3313606***	.1290302	-.2809297**	.1304457	-.4031012**	.1770605
wmids	.0026103	.1027559	.0211611	.1027753	.0315664	.130505
nwest	-.0810168	.157859	-.0147816	.1599316	-.1994931	.2105406
wales	.0053722	.2237193	.0914819	.2251538	.1514853	.3010376
scot	-.4323478**	.1981055	-.3656006*	.1996191	-.3033246	.2551652
nwestatb	-.0736995	.1536244	-.0608054	.153663	-.0386384	.2101845
northatb	.3167286*	.1786331	.3253986*	.1786462	.408173*	.2444558
ewridatb	-.0529315	.1426879	-.0293122	.1429125	-.0449686	.1906125
nmidsatb	-.1626243	.1480589	-.1557672	.147904	-.0007353	.2047958
eastatb	-.338708***	.1250187	-.3461945***	.1250021	-.435367***	.1602716
southatb	-.0938661	.1367407	-.0968046	.1366675	-.0566133	.1789649
swestatb	.0070702	.159926	.0197597	.1599771	.1415559	.2109169
midsatb	-.1477204	.1196224	-.1025785	.1207412	-.0925445	.1587004
walesatb	-.1832398	.2148449	-.1764098	.2147113	-.1218421	.2889291
scotatb	.1336334	.1955674	.1416885	.1957139	.1159705	.2537739
waved5	-.600018***	.0833191	-.8560154***	.1218073	-.8240515***	.1552672
waved6	.4704413***	.1138951	-.0695169	.2108058	.0382088	.2665392
rdepequiv			1.293355***	.444378	1.120644**	.5670688
lninc					.2897537	.5585211
rdepatb					1.745192	1.295906

_cons	6.483099***	.4182903	2.602684***	1.356449	1.667706	3.379653

3.2.2 Panel data model

3.2.2.1 Entire sample

malscore	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0689814**	.0270469	.0305621	.0913543	-.0324186	.1141792
prof	-.1613821	.1022297	-.1571574	.1023963	-.1379109	.127163
intermed	-.1462212**	.0685564	-.1419569**	.068683	-.0768571	.0893539
skillnm	-.1548403**	.0663902	-.1535047**	.0664349	-.211703**	.0855722
skillman	.0129398	.0687748	.0141084	.0688013	.0351542	.0884895
unsklman	-.0080125	.1216862	-.0130428	.1218838	-.0841649	.1640901
child	.1532776***	.0487213	.1494834***	.0489485	.1472821**	.0632384
single	.1290437**	.0505827	.1273094**	.0506037	.036126	.0628339
separated	.7308484***	.1354925	.7284389***	.1357086	.7895319***	.1841362
divorced	.4786129***	.0885124	.4762672***	.0885625	.4229326***	.1205961
widowed	1.015182**	.410599	1.014189**	.4101445	.8773097*	.4638236
cse	-.9259879***	.1313677	-.9239758***	.1312943	-.9752562***	.1823098
ogcse	-1.511593***	.1126888	-1.506995***	.112663	-1.640121***	.1573735
alevel	-1.744193***	.1223631	-1.738833***	.1224023	-1.896261***	.1665173
diploma	-1.867836***	.124183	-1.862029***	.1242292	-1.948041***	.1719595
degree	-2.007884***	.1270738	-2.003407***	.1270526	-2.03685***	.1767453
north	-.0587073	.1448477	-.0392103	.1459432	.0378256	.1849758
yorkhumb	-.1403441	.0897245	-.1240846	.090966	-.1821309	.1195447
eastmids	-.0619028	.0981196	-.0480495	.0989183	-.0788918	.1285949
eastang	-.1582935*	.092686	-.1450759	.0933992	-.1658005	.1177449
sthwest	-.1491873*	.0838816	-.1389646*	.0844366	-.1784678	.1113623
wmids	-.0124186	.051759	-.0090302	.0518407	.0368625	.0651413
nwest	.0511503	.1138626	.0650874	.1145547	.0329438	.1545933
wales	.103232	.1651347	.1206243	.1659892	.2167969	.2143827
scot	-.1702931	.1554952	-.1560444	.1561854	-.1849006	.1885827
nwestatb	-.0894132	.1266582	-.0851543	.1266702	.0028794	.174354
northatb	.1565335	.1491388	.1587731	.1490974	.2389664	.1892134
ewridatb	-.0049628	.1190273	.0023079	.1191627	.0572376	.1559969
nmidsatb	-.1640694	.1226511	-.1618791	.1225899	.0047779	.1605122
eastatb	-.24803**	.111765	-.2490615**	.1117005	-.220072	.1373298
southatb	-.002108	.1308091	-.0023546	.1307102	.1291674	.1647684
swestatb	-.0085251	.1386449	-.0053894	.1386154	.1528861	.1769145
midsatb	-.0780805	.1073491	-.0671629	.1078414	.0389862	.1410647
walesatb	-.1268272	.1797671	-.1222152	.179805	-.1057412	.233113
scotatb	-.0357283	.1635042	-.0323539	.16351	.0680763	.204138
men	-.9459804***	.0577449	-.9401278***	.0579247	-.9790944***	.0726991
waved5	-.3400774***	.0458659	-.3968143***	.0670777	-.3860817***	.085017
waved6	.6685684***	.0611777	.5349686***	.1311066	.6149593***	.1643397
rdepequiv			.3176039	.2787755	.1277983	.3477793
lninc					.3112162	.4863475
rdepatb					1.888395	1.170185
_cons	5.230378***	.2659984	4.276486***	.8774511	3.12536	2.767734

sigma_u	2.1703486	2.1671	2.0538026
sigma_e	2.007777	2.007772	1.9975253
rho	.53885136	.53812643	.5138884

(fraction of variance due to u_i)

3.2.2.2 For men only

malscore	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.1346717***	.0400385	.1673505	.1348711	.0819318	.157106
prof	-.0140101	.1282555	-.0019065	.1284294	.1336707	.157375
intermed	-.0488654	.0948479	-.0390325	.0948066	.1296565	.1190113
skillnm	-.0794085	.1038142	-.0719567	.1037683	-.0487318	.1257821
skillman	.0972912	.0864169	.0998175	.0863917	.2468328**	.1095939
unsklman	.309955*	.1714544	.2876263*	.1720344	.3308203	.2360279
child	.1022957	.0645607	.0971041	.0646557	.0800426	.0844341
single	.196619***	.0652779	.1934305***	.065206	.1164674	.0802261
separated	.479654***	.186999	.4693812**	.1880142	.646468**	.2719401
divorced	.1661966	.1238093	.1568116	.1236949	.0122551	.1594842
widowed	-.3946582	.5175216	-.3946994	.5227288	.2116037	.5611044
cse	-.5530329***	.1808753	-.5495441***	.1807786	-.7062385***	.2493396
ogcse	-1.041443***	.1506539	-1.028841***	.1505518	-1.321692***	.2073957
alevel	-1.065315***	.1602277	-1.050982***	.1602699	-1.379274***	.2189887
diploma	-1.317389***	.1649689	-1.300491***	.1649988	-1.552669***	.2247007
degree	-1.557806***	.1659378	-1.549118***	.1657827	-1.695486***	.2294034
north	-.0404598	.1866838	.0179385	.1879208	.1718782	.2172209
yorkhumb	.0305815	.1168023	.0788662	.1183296	.062671	.1499869
eastmids	.0501331	.1256196	.0911308	.126773	.0884093	.1600515
eastang	-.036962	.122208	.0017399	.1229529	-.029815	.1488931
sthwest	.0145779	.111999	.0444986	.1127194	.021863	.1435438
wmids	-.0151003	.066222	-.0061445	.0662773	.0663642	.0833325
nwest	.1741503	.1496276	.2105496	.1502759	.1613433	.2106391
wales	.1502375	.222876	.1921135	.2247384	.1998472	.279953
scot	-.0007231	.219736	.0406971	.2204665	.004136	.2758832
nwestatb	-.1048288	.1722162	-.0884455	.1722558	.292258	.2408109
northatb	.037176	.1961859	.0421472	.1961013	.0852964	.228292
ewridatb	-.0299178	.1570556	-.0063331	.1571639	.1206088	.2020541
nmidsatb	-.1868002	.1625971	-.1769396	.1623175	-.1016244	.2006536
eastatb	-.1719673	.1461974	-.1726981	.1461419	-.0556937	.1728743
southatb	.0648436	.1840802	.065167	.183906	.2611449	.2202136
swestatb	-.0249471	.1863478	-.0184114	.1861965	.1475028	.2301462
midsatb	-.0116689	.1401283	.0213831	.1407905	.2164556	.181988
walesatb	-.0303136	.2438289	-.0072484	.244448	.0069732	.3043715
scotatb	-.1007677	.2250919	-.0880451	.2252396	.0706001	.2926018
waved5	.1028214	.0645609	-.0455676	.0893334	-.0368406	.1094926
waved6	1.113092***	.0810209	.703758***	.1900989	.8405016***	.2245333
rdepequiv			.9958386**	.4210628	.6854426	.4897124
lninc					.3081166	.6510588
rdepatb					1.47199	1.588255
_cons	4.015519***	.3929722	1.125205	1.290113	.1904426	3.69771

sigma_u	2.0121918	2.0111531	1.854587
sigma_e	1.8541547	1.8539938	1.8148185
rho	.54080687	.54059351	.51083659
	(fraction of variance due to u_i)		

3.2.2.3 For women only

malscore	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0352791	.0392683	.0850808	.1280848	.0173115	.163983
prof	-.5978561***	.1776286	-.5933207***	.1777592	-.6344085***	.2173259
intermed	-.2847552***	.0985356	-.2781494***	.098859	-.2697453**	.1301625
skillnm	-.2326185***	.0852292	-.230891***	.0853417	-.338874***	.111253
skillman	.0397224	.1252278	.0423029	.1253109	-.078474	.1578095
unsklman	-.1186693	.1702297	-.1207161	.1703036	-.2649743	.2245293
child	.1584596**	.0723729	.152063**	.0729495	.1501834	.0929439
single	.1916462**	.0783359	.1906973**	.0783421	.0779251	.0973138
separated	.9094258***	.1922786	.9075774***	.1925338	.876787***	.2468317
divorced	.7109313***	.1205081	.7090802***	.1206121	.7054649***	.1667413
widowed	1.441494***	.4850423	1.440185***	.4843381	1.129626**	.5741098
cse	-1.17168***	.1848381	-1.168254***	.1846903	-1.141541***	.2562092
ogcse	-1.824706***	.1612857	-1.818252***	.1612352	-1.825687***	.2262716
alevel	-2.431103***	.1839165	-2.423338***	.1839417	-2.380453***	.2452393
diploma	-2.231177***	.1812491	-2.223397***	.1813765	-2.179633***	.2537321
degree	-2.273794***	.1895624	-2.265368***	.1897083	-2.230414***	.2649482
north	-.1085551	.2189188	-.0856533	.2204512	-.0595389	.2833602
yorkhumb	-.3003706**	.1336477	-.2801217**	.1356185	-.3728992**	.1830242
eastmids	-.2021682	.1485202	-.1857349	.1495987	-.2044792	.1982584
eastang	-.26671**	.1362592	-.2501952*	.1374767	-.2482778	.17724
sthwest	-.2853306**	.1222445	-.2721586**	.1231781	-.344396**	.1671591
wmids	-.0150674	.0781518	-.0108086	.0782619	.0279115	.0979772
nwest	-.0782144	.1676566	-.0590039	.168979	-.0938515	.2188226
wales	.0368172	.2456369	.0614555	.2464094	.2354629	.3230442
scot	-.294432	.213894	-.2763954	.2149168	-.3082756	.2585107
nwestatb	-.0750652	.1816074	-.0712734	.1815533	-.2020907	.2459693
northatb	.2985177	.2225052	.3027902	.2224033	.3917796	.2898678
ewridatb	.0256119	.1780051	.0337993	.1781079	.0379787	.2361626
nmidsatb	-.1323652	.1819354	-.1305608	.1818033	.1159586	.2487542
eastatb	-.3187291*	.167575	-.3209408*	.1674522	-.3821025*	.2138411
southatb	-.0570183	.1843085	-.057796	.1841216	.0327825	.2408215
swestatb	-.0238579	.2012472	-.0194952	.2011908	.1372654	.2635498
midsatb	-.1347248	.1620379	-.121341	.1627211	-.1011473	.2142516
walesatb	-.1670766	.2648553	-.1648452	.2646357	-.1515238	.3501764
scotatb	.0330274	.2304052	.0360817	.2303638	.0695181	.2856524
waved5	-.6296952***	.0650146	-.7058338***	.1017225	-.6727496***	.1298739
waved6	.3656883***	.093762	.2052673	.1862569	.2781262	.2368314
rdepequiv			.3843248	.3927651	.1817404	.5021365
lninc					.2581589	.7276427
rdepatb					1.907379	1.715129

_cons	5.513537***	.3860301	4.361053***	1.230914	3.520295	4.116994
sigma_u	2.3003533		2.2951952		2.2172239	
sigma_e	2.125844		2.1258738		2.1335672	
rho	.53936526		.53824266		.5192208	
	(fraction of variance due to u_i)					

3.3 Using deprivation from the mean as relative income measure

3.3.1 Pooled OLS model

3.3.1.1 Entire sample

malscore	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.1933934***	.0313457	-.2714327***	.0429556	-.2397233***	.0537543
prof	-.4076187***	.1099343	-.4248605***	.1099781	-.4123986***	.1347379
intermed	-.2860846***	.0752852	-.3038037***	.0754997	-.3089678***	.0947492
skillnm	-.2901454***	.0728132	-.2909785***	.0727948	-.3452959***	.0907758
skillman	-.029995	.0762356	-.0263873	.0762301	.0100443	.095601
unsklman	.2592681*	.1437403	.2674442*	.1437543	.2736508	.18939
child	.1399419**	.0551278	.1196702**	.0554562	.0713496	.0696155
single	.2360674***	.0551323	.2467828***	.0552878	.1294092*	.0681023
separated	.938646***	.1622434	.9380732***	.1622327	.8759529***	.2039685
divorced	.7303067***	.1015527	.7355974***	.1015568	.6685778***	.1292126
widowed	1.191998***	.4654029	1.185621**	.4645561	.4283972	.4534812
cse	-.8120281***	.1003341	-.812038***	.1003088	-.934313***	.1339168
ogcse	-1.320619***	.0866783	-1.320494***	.0866443	-1.466731***	.1160362
alevel	-1.520284***	.093759	-1.521406***	.0937528	-1.732416***	.1232066
diploma	-1.603076***	.0966207	-1.605035***	.096608	-1.695892***	.1282536
degree	-1.70046***	.1011291	-1.719729***	.1014148	-1.793415***	.1348891
north	-.0118685	.1311611	-.0199022	.1312078	-.0645144	.1647116
yorkhumb	-.0624359	.0963202	-.0741775	.096419	-.1509763	.1238587
eastmids	.0179774	.10484	.0133529	.1047711	.0574547	.1328841
eastang	-.1367142	.1018468	-.1437159	.1019255	-.1427879	.1236198
sthwest	-.152754*	.0898426	-.1647965*	.0899756	-.2652367**	.1131491
wmids	.0107778	.0681744	.0117537	.0681408	.0389733	.0843019
nwest	.0514819	.1103668	.0446943	.1103739	-.0419439	.1455304
wales	.0822381	.1565809	.0676487	.1567792	.0789099	.2007308
scot	-.2666954*	.1433224	-.2674035*	.1433841	-.2640995	.1789481
nwestatb	-.0804637	.108431	-.0834831	.1083798	-.0985705	.1504089
northatb	.1202021	.1213683	.1177322	.1212859	-.0581123	.1731734
ewridatb	-.0360859	.0966034	-.0369029	.0966086	-.1917128	.129412
nmidsatb	-.2045775**	.0991505	-.2030203**	.0991346	-.2673584**	.1287367
eastatb	-.2505661***	.0836949	-.2462389***	.0836998	-.2910194***	.1026067
southatb	-.0014855	.0961017	-.0012928	.0960853	-.0164938	.1199808
swestatb	.0128023	.1097595	.0138676	.1097449	.0216805	.1413912
midsatb	-.0838107	.0791969	-.0913384	.079268	-.229472**	.1058518
walesatb	-.1287818	.1500126	-.1292557	.1499008	-.2324183	.2007927
scotatb	.0305546	.1401435	.0255156	.1402344	-.1548015	.1833818
men	-.9253402***	.044886	-.9415871***	.0452631	-.9810571***	.0556087

waved5	-.2505476***	.0584717	-.3952502***	.0833471	-.3356397***	.103974
waved6	.7625428***	.0744701	.7062908***	.0788636	.7500705***	.0967824
depmean			.1555915***	.0563363	.1055526	.0710132
lninc					-2.735144***	.9773917
depmeanatb					2.175791**	.9110969
_cons	6.093062***	.28892	6.77567***	.3892574	18.32223***	4.054535

3.3.1.2 For men only

malscore	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.2285866***	.0463821	-.2460148***	.0628281	-.1577723**	.075558
prof	-.2480802*	.138339	-.2505217*	.1383148	-.1166325	.1677791
intermed	-.1253805	.102736	-.1294813	.1027193	-.0164285	.1255944
skillnm	-.236841**	.1117438	-.2371167**	.1117345	-.1452988	.1346799
skillman	.033766	.0956667	.034275	.0956949	.1895691	.1191823
unsklman	.4660316**	.1999289	.4646831**	.2000198	.7005207**	.2745869
child	-.0088221	.0745179	-.0137724	.0750719	-.020918	.094404
single	.2383376***	.0718608	.2412353***	.0720856	.0860835	.0883112
separated	.5882533***	.2253213	.5879579***	.2252964	.8151016***	.3001451
divorced	.3587809**	.1460026	.3599217**	.1459738	.2109475	.1756702
widowed	-.4858426	.5137898	-.4888424	.5146568	-.2215028	.6083737
cse	-.471197***	.1373612	-.4715849***	.1373842	-.6674815***	.187431
ogcse	-.8813413***	.1151271	-.8819485***	.1151375	-1.160012***	.1564315
alevel	-.8882382***	.1225185	-.8893958***	.1226238	-1.236485***	.1650492
diploma	-1.119988***	.1269087	-1.121609***	.1270261	-1.36003***	.1692657
degree	-1.314527***	.1306202	-1.320739***	.1318953	-1.476485***	.1773055
north	.149288	.1713964	.1488536	.171368	.1845363	.1973324
yorkhumb	.1324499	.1256114	.1297944	.1258452	.0590335	.157362
eastmids	.1693782	.1349621	.168627	.1349733	.1390633	.1673799
eastang	.0027773	.1331422	.0012195	.1331114	-.0917573	.1530148
sthwest	.0720871	.1211169	.0691694	.1214952	-.0003492	.1485195
wmids	.0220013	.0876875	.0223291	.0876963	.0995426	.1083554
nwest	.1768198	.1507878	.1751277	.1509398	.2220643	.2065155
wales	.1446256	.2197769	.1417708	.2201004	.0288425	.2673841
scot	-.045319	.2025739	-.0453406	.2025751	-.0749486	.2588438
nwestatb	-.0690946	.149234	-.0686657	.1492678	.0354556	.2126817
northatb	-.0585113	.1607129	-.0598053	.1606645	-.2042356	.210809
ewridatb	-.022201	.1281468	-.0215695	.1281977	-.0703598	.169097
nmidsatb	-.2376489*	.1296222	-.2372626*	.1296433	-.3268961**	.1597059
eastatb	-.1525769	.1092357	-.1512517	.1093093	-.1203922	.1293163
southatb	.1246846	.1335632	.1251245	.1335532	.1367031	.1602967
swestatb	-.0019306	.1454997	-.0011436	.1455046	.0495945	.1796761
midsatb	.0069448	.1029078	.0062655	.1029571	-.0435217	.1370368
walesatb	.0040006	.2093136	.0035694	.2092797	.0267593	.2680179
scotatb	-.0693814	.1954981	-.0704593	.1955267	-.1548126	.2551323
waved5	.2250213***	.0817499	.1857249	.1301747	.2728942*	.1576119
waved6	1.181438***	.0981886	1.168637***	.1049938	1.191147***	.1284944
depmean			.0340451	.0804355	-.083556	.0973252
lninc					-1.694345	1.260832

depmeanatb					1.278817	1.164536
_cons	4.68442***	.4317292	4.836795***	.5714637	11.46624**	5.25007

3.3.1.3 For women only

malscore	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.1740155***	.045137	-.2011298***	.0593619	-.2165545***	.0759491
prof	-.821749***	.1876167	-.8330879***	.1881831	-.8984336***	.2277549
intermed	-.4417474***	.1086234	-.448837***	.1091751	-.5449314***	.1388319
skillnm	-.3237099***	.095564	-.3241048***	.0955792	-.4687855***	.1201127
skillman	.1039325	.1427791	.1023181	.1428426	.0189449	.1768692
unsklman	.2494061	.2035843	.2542124	.2037026	.072708	.2593806
child	.1786841**	.0802608	.1723171**	.0804563	.0739465	.1000467
single	.2770088***	.0827692	.2781628***	.0827838	.1907252*	.1027328
separated	1.166635***	.2297238	1.167328***	.2297496	.8909019***	.2758067
divorced	.9600396***	.1361495	.9614518***	.1361379	.9604842***	.1772958
widowed	1.587374***	.5432546	1.584459***	.5423941	.6344499	.5634474
cse	-1.045606***	.1413808	-1.045324***	.1413891	-1.099795***	.186613
ogcse	-1.621955***	.1244036	-1.621828***	.1244048	-1.651228***	.1658101
alevel	-2.165638***	.1400639	-2.1657***	.1400781	-2.214443***	.1810246
diploma	-1.914597***	.1427684	-1.915198***	.1427756	-1.88616***	.1914136
degree	-1.920864***	.1518454	-1.926138***	.1518756	-1.946519***	.2026025
north	-.1758311	.1952101	-.1800946	.195492	-.2610833	.2543796
yorkhumb	-.221112	.1431937	-.2254659	.1432591	-.3141199*	.187706
eastmids	-.1416352	.1592596	-.142329	.1592148	.0124059	.2061426
eastang	-.2592127*	.1497948	-.2616726*	.1499423	-.1793918	.1862624
sthwest	-.3313606***	.1290302	-.3356588***	.1291585	-.4913966***	.1669397
wmids	.0026103	.1027559	.002946	.1027425	.0035413	.1270179
nwest	-.0810168	.157859	-.0829251	.1578242	-.2717941	.2011892
wales	.0053722	.2237193	.0001299	.2237236	.080889	.2933233
scot	-.4323478**	.1981055	-.4329472**	.198145	-.3928442	.2458345
nwestatb	-.0736995	.1536244	-.0766151	.1536706	-.1872072	.2099174
northatb	.3167286*	.1786331	.3168394*	.1786389	.1020094	.2676419
ewridatb	-.0529315	.1426879	-.0542866	.1427389	-.2599293	.1927389
nmidsatb	-.1626243	.1480589	-.1624973	.148058	-.1858298	.2004446
eastatb	-.338708***	.1250187	-.3375581***	.1250744	-.4459861***	.1582705
southatb	-.0938661	.1367407	-.0942385	.1367094	-.1126791	.1754163
swestatb	.0070702	.159926	.006869	.1599151	.0041553	.2118415
midsatb	-.1477204	.1196224	-.1519288	.1198122	-.3752228**	.1614444
walesatb	-.1832398	.2148449	-.1833307	.2147041	-.3487855	.2920353
scotatb	.1336334	.1955674	.131989	.1955967	-.1319359	.2612926
waved5	-.600018***	.0833191	-.6465559***	.1109991	-.5871922***	.1395927
waved6	.4704413***	.1138951	.4433827***	.1240085	.5020535***	.1521744
depmean			.0615333	.0870178	.0804753	.1117695
lninc					-3.453407**	1.483447
depmeanatb					2.844507**	1.400516
_cons	6.483099***	.4182903	6.717476***	.536749	21.63283***	6.13096

3.3.2 Panel data model

3.3.2.1 Entire sample

malscore	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0689814**	.0270469	-.1646255***	.037288	-.1503782***	.046874
prof	-.1613821	.1022297	-.1746151*	.1021516	-.1797476	.1253738
intermed	-.1462212**	.0685564	-.1644717**	.0686309	-.1276352	.0869849
skillnm	-.1548403**	.0663902	-.1531368**	.0663417	-.2267836***	.0831763
skillman	.0129398	.0687748	.0165835	.0687375	.0082049	.0861904
unsklman	-.0080125	.1216862	.0047517	.1217272	-.0629098	.1613347
child	.1532776***	.0487213	.1261101***	.0491323	.1124872*	.0615741
single	.1290437**	.0505827	.1473552***	.0507191	.0684528	.0622738
separated	.7308484***	.1354925	.728931***	.1354361	.7706008***	.1721497
divorced	.4786129***	.0885124	.4863819***	.0884908	.4548371***	.114232
widowed	1.015182**	.410599	1.009106**	.4096398	.743851*	.4517715
cse	-.9259879***	.1313677	-.925538***	.1313376	-1.022595***	.1747611
ogcse	-1.511593***	.1126888	-1.510565***	.112632	-1.633485***	.1506026
alevel	-1.744193***	.1223631	-1.744248***	.1223478	-1.922554***	.1602359
diploma	-1.867836***	.124183	-1.869793***	.1241474	-1.938819***	.1651572
degree	-2.007884***	.1270738	-2.032109***	.1272042	-2.073658***	.1694691
north	-.0587073	.1448477	-.0667854	.1447672	-.047992	.1754069
yorkhumb	-.1403441	.0897245	-.1543087*	.0897629	-.1783948	.1139115
eastmids	-.0619028	.0981196	-.070876	.0979845	-.1130073	.123563
eastang	-.1582935*	.092686	-.1662917*	.0927168	-.1679503	.1142302
sthwest	-.1491873*	.0838816	-.1607137*	.0839795	-.2084918**	.1059888
wmids	-.0124186	.051759	-.0116654	.0517158	.0358653	.0638764
nwest	.0511503	.1138626	.0453565	.1138735	.0363661	.1470655
wales	.103232	.1651347	.086969	.1653475	.1890091	.207804
scot	-.1702931	.1554952	-.170969	.1555728	-.2078177	.1833768
nwestatb	-.0894132	.1266582	-.0945838	.126618	-.1832965	.1768108
northatb	.1565335	.1491388	.1516647	.1490033	-.075451	.2125627
ewridatb	-.0049628	.1190273	-.007251	.1190921	-.1649631	.1608661
nmidsatb	-.1640694	.1226511	-.1607446	.1226303	-.1990718	.1591724
eastatb	-.24803**	.111765	-.2426842**	.1117493	-.2681444*	.1373768
southatb	-.002108	.1308091	-.0009527	.1308312	.0151066	.1634953
swestatb	-.0085251	.1386449	-.0083332	.138685	-.0203149	.1781359
midsatb	-.0780805	.1073491	-.0860317	.107416	-.2499279*	.1431182
walesatb	-.1268272	.1797671	-.1283346	.1797029	-.3198094	.2375121
scotatb	-.0357283	.1635042	-.0416203	.1635957	-.2163931	.2091163
men	-.9459804***	.0577449	-.9643736***	.0579817	-.9845851***	.0712004
waved5	-.3400774***	.0458659	-.5108045***	.0664993	-.4508013***	.0831337
waved6	.6685684***	.0611777	.6047632***	.0641462	.6340567***	.0793162
depmean			.1866353***	.047114	.1450542**	.059206
lninc					-3.287471**	1.327359
depmeanatb					2.582784**	1.232326
_cons	5.230378***	.2659984	6.061712***	.3492542	20.05403***	5.494709
sigma_u	2.1703486		2.170899		2.1164895	
sigma_e	2.007777		2.006978		1.9981166	
rho	.53885136		.53917518		.52874517	

(fraction of variance due to u_i)

3.3.2.2 For men only

malscore	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.1346717***	.0400385	-.1708904***	.0536446	-.1210393*	.0653353
prof	-.0140101	.1282555	-.0159422	.1282311	.0838438	.1562748
intermed	-.0488654	.0948479	-.0550686	.0947853	.0775	.1168027
skillnm	-.0794085	.1038142	-.077721	.1038371	-.0787762	.1241221
skillman	.0972912	.0864169	.098754	.0864277	.2124797**	.1079678
unsklman	.309955*	.1714544	.3062126*	.1716345	.4084589*	.2335131
child	.1022957	.0645607	.0912552	.0651427	.0817775	.0818686
single	.196619***	.0652779	.2030081***	.0653112	.1205344	.0797038
separated	.479654***	.186999	.478746***	.1869435	.6749735***	.2475125
divorced	.1661966	.1238093	.1684198	.1238376	.0661538	.1521762
widowed	-.3946582	.5175216	-.3957612	.5188723	-.0818895	.601495
cse	-.5530329***	.1808753	-.5535065***	.1808921	-.7210047***	.2445879
ogcse	-1.041443***	.1506539	-1.042684***	.1506532	-1.277541***	.2041526
alevel	-1.065315***	.1602277	-1.067613***	.1602813	-1.363318***	.2156263
diploma	-1.317389***	.1649689	-1.321097***	.1650239	-1.529645***	.2201195
degree	-1.557806***	.1659378	-1.571863***	.1667197	-1.694397***	.2252336
north	-.0404598	.1866838	-.0395322	.1865402	.0252989	.2052651
yorkhumb	.0305815	.1168023	.0251642	.1169892	.0322582	.1441626
eastmids	.0501331	.1256196	.0469301	.1256471	.0153696	.1533656
eastang	-.036962	.122208	-.0402854	.1222628	-.0468603	.1434364
sthwest	.0145779	.111999	.0097266	.1122875	-.0142107	.1373151
wmids	-.0151003	.066222	-.014032	.0662607	.0656587	.081678
nwest	.1741503	.1496276	.1714008	.1497047	.1929425	.1946214
wales	.1502375	.222876	.1452954	.2230048	.0695887	.2598837
scot	-.0007231	.219736	.0009313	.2196432	-.0728428	.2654414
nwestatb	-.1048288	.1722162	-.104164	.1722149	.0653765	.2441991
northatb	.037176	.1961859	.0329249	.1960735	-.1247149	.2650478
ewridatb	-.0299178	.1570556	-.0289428	.1570928	-.0955901	.2113361
nmidsatb	-.1868002	.1625971	-.185063	.1626401	-.2813671	.2032236
eastatb	-.1719673	.1461974	-.1695145	.1462448	-.1316914	.1756229
southatb	.0648436	.1840802	.0658898	.1841201	.1125961	.2235772
swestatb	-.0249471	.1863478	-.0235	.1863979	-.0357555	.2308033
midsatb	-.0116689	.1401283	-.0126532	.1401787	-.0625197	.1871089
walesatb	-.0303136	.2438289	-.0318538	.2436637	-.0427239	.3078337
scotatb	-.1007677	.2250919	-.10437	.2250129	-.1441553	.2890951
waved5	.1028214	.0645609	.0216339	.1063238	.1377483	.1298667
waved6	1.113092***	.0810209	1.086539***	.0868142	1.142081***	.107518
depmean			.0705446	.0677833	-.0221838	.0819761
lninc					-2.253201	1.751822
depmeanatb					1.73792	1.620538
_cons	4.015519***	.3929722	4.330851***	.5025723	13.56364*	7.270731
sigma_u	2.0121918		2.0124891		1.9588636	
sigma_e	1.8541547		1.8542074		1.8250737	

rho	.54080687	.54086614	.53531319
	(fraction of variance due to u_i)		

3.3.2.3 For women only

malscore	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
lnallinc	-.0352791	.0392683	-.0781424	.0520503	-.0929714	.0663149
prof	-.5978561***	.1776286	-.6088919***	.1774934	-.6778156***	.2117918
intermed	-.2847552***	.0985356	-.2949121***	.0987721	-.3206356**	.1267954
skillnm	-.2326185***	.0852292	-.2328006***	.085223	-.3533733***	.1080677
skillman	.0397224	.1252278	.0359318	.125243	-.1194092	.152502
unsklman	-.1186693	.1702297	-.1087891	.1704978	-.2847891	.2202016
child	.1584596**	.0723729	.1460096**	.0727683	.1179112	.0899796
single	.1916462**	.0783359	.1964859**	.0783808	.1199736	.0964828
separated	.9094258***	.1922786	.9100465***	.1922501	.839596***	.2360131
divorced	.7109313***	.1205081	.7144852***	.1204607	.7302278***	.1584765
widowed	1.441494***	.4850423	1.437144***	.4839747	1.035518*	.5617333
cse	-1.17168***	.1848381	-1.171302***	.1848397	-1.213392***	.2434656
ogcse	-1.824706***	.1612857	-1.824195***	.1612702	-1.857831***	.2145909
alevel	-2.431103***	.1839165	-2.431264***	.1839405	-2.466763***	.2345412
diploma	-2.231177***	.1812491	-2.232373***	.1812479	-2.18177***	.2424626
degree	-2.273794***	.1895624	-2.282766***	.1895031	-2.27495***	.2515526
north	-.1085551	.2189188	-.1153237	.2191657	-.1269768	.273215
yorkhumb	-.3003706**	.1336477	-.3069191**	.1336433	-.3596204**	.1732867
eastmids	-.2021682	.1485202	-.2041347	.1483906	-.2220163	.1917115
eastang	-.26671**	.1362592	-.2699743*	.1362703	-.2552872	.1722417
sthwest	-.2853306**	.1222445	-.290625**	.1223111	-.3813433**	.1583658
wmids	-.0150674	.0781518	-.0152965	.0781424	.0161741	.096212
nwest	-.0782144	.1676566	-.0801804	.1676924	-.1348375	.2120773
wales	.0368172	.2456369	.0301717	.2456679	.2785525	.3191062
scot	-.294432	.213894	-.2966909	.2140545	-.3106767	.2522321
nwestatb	-.0750652	.1816074	-.0804418	.1816358	-.3539692	.2499802
northatb	.2985177	.2225052	.2986079	.2224712	.0217424	.3255446
ewridatb	.0256119	.1780051	.0228905	.1781202	-.1777598	.2400651
nmidsatb	-.1323652	.1819354	-.1321412	.181913	-.1045797	.2429453
eastatb	-.3187291*	.167575	-.3165115*	.1675835	-.3964711*	.2107232
southatb	-.0570183	.1843085	-.0570193	.1842851	-.0502028	.2358531
swestatb	-.0238579	.2012472	-.024738	.201242	-.0182185	.2654359
midsatb	-.1347248	.1620379	-.1405606	.16216	-.4072883*	.216583
walesatb	-.1670766	.2648553	-.1683942	.2648396	-.4886309	.3547584
scotatb	.0330274	.2304052	.0318577	.2305257	-.2413768	.3004804
waved5	-.6296952***	.0650146	-.7011413***	.0886079	-.6737449***	.1106645
waved6	.3656883***	.093762	.3249251***	.1008955	.3243467***	.1241326
depmean			.0956687	.0729617	.1142066	.0930065
lninc					-3.931108**	1.970725
depmeanatb					3.159394*	1.840379
_cons	5.513537***	.3860301	5.883256***	.486415	22.81517***	8.140698
sigma_u	2.3003533		2.3002779		2.2487503	

```
     sigma_e |     2.125844               2.1257488               2.1298085
         rho |    .53936526               .53937123               .52714458
                                 (fraction of variance due to u_i)
------------------------------------------------------------------------------
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Appendix 3 Quantile regression results

The 1997 sample

Simultaneous quantile regression	Number of obs = 5745
bootstrap(20) SEs	.56 Pseudo R2 = 0.0873
	.79 Pseudo R2 = 0.1402
	.98 Pseudo R2 = 0.1120

ghq12scr	Coef.	Bootstrap Std. Err.	t	P>|t|	[95% Conf.	Interval]
q5643						
age	.0122871	.0139585	0.88	0.379	-.0150768	.039651
age2	-.0002168	.0001832	-1.18	0.237	-.0005759	.0001422
male	-.1770246*	.0970922	-1.82	0.068	-.3673622	.0133129
hhsize	-.0226577	.0214989	-1.05	0.292	-.0648037	.0194882
northw	.0730385	.0738148	0.99	0.322	-.0716666	.2177436
trent	-.0030624	.0694852	-0.04	0.965	-.1392798	.133155
wesmid	-.0297901	.0593469	-0.50	0.616	-.1461326	.0865523
anglia	.0281363	.0500208	0.56	0.574	-.0699234	.1261961
northames	.0588847	.0917948	0.64	0.521	-.1210681	.2388374
southames	.1004007	.0839881	1.20	0.232	-.0642478	.2650492
souwes	.0380837	.0698698	0.55	0.586	-.0988875	.175055
bmi	.0083072	.0239534	0.35	0.729	-.0386505	.0552649
bmi2	-.0002558	.0004453	-0.57	0.566	-.0011289	.0006172
eqvinc	-4.03e-07	1.07e-06	-0.37	0.708	-2.51e-06	1.70e-06
lli	.4449124	.3048897	1.46	0.145	-.1527871	1.042612
single	.0644642	.0726658	0.89	0.375	-.0779884	.2069167
widowed	.2777043	.2702359	1.03	0.304	-.2520606	.8074691
divorced	.1422126	.2254183	0.63	0.528	-.2996928	.584118
degree	.1226996	.0976163	1.26	0.209	-.0686654	.3140647
alevel	.0615291	.0622665	0.99	0.323	-.0605369	.1835951
olevel	-.0201791	.0570216	-0.35	0.723	-.1319631	.0916049
other	-.0243065	.068351	-0.36	0.722	-.1583004	.1096874
excellent	-4.54025***	.6533733	-6.95	0.000	-5.82111	-3.259391
good	-4.325808***	.6101417	-7.09	0.000	-5.521917	-3.129699
fair	-3.146263***	.6068997	-5.18	0.000	-4.336017	-1.95651
sc2	.0567965	.0937107	0.61	0.544	-.126912	.240505
sc31	.0250283	.076911	0.33	0.745	-.1257465	.1758031
sc32	-.0482259	.0950086	-0.51	0.612	-.2344788	.1380271
sc4	-.0255683	.0897977	-0.28	0.776	-.2016059	.1504693
sc5	.0446329	.1008131	0.44	0.658	-.152999	.2422648
sc6	.4254919	.2904322	1.47	0.143	-.1438653	.9948492
_cons	4.568849***	.9025781	5.06	0.000	2.799454	6.338245
q7875						
age	.0726451**	.029185	2.49	0.013	.0154315	.1298588
age2	-.0011254***	.0003291	-3.42	0.001	-.0017705	-.0004802
male	-.8575622***	.1514503	-5.66	0.000	-1.154462	-.5606621

hhsize	-.0107262	.0419905	-0.26	0.798	-.0930434	.0715911
northw	.1349685	.210302	0.64	0.521	-.2773031	.5472401
trent	-.1123826	.1870412	-0.60	0.548	-.4790543	.2542891
wesmid	-.116295	.2133108	-0.55	0.586	-.534465	.3018751
anglia	.0628879	.2161032	0.29	0.771	-.3607563	.4865321
northames	.3462508	.2494319	1.39	0.165	-.1427303	.8352319
southames	.1719768	.2685554	0.64	0.522	-.3544936	.6984471
souwes	.0153307	.1662768	0.09	0.927	-.310635	.3412963
bmi	.1177379	.1161375	1.01	0.311	-.1099357	.3454115
bmi2	-.0023829	.0019977	-1.19	0.233	-.0062992	.0015334
eqvinc	-3.21e-06**	1.64e-06	-1.96	0.050	-6.42e-06	-4.62e-09
lli	.6239029***	.1597536	3.91	0.000	.3107252	.9370806
single	.2454296	.1853821	1.32	0.186	-.1179896	.6088488
widowed	.9930671***	.3700587	2.68	0.007	.2676116	1.718523
divorced	1.002514***	.3279562	3.06	0.002	.3595957	1.645433
degree	.2636519	.190666	1.38	0.167	-.1101259	.6374296
alevel	.3021354*	.1681188	1.80	0.072	-.0274412	.631712
olevel	.2085491	.1475599	1.41	0.158	-.0807242	.4978225
other	-.1800336	.1898622	-0.95	0.343	-.5522355	.1921684
excellent	-6.879991***	.5777476	-11.91	0.000	-8.012595	-5.747386
good	-6.122043***	.5791244	-10.57	0.000	-7.257347	-4.98674
fair	-4.09863***	.5968114	-6.87	0.000	-5.268606	-2.928653
sc2	.2649634	.2485277	1.07	0.286	-.2222452	.752172
sc31	-.0924104	.2648512	-0.35	0.727	-.6116193	.4267985
sc32	-.2866125	.2887645	-0.99	0.321	-.8527005	.2794754
sc4	-.1202916	.3161937	-0.38	0.704	-.7401511	.4995679
sc5	.0964089	.5438207	0.18	0.859	-.9696859	1.162504
sc6	.2960368	.3107213	0.95	0.341	-.3130948	.9051683
_cons	6.052044***	1.805652	3.35	0.001	2.512282	9.591806
q9800						
age	.1339426	.1348447	0.99	0.321	-.1304043	.3982894
age2	-.0018621	.0015204	-1.22	0.221	-.0048428	.0011185
male	-1.405805***	.4038886	-3.48	0.001	-2.197579	-.6140299
hhsize	-.0017975	.1693372	-0.01	0.992	-.3337626	.3301677
northw	.3205445	.5820206	0.55	0.582	-.8204365	1.461526
trent	-.0275736	.8768985	-0.03	0.975	-1.746627	1.69148
wesmid	-.1339952	.5125244	-0.26	0.794	-1.138737	.870747
anglia	-.9734721	1.001139	-0.97	0.331	-2.936084	.9891402
northames	-.6600044	.7495009	-0.88	0.379	-2.129311	.8093017
southames	-1.35425*	.8061137	-1.68	0.093	-2.934538	.226039
souwes	-.6918313	.81403	-0.85	0.395	-2.287639	.9039763
bmi	-.2686532	.2070642	-1.30	0.195	-.6745776	.1372712
bmi2	.004204	.0034495	1.22	0.223	-.0025584	.0109664
eqvinc	.0000156	.0000166	0.94	0.347	-.0000169	.0000482
lli	1.066613***	.3799351	2.81	0.005	.3217959	1.81143
single	.2673719	.5837436	0.46	0.647	-.8769869	1.411731
widowed	2.291474	1.39719	1.64	0.101	-.4475481	5.030497
divorced	1.28791**	.6361056	2.02	0.043	.0409015	2.534918
degree	.751373	.716372	1.05	0.294	-.6529879	2.155734
alevel	.7311882	.4989561	1.47	0.143	-.246955	1.709331
olevel	.3746884	.4120034	0.91	0.363	-.4329945	1.182371
other	-.0912197	.7164817	-0.13	0.899	-1.495796	1.313356

excellent	-4.238385***	.5050257	-8.39	0.000	-5.228427	-3.248343
good	-2.213085***	.557766	-3.97	0.000	-3.306518	-1.119652
fair	-1.138757**	.4734371	-2.41	0.016	-2.066873	-.2106403
sc2	.9956867	1.076591	0.92	0.355	-1.114841	3.106214
sc31	.4977732	1.228311	0.41	0.685	-1.910182	2.905728
sc32	.6617198	1.047162	0.63	0.527	-1.391115	2.714555
sc4	1.23298	1.006434	1.23	0.221	-.7400136	3.205973
sc5	.5312906	1.046639	0.51	0.612	-1.520519	2.5831
sc6	.1135841	1.518864	0.07	0.940	-2.863965	3.091133
_cons	12.63984***	3.551357	3.56	0.000	5.67783	19.60184

The 2005 sample

```
Simultaneous quantile regression                    Number of obs =      4221
  bootstrap(20) SEs                                 .64 Pseudo R2 =    0.1220
                                                    .82 Pseudo R2 =    0.1818
                                                    .98 Pseudo R2 =    0.1895
```

ghq12scr	Coef.	Bootstrap Std. Err.	t	P>|t|	[95% Conf.	Interval]
q6434						
age	-2.17e-14	2.0015542	-0.00	1.000	-.003047	.003047
age2	2.59e-16	.0000333	0.00	1.000	-.0000653	.0000653
male	1.37e-14	.0377658	0.00	1.000	-.074041	.074041
hhsize	-6.69e-15	.0045488	-0.00	1.000	-.0089181	.0089181
northw	4.82e-14	.0713476	0.00	1.000	-.1398792	.1398792
yorkhum	2.12e-14	.0190491	0.00	1.000	-.0373463	.0373463
eastmid	2.54e-14	.0219753	0.00	1.000	-.0430832	.0430832
wesmid	1.36e-14	.0304414	0.00	1.000	-.0596812	.0596812
east	-1.16e-14	.030127	-0.00	1.000	-.0590649	.0590649
london	1.25e-14	.3069543	0.00	1.000	-.6017932	.6017932
souest	2.97e-14	.021727	0.00	1.000	-.0425964	.0425964
souwes	2.70e-14	.0692963	0.00	1.000	-.1358574	.1358574
bmi	-1.45e-14	.0159844	-0.00	1.000	-.0313379	.0313379
bmi2	2.78e-16	.0002552	0.00	1.000	-.0005004	.0005004
eqvinc	9.32e-20	3.79e-07	0.00	1.000	-7.42e-07	7.42e-07
lli	-1.00e-13	.0613083	-0.00	1.000	-.1201967	.1201967
single	-1.74e-14	.0281046	-0.00	1.000	-.0551	.0551
widowed	3.96e-14	.4299456	0.00	1.000	-.8429215	.8429215
divorced	1**	.4487419	2.23	0.026	.1202277	1.879772
degree	-4.01e-14	.011158	-0.00	1.000	-.0218757	.0218757
alevel	-7.37e-14	.0117637	-0.00	1.000	-.0230632	.0230632
olevel	-6.04e-14	.0312115	-0.00	1.000	-.0611911	.0611911
other	-5.91e-14	.0121921	-0.00	1.000	-.023903	.023903
excellent	-7***	.5669013	-12.35	0.000	-8.111427	-5.888573
good	-7***	.5687437	-12.31	0.000	-8.115039	-5.884961
fair	-6***	.7907749	-7.59	0.000	-7.550338	-4.449662
sc2	1.55e-13	.2233168	0.00	1.000	-.4378195	.4378195
sc31	1.39e-13	.2252986	0.00	1.000	-.4417048	.4417048
sc32	1.62e-13	.2264029	0.00	1.000	-.4438698	.4438698

sc4	1.35e-13	.2304818	0.00	1.000	-.4518667	.4518667
sc5	1.11e-13	.5304065	0.00	1.000	-1.039878	1.039878
sc6	1***	.2240997	4.46	0.000	.5606456	1.439354
_cons	7***	.627124	11.16	0.000	5.770504	8.229496
q8218						
age	.0207407	.0363904	0.57	0.569	-.0506038	.0920852
age2	-.0004261	.0003643	-1.17	0.242	-.0011403	.0002881
male	-.5840298***	.2249592	-2.60	0.009	-1.025069	-.1429904
hhsize	.055785	.0686419	0.81	0.416	-.0787896	.1903597
northw	.6339388*	.3341203	1.90	0.058	-.0211142	1.288992
yorkhum	.0491192	.3213276	0.15	0.879	-.5808535	.6790919
eastmid	.4567431	.3350758	1.36	0.173	-.2001833	1.113669
wesmid	.4066069	.3282328	1.24	0.215	-.2369035	1.050117
east	.1633036	.2917786	0.56	0.576	-.4087372	.7353444
london	.7979493**	.3512781	2.27	0.023	.1092579	1.486641
souest	.2493543	.2477183	1.01	0.314	-.2363049	.7350135
souwes	.26613	.321258	0.83	0.407	-.363706	.8959661
bmi	-.0668308	.1077592	-0.62	0.535	-.278096	.1444344
bmi2	.0007709	.0018159	0.42	0.671	-.0027891	.004331
eqvinc	-3.45e-06	2.25e-06	-1.53	0.126	-7.86e-06	9.64e-07
lli	.4138653*	.2422202	1.71	0.088	-.0610147	.8887454
single	.4132376	.288072	1.43	0.152	-.1515363	.9780116
widowed	1.592835***	.5791625	2.75	0.006	.4573696	2.728301
divorced	1.099107***	.3907644	2.81	0.005	.3330015	1.865212
degree	.1976028	.1944196	1.02	0.310	-.1835628	.5787684
alevel	.047737	.164846	0.29	0.772	-.2754487	.3709228
olevel	-.0560401	.1564311	-0.36	0.720	-.3627281	.2506479
other	.9929689**	.4273741	2.32	0.020	.1550889	1.830849
excellent	-8.666207***	.2968419	-29.19	0.000	-9.248175	-8.084239
good	-7.828903***	.2969485	-26.36	0.000	-8.41108	-7.246727
fair	-5.392177***	.4657902	-11.58	0.000	-6.305373	-4.478981
sc2	-.0963455	.2531733	-0.38	0.704	-.5926994	.4000085
sc31	-.1015728	.3201591	-0.32	0.751	-.7292544	.5261089
sc32	-.3484602	.2699232	-1.29	0.197	-.8776529	.1807324
sc4	-.3003533	.2890422	-1.04	0.299	-.8670294	.2663228
sc5	-.2550585	.5432248	-0.47	0.639	-1.320067	.8099504
sc6	-.100218	.2788698	-0.36	0.719	-.6469509	.4465148
_cons	10.71061***	1.607261	6.66	0.000	7.559525	13.86169
q9800						
age	.3136144***	.1002193	3.13	0.002	.1171314	.5100974
age2	-.0035066***	.0012559	-2.79	0.005	-.0059689	-.0010444
male	-1.321134**	.5201314	-2.54	0.011	-2.340868	-.3014005
hhsize	.4689586**	.2173917	2.16	0.031	.0427555	.8951618
northw	1.956136	1.194205	1.64	0.101	-.3851404	4.297412
yorkhum	-.2886113	1.1455	-0.25	0.801	-2.5344	1.957177
eastmid	2.541827***	.9273539	2.74	0.006	.723721	4.359933
wesmid	2.025287*	1.127109	1.80	0.072	-.1844436	4.235018
east	-.9967351	1.142963	-0.87	0.383	-3.237548	1.244078
london	-.5898838	1.246424	-0.47	0.636	-3.033536	1.853768
souest	.1644977	1.060348	0.16	0.877	-1.914347	2.243342
souwes	.8937476	1.215982	0.74	0.462	-1.490222	3.277717

bmi	-.3451882*	.2031452	-1.70	0.089	-.7434605	.0530842
bmi2	.0046341	.0031655	1.46	0.143	-.001572	.0108403
eqvinc	-.00001	.0000105	-0.95	0.340	-.0000307	.0000106
lli	.900062*	.5161107	1.74	0.081	-.1117889	1.911913
single	1.513276***	.4433804	3.41	0.001	.644015	2.382537
widowed	1.084944	.9400603	1.15	0.249	-.7580733	2.927961
divorced	2.016481***	.7035387	2.87	0.004	.6371719	3.39579
degree	-.1325458	.758177	-0.17	0.861	-1.618975	1.353883
alevel	-.3083067	.6176932	-0.50	0.618	-1.519313	.9026998
olevel	-.0710093	.7522924	-0.09	0.925	-1.545902	1.403883
other	-.4946302	.7582859	-0.65	0.514	-1.981273	.9920126
excellent	-6.431019***	.9440401	-6.81	0.000	-8.281838	-4.580199
good	-4.653332***	.8865186	-5.25	0.000	-6.391379	-2.915285
fair	-3.034558***	.6935334	-4.38	0.000	-4.394251	-1.674864
sc2	-1.259364*	.6988456	-1.80	0.072	-2.629472	.1107441
sc31	-.3438783	1.041891	-0.33	0.741	-2.386537	1.69878
sc32	-1.395529	1.163882	-1.20	0.231	-3.677356	.8862975
sc4	-.9024182	1.13365	-0.80	0.426	-3.124973	1.320136
sc5	-.1269256	1.19121	-0.11	0.915	-2.462329	2.208478
sc6	-1.730767	1.138124	-1.52	0.128	-3.962093	.5005596
_cons	11.49712**	4.622359	2.49	0.013	2.434844	20.55939

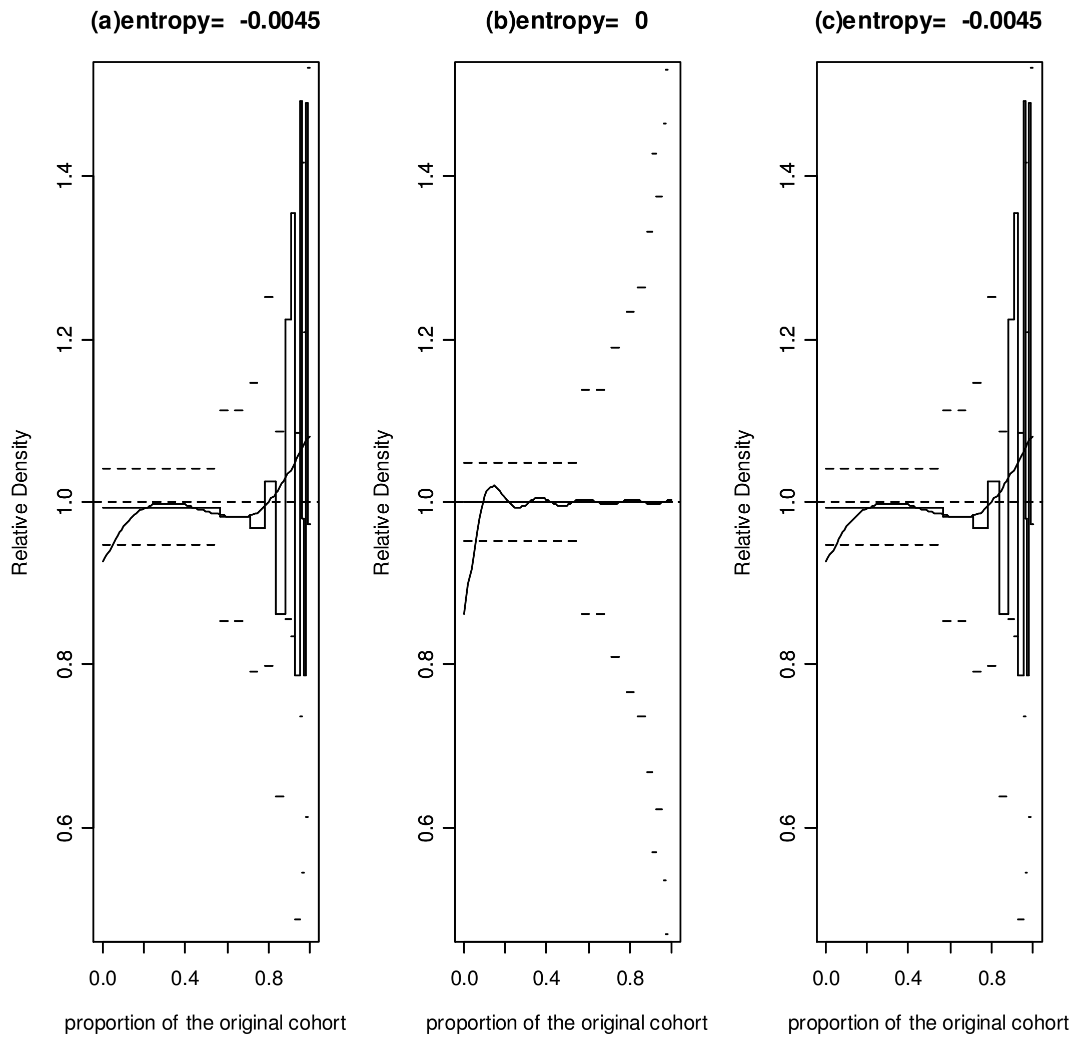
Appendix 4 Frequency of GHQ scores in 1997 and 2005

	1997			2005		
GHQ score	**Freq.**	**Percent**	**Cum.**	**Freq.**	**Percent**	**Cum.**
0	3,242	56.43	56.43	2,716	64.34	64.34
1	786	13.68	70.11	498	11.8	76.14
2	496	8.63	78.75	255	6.04	82.18
3	293	5.1	83.85	172	4.07	86.26
4	216	3.76	87.61	130	3.08	89.34
5	170	2.96	90.57	99	2.35	91.68
6	124	2.16	92.72	85	2.01	93.7
7	98	1.71	94.43	49	1.16	94.86
8	81	1.41	95.84	46	1.09	95.95
9	73	1.27	97.11	51	1.21	97.16
10	67	1.17	98.28	41	0.97	98.13
11	51	0.89	99.16	33	0.78	98.91
12	48	0.84	100	46	1.09	100
Total	5,745	100		4,221	100	

Appendix 5 Relative distributions results

The relative distributions results included in the thesis are year by year comparisons of non-truncated samples for both male and female, male only and female only; male-female comparisons within the years 1991, 1997 and 2005 for non-truncated samples, samples truncated at GHQ score of 0 and samples truncated at GHQ score of 2.

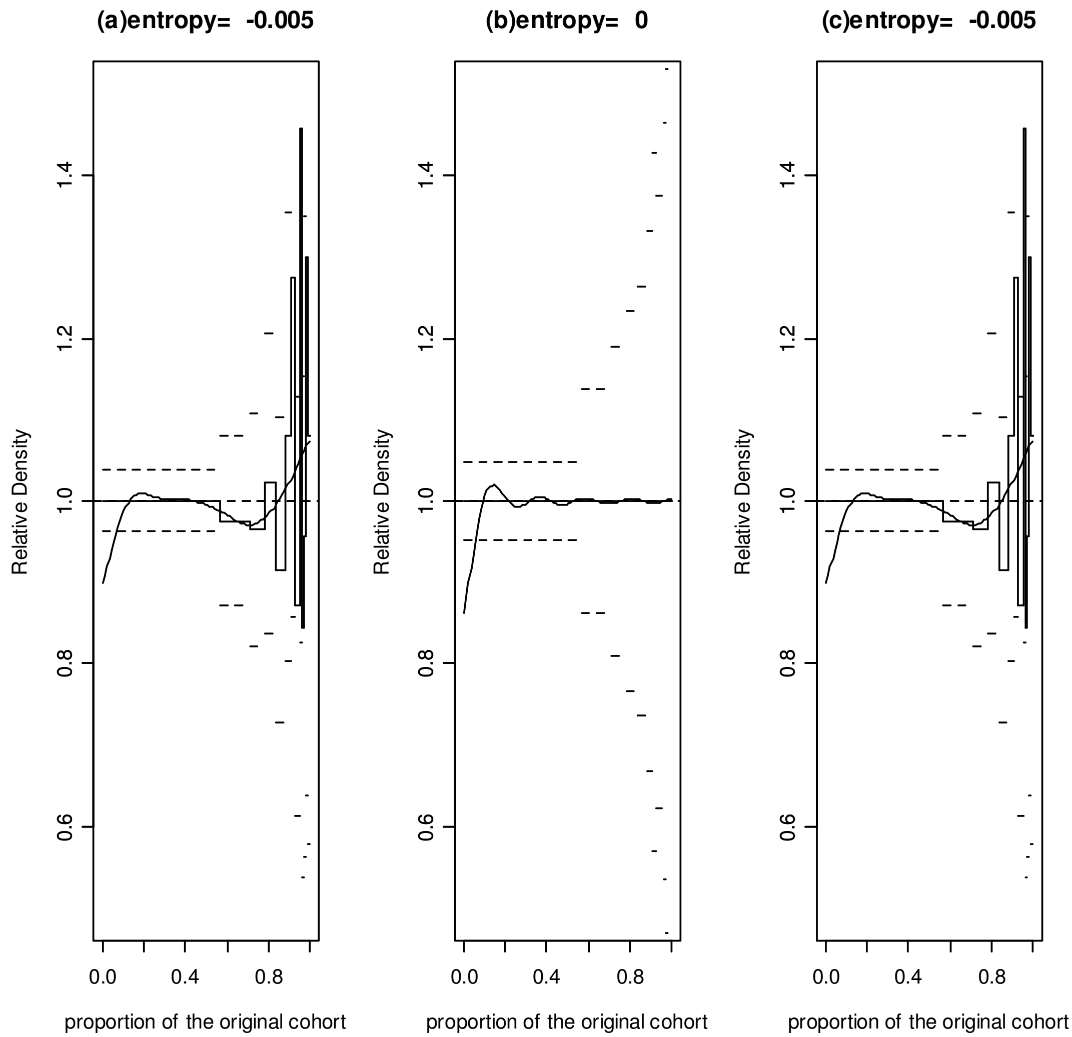
91-92 Total



Entropy	Estimate
Overall change	-0.0045
Median effect	0
Shape effect	-0.0045

Polarization index	Estimate	95% CI	p-value
Median index	-0.283	-0.314 - -0.253	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.283	-0.344 - -0.223	0.000

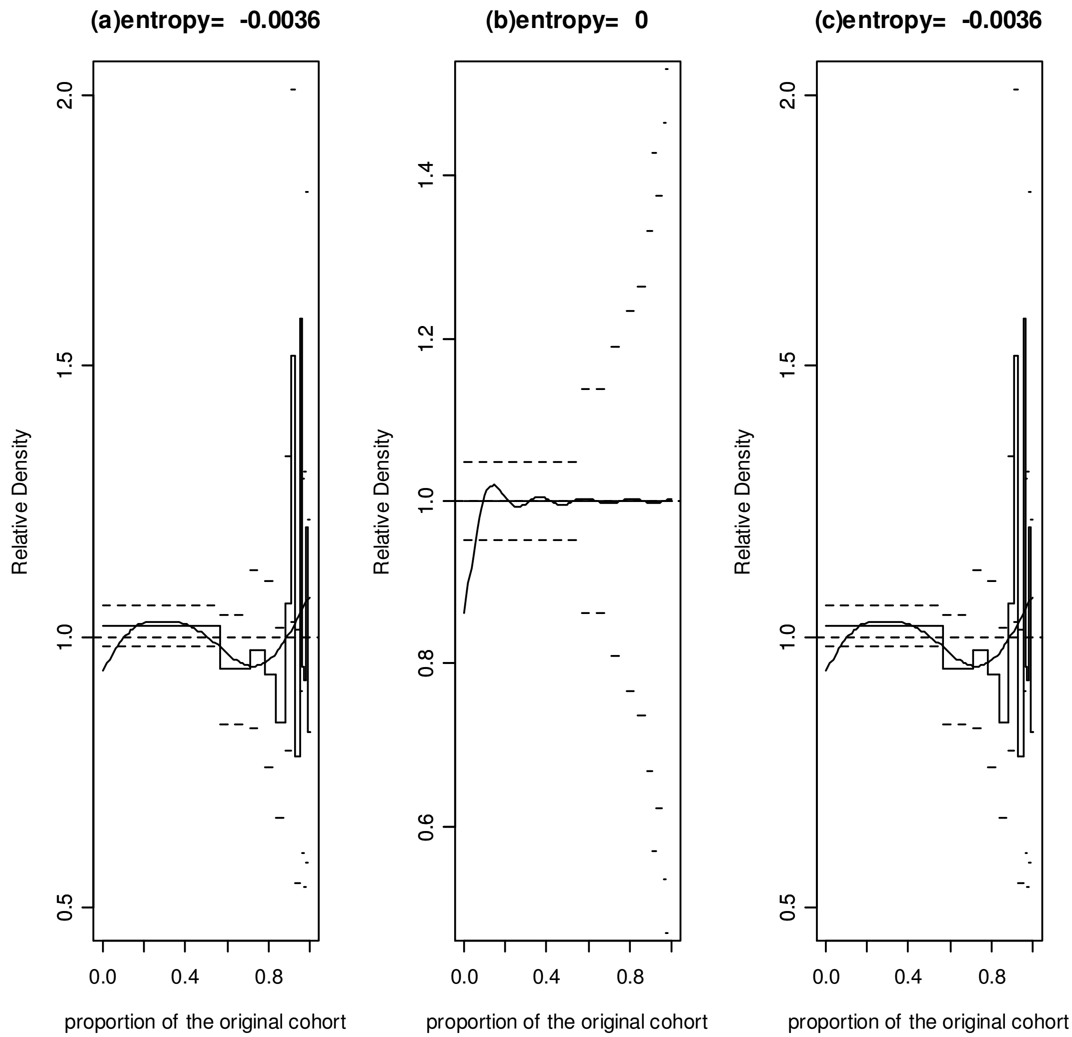
91-93



Entropy	Estimate
Overall change	-0.005
Median effect	0
Shape effect	-0.005

Polarization index	Estimate	95% CI	p-value
Median index	-0.287	-0.312 - -0.263	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.287	-0.336 - -0.239	0.000

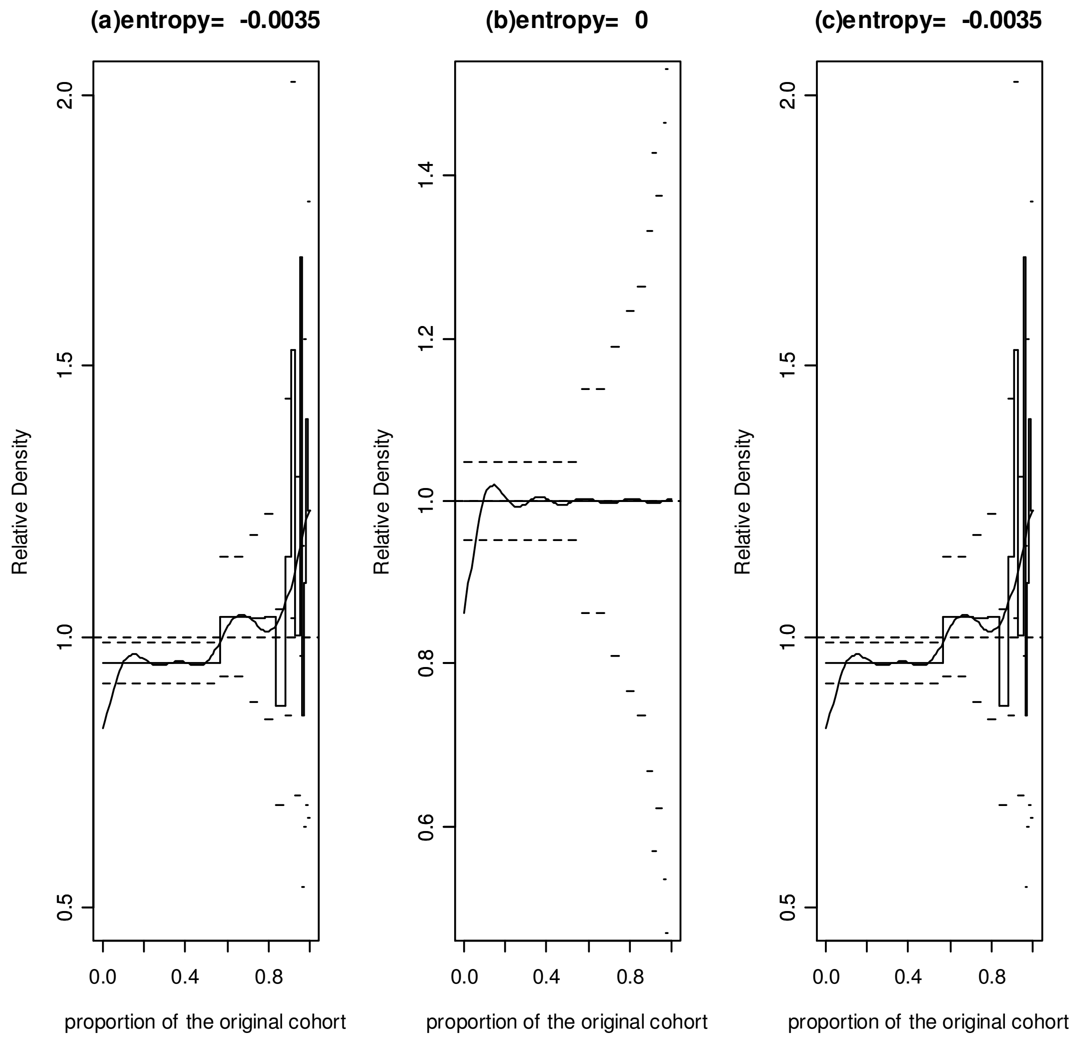
91-94



Entropy	Estimate		
Overall change	-0.0036		
Median effect	0		
Shape effect	-0.0036		

Polarization index	Estimate	95% CI	p-value
Median index	-0.298	-0.322 - -0.274	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.298	-0.346 - -0.250	0.000

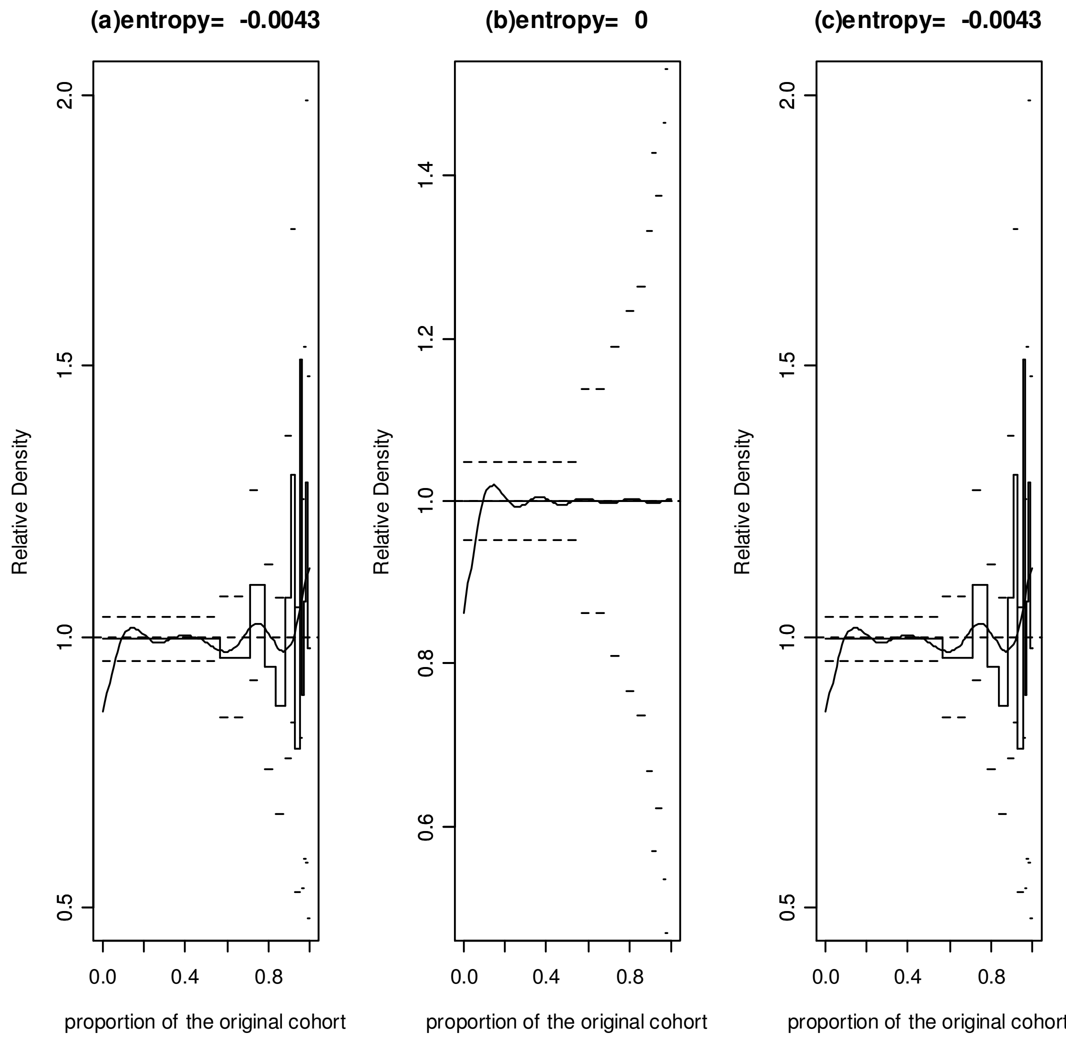
91-95



Entropy	Estimate
Overall change	-0.0035
Median effect	0
Shape effect	-0.0035

Polarization index	Estimate	95% CI	p-value
Median index	-0.256	-0.282 - -0.231	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.256	-0.307 - -0.205	0.000

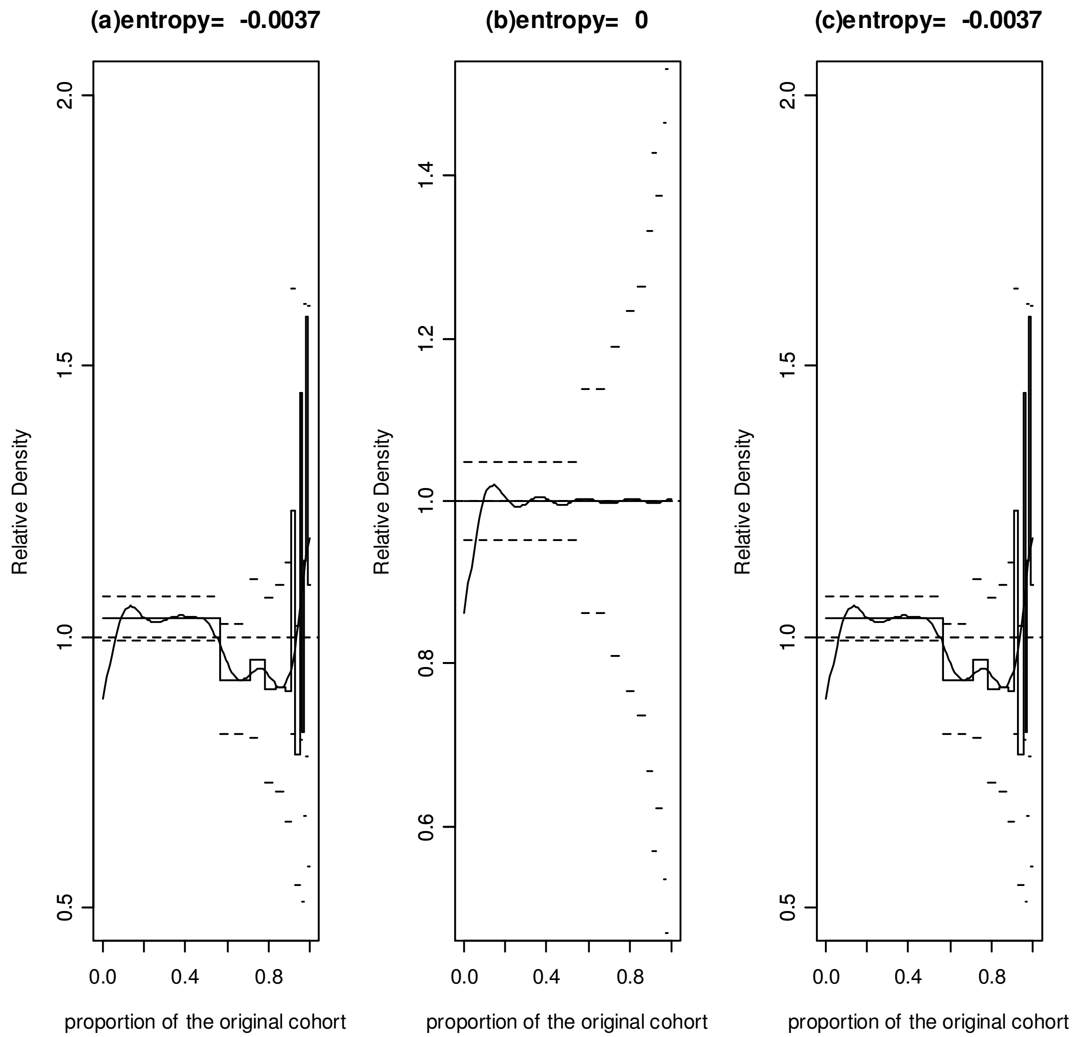
91-97



Entropy	Estimate
Overall change	-0.0043
Median effect	0
Shape effect	-0.0043

Polarization index	Estimate	95% CI	p-value
Median index	-0.286	-0.313 - -0.259	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.286	-0.340 - -0.233	0.000

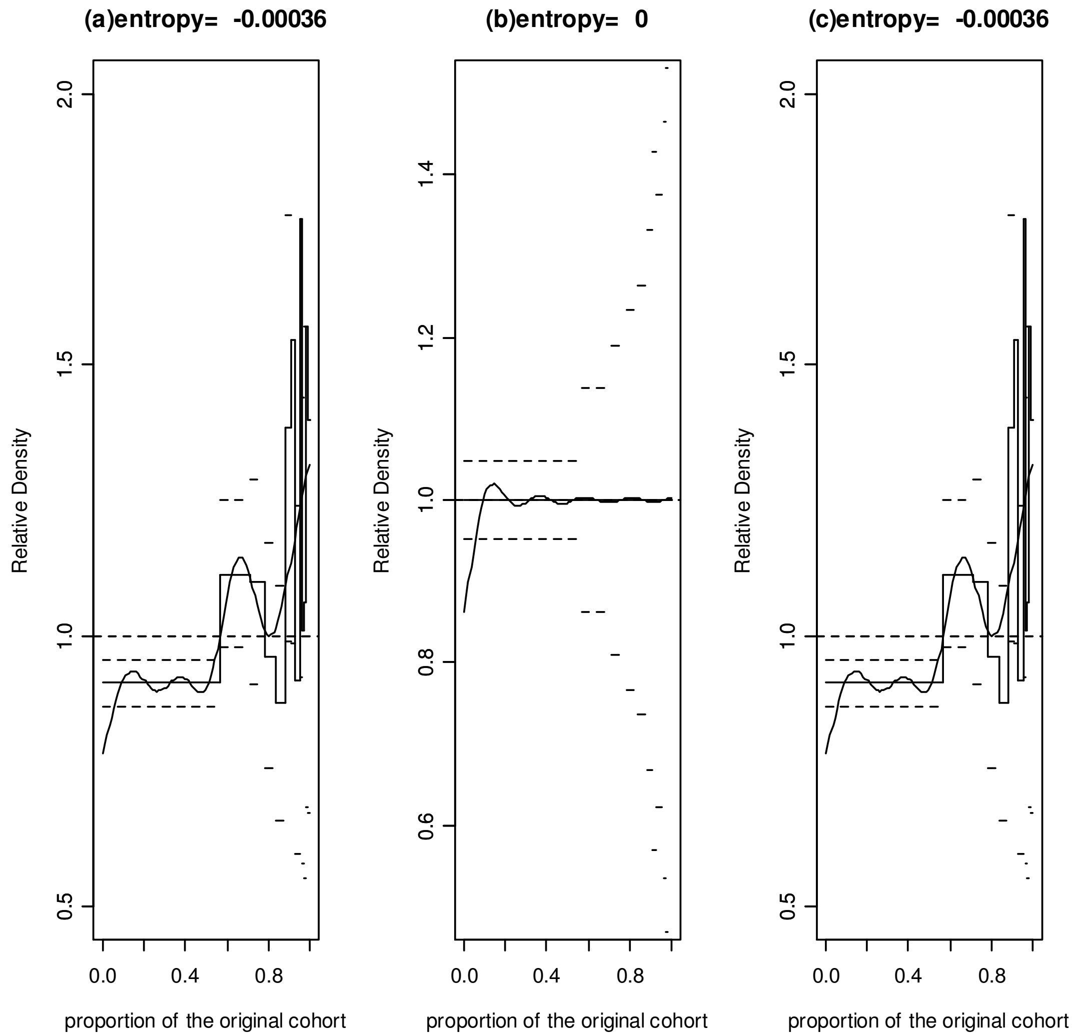
91-98



Entropy	Estimate
Overall change	-0.0037
Median effect	0
Shape effect	-0.0037

Polarization index	Estimate	95% CI	p-value
Median index	-0.304	-0.328 - -0.280	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.304	-0.352 - -0.257	0.000

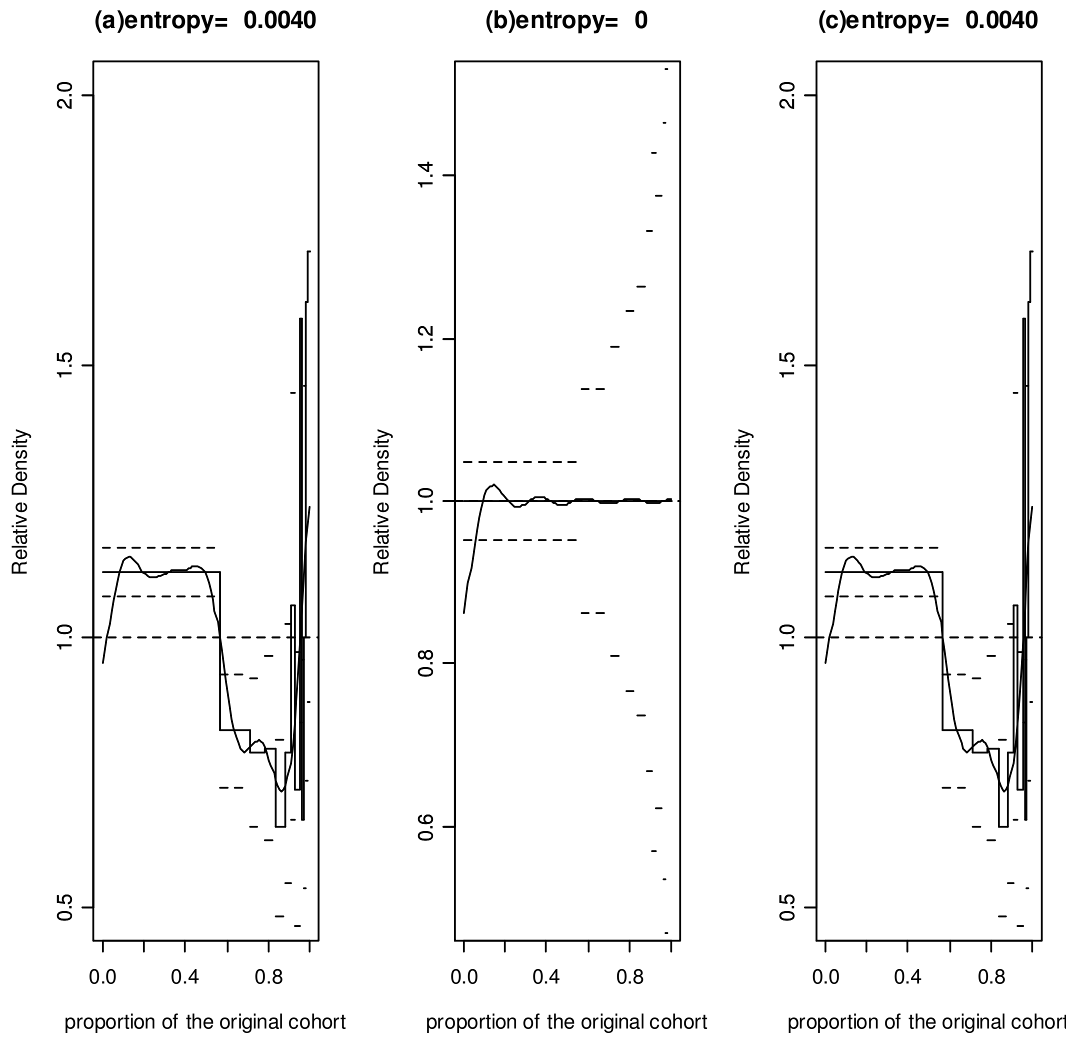
91-99



Entropy	Estimate
Overall change	-0.00036
Median effect	0
Shape effect	-0.00036

Polarization index	Estimate	95% CI	p-value
Median index	-0.235	-0.266- -0.204	0.000
Lower index	NaN	NaN	NaN
Upper index	-2.35e-01	-2.97e-01- -1.73e-01	5.10e-14

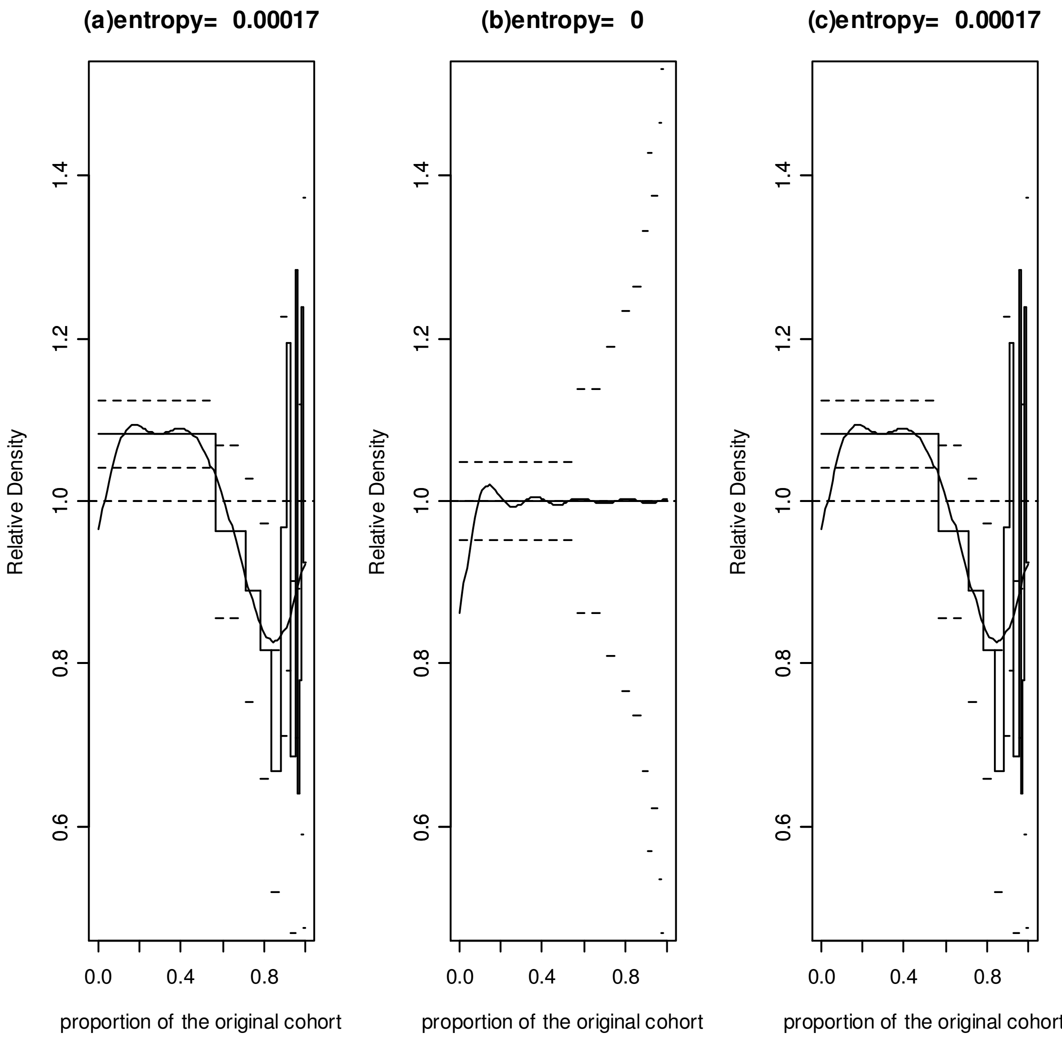
91-00



Entropy	Estimate
Overall change	0.0040
Median effect	0
Shape effect	0.0040

Polarization index	Estimate	95% CI	p-value
Median index	-0.350	-0.374- -0.326	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.350	-0.398- -0.301	0.000

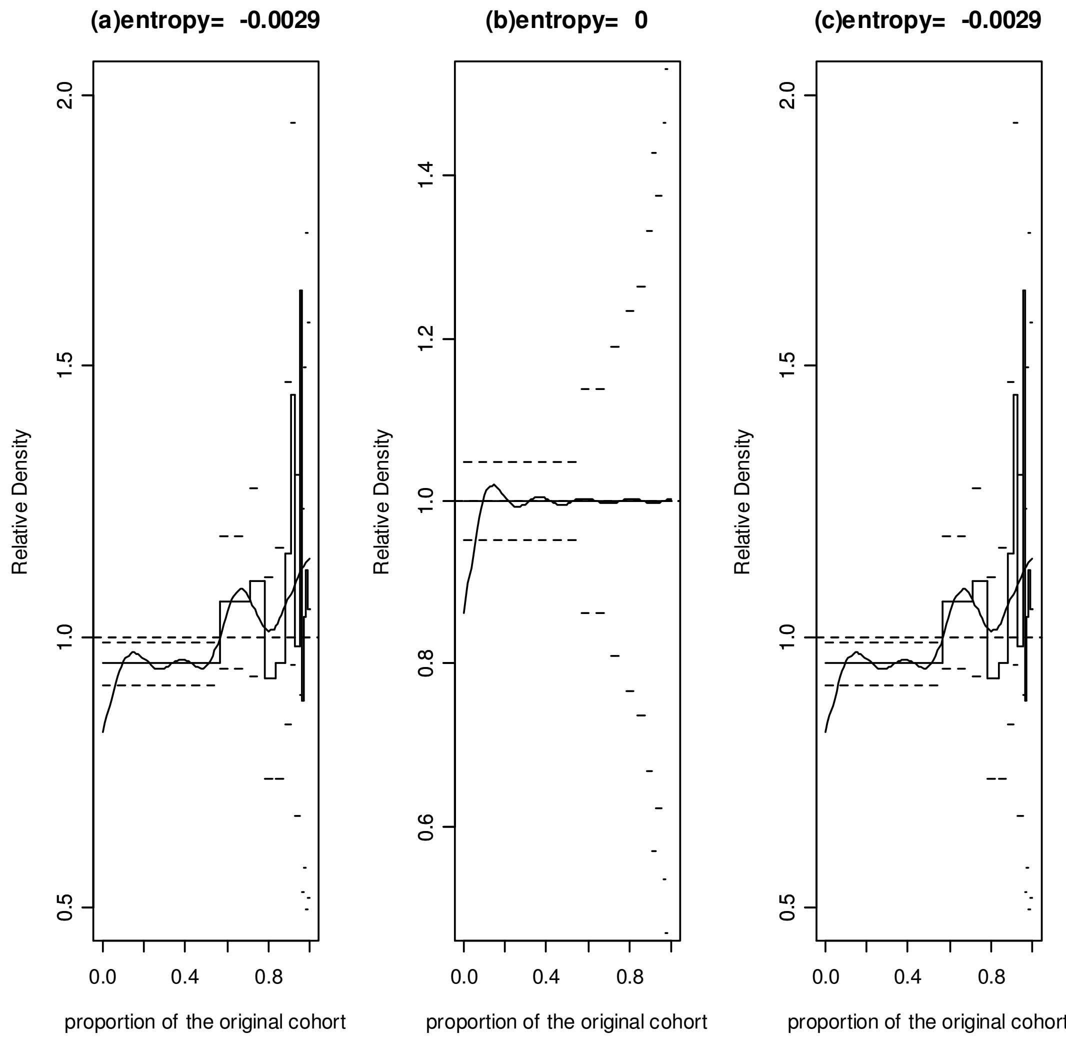
91-01



Entropy	Estimate
Overall change	0.00017
Median effect	0
Shape effect	0.00017

Polarization index	Estimate	95% CI	p-value
Median index	-0.345	-0.368- -0.322	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.345	-0.391- -0.299	0.000

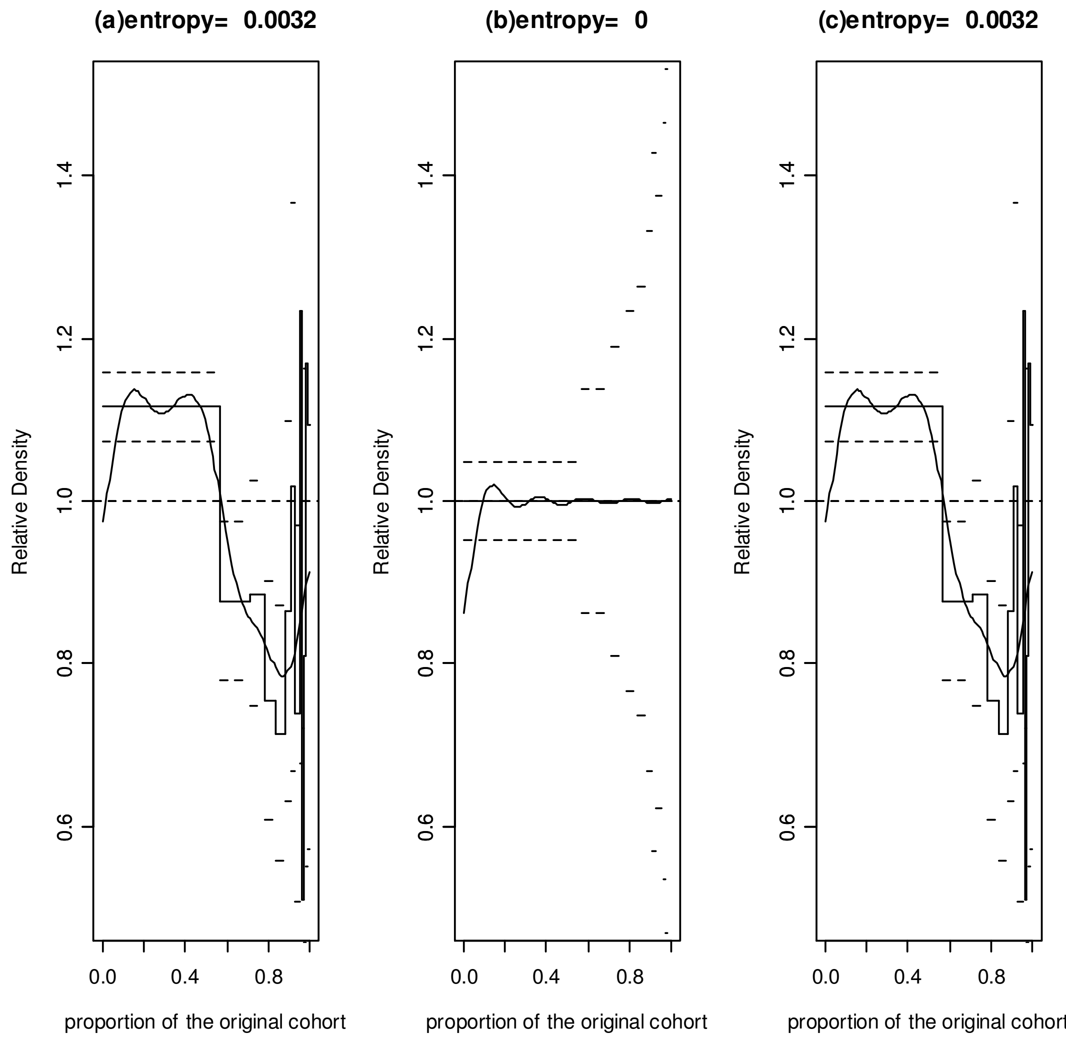
91-02



Entropy	Estimate
Overall change	-0.0029
Median effect	0
Shape effect	-0.0029

Polarization index	Estimate	95% CI	p-value
Median index	-0.261	-0.289- -0.233	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.261	-0.317- -0.206	0.000

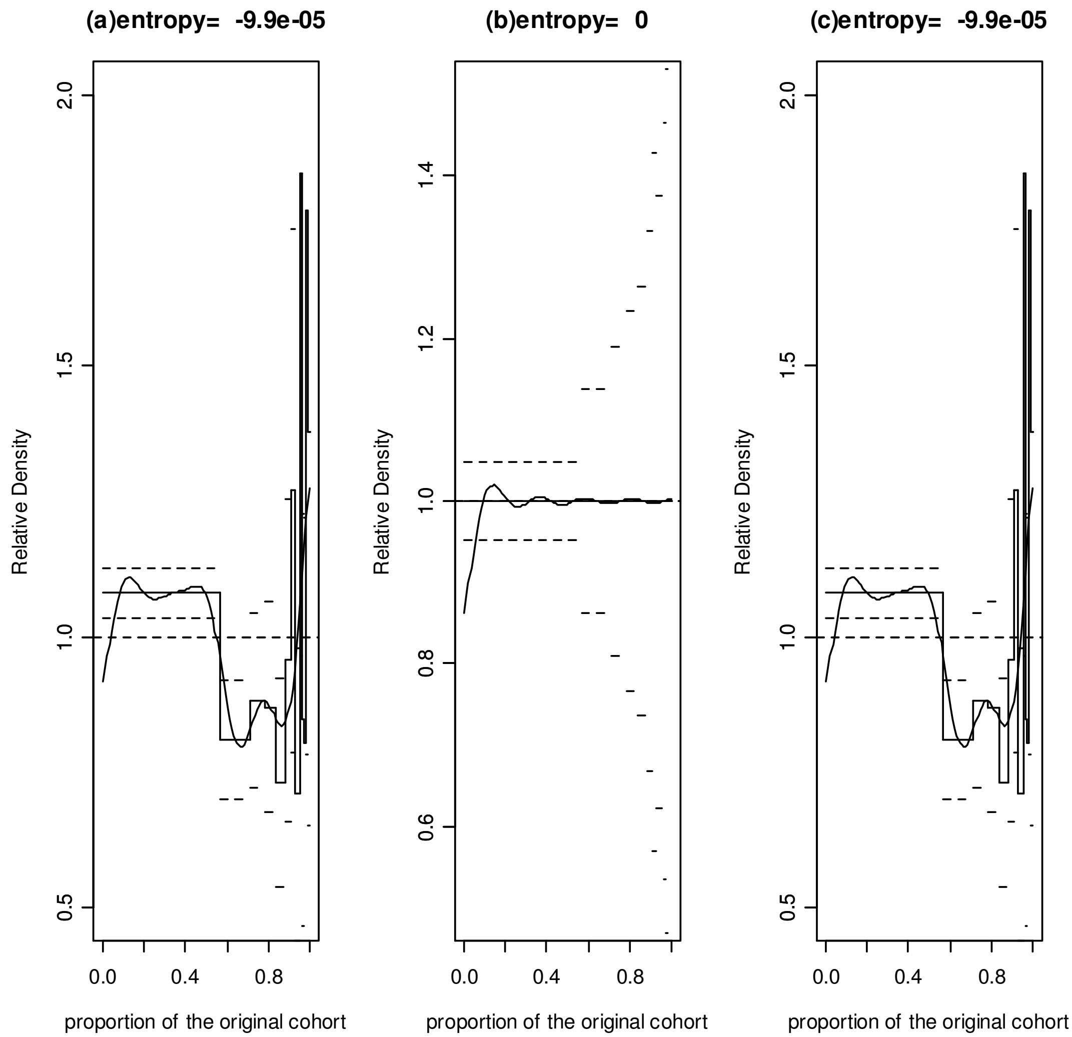
91-03



Entropy	Estimate
Overall change	0.0032
Median effect	0
Shape effect	0.0032

Polarization index	Estimate	95% CI	p-value
Median index	-0.361	-0.384- -0.339	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.361	-0.406- -0.317	0.000

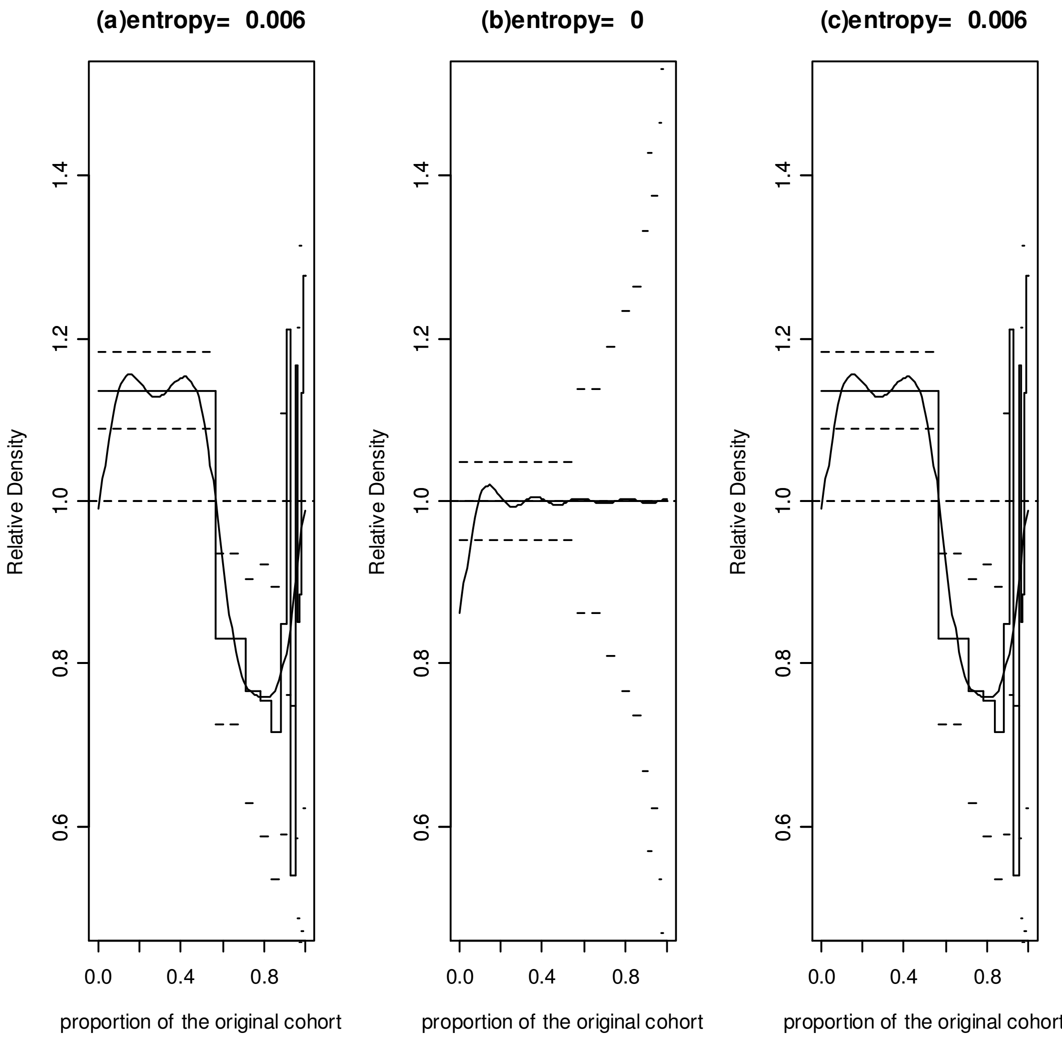
91-04



Entropy	Estimate		
Overall change	-9.9e-05		
Median effect	0		
Shape effect	-9.9e-05		

Polarization index	Estimate	95% CI	p-value
Median index	-0.322	-0.350- -0.295	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.322	-0.377- -0.268	0.000

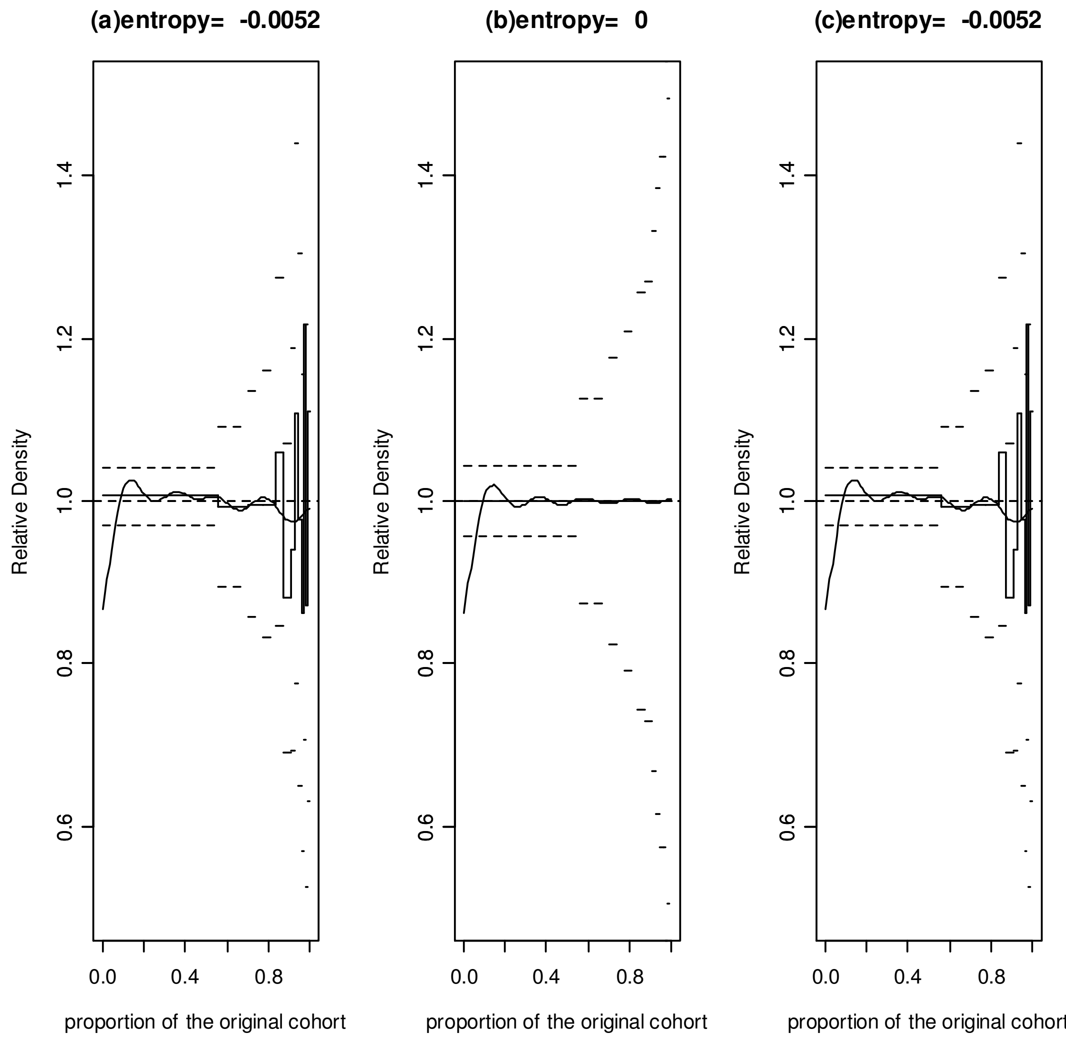
91-05



Entropy	Estimate
Overall change	0.006
Median effect	0
Shape effect	0.006

Polarization index	Estimate	95% CI	p-value
Median index	-0.365	-0.390- -0.341	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.365	-0.414- -0.316	0.000

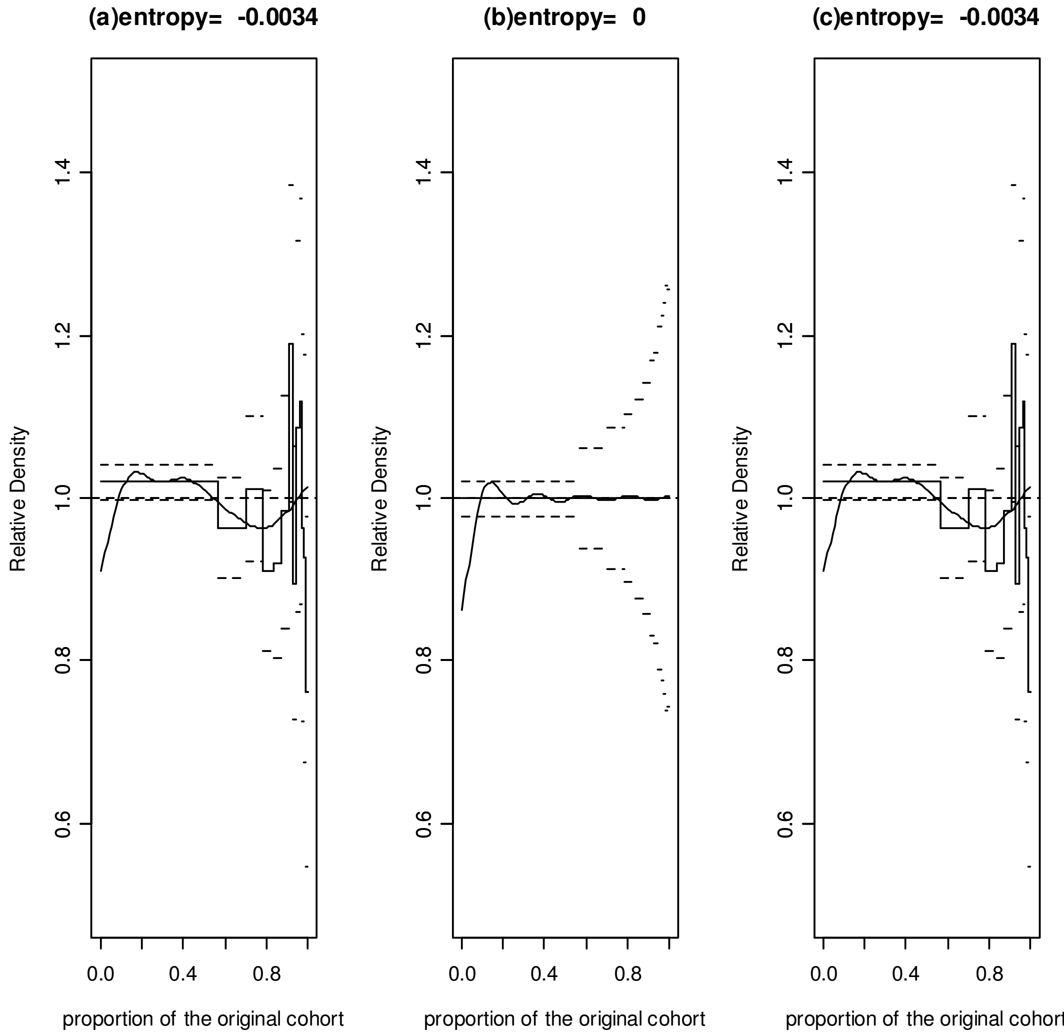
92-93



Entropy	Estimate
Overall change	-0.0052
Median effect	0
Shape effect	-0.0052

Polarization index	Estimate	95% CI	p-value
Median index	-0.305	-0.328- -0.282	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.305	-0.350- -0.260	0.000

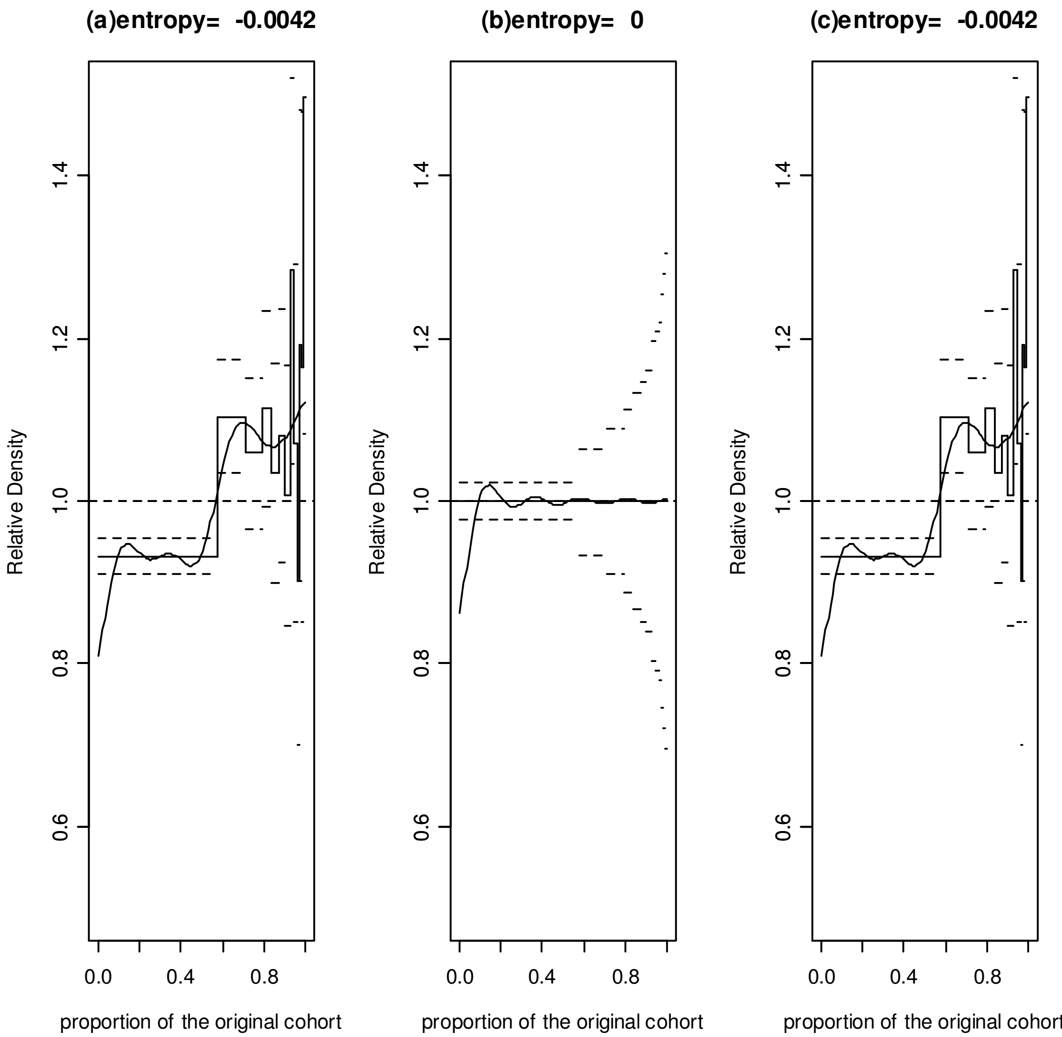
93-94



Entropy	Estimate
Overall change	-0.0034
Median effect	0
Shape effect	-0.0034

Polarization index	Estimate	95% CI	p-value
Median index	-0.304	-0.318- -0.290	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.304	-0.332- -0.276	0.000

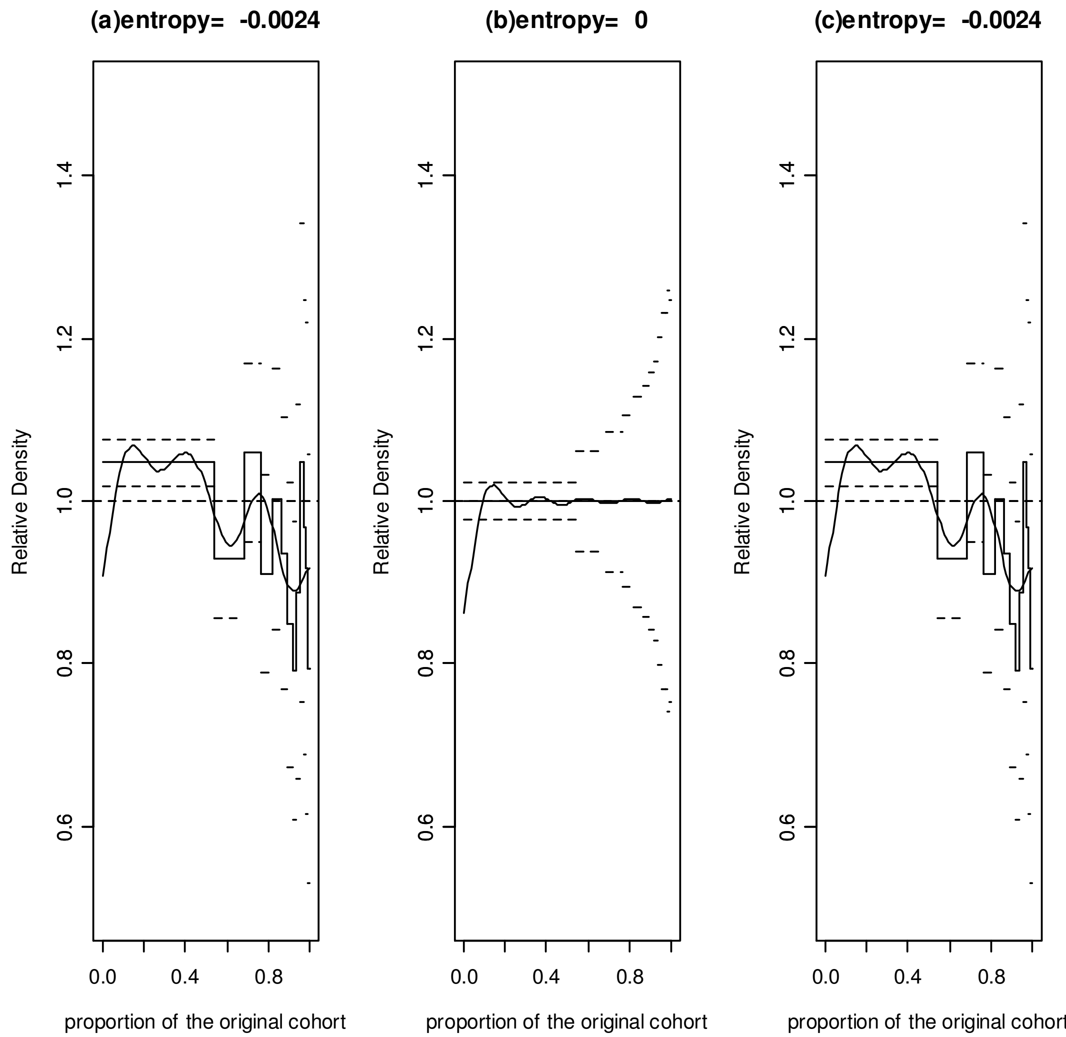
94-95



Entropy	Estimate
Overall change	-0.0042
Median effect	0
Shape effect	-0.0042

Polarization index	Estimate	95% CI	p-value
Median index	-0.232	-0.247- -0.217	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.232	-0.261- -0.202	0.000

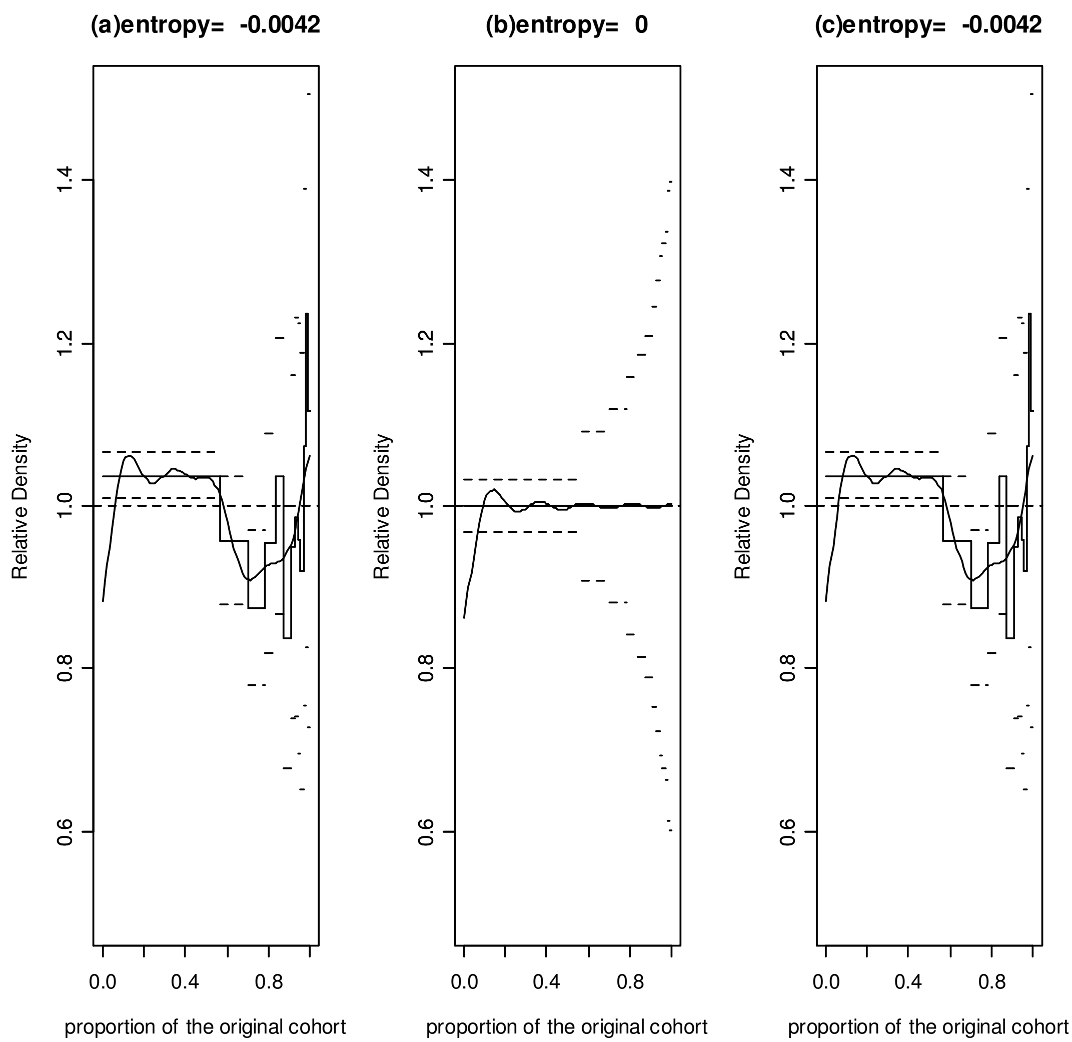
95-97



Entropy	Estimate
Overall change	-0.0024
Median effect	0
Shape effect	-0.0024

Polarization index	Estimate	95% CI	p-value
Median index	-0.379	-0.398- -0.360	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.379	-0.416- -0.342	0.000

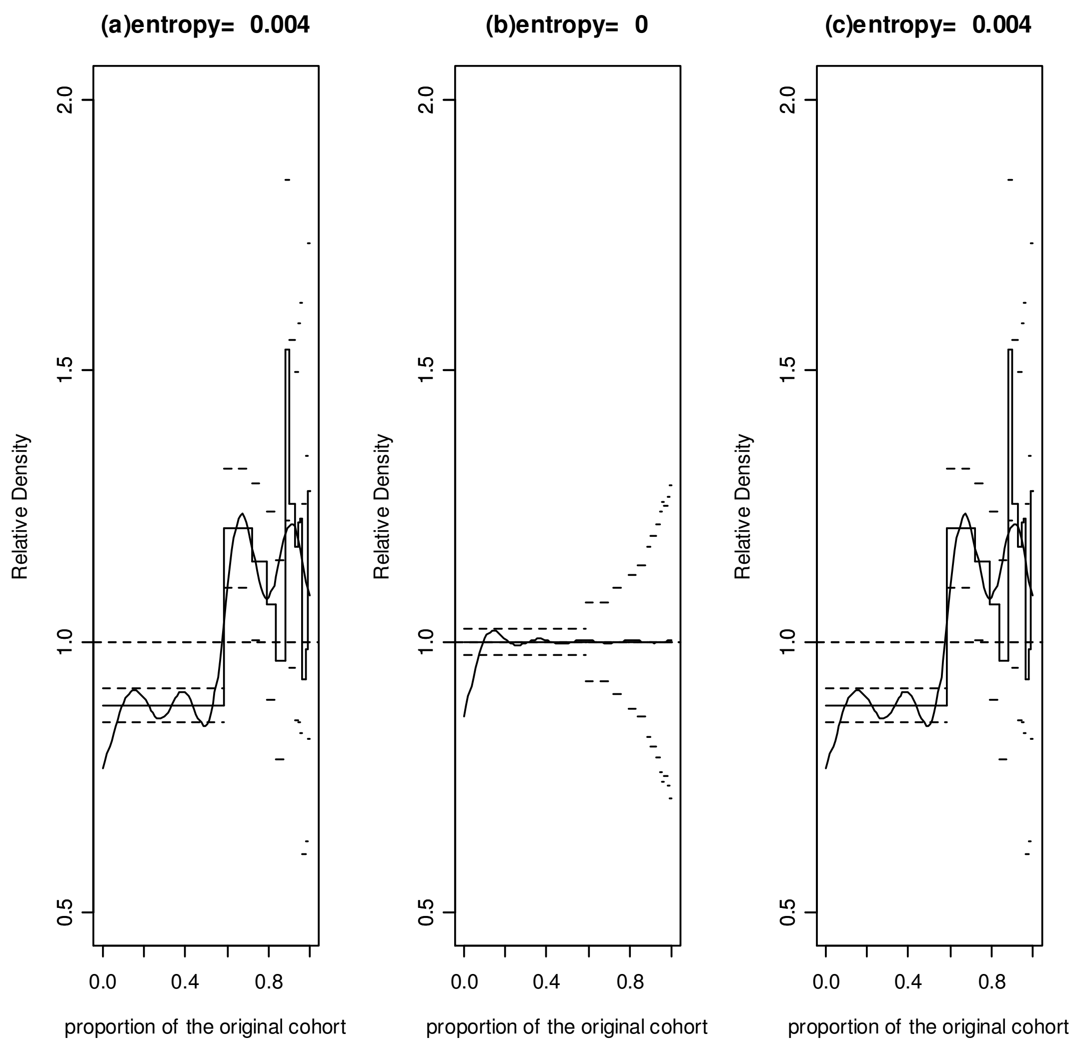
97-98



Entropy	Estimate
Overall change	-0.0042
Median effect	0
Shape effect	-0.0042

Polarization index	Estimate	95% CI	p-value
Median index	-0.316	-0.334- -0.298	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.316	-0.352- -0.280	0.000

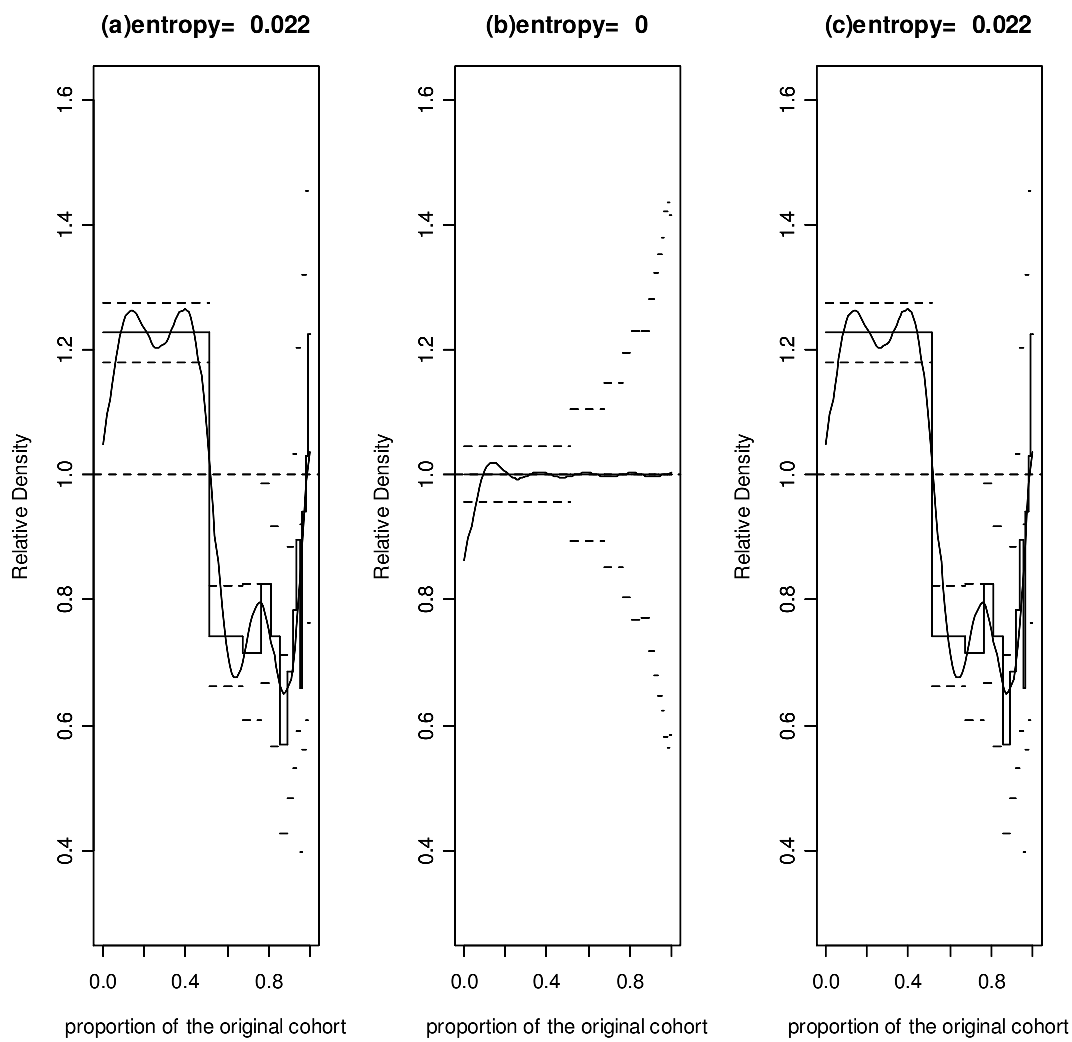
98-99



Entropy	Estimate
Overall change	0.004
Median effect	0
Shape effect	0.004

Polarization index	Estimate	95% CI	p-value
Median index	-0.192	-0.214- -0.170	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.192	-0.235- -0.149	0.000

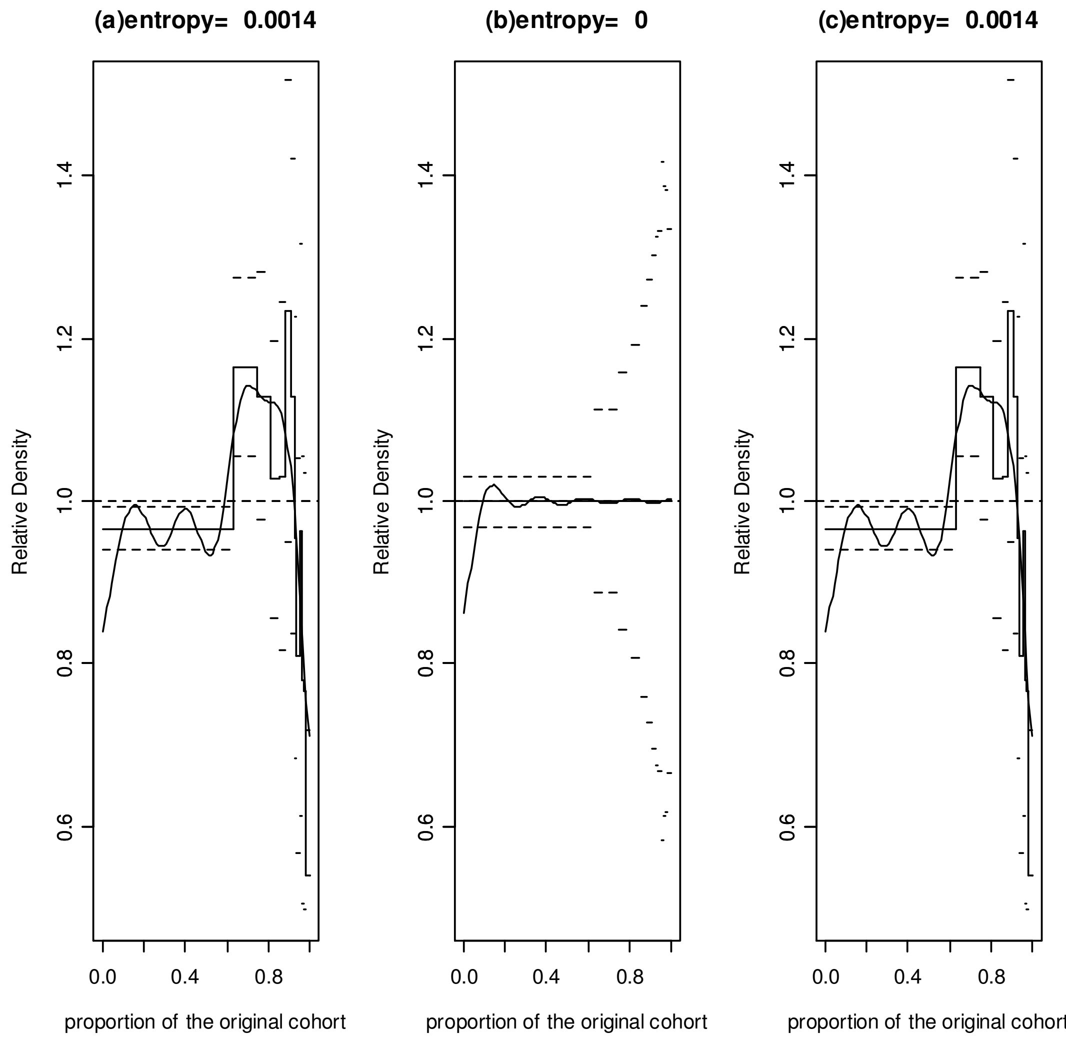
99-00



Entropy	Estimate
Overall change	0.022
Median effect	0
Shape effect	0.022

Polarization index	Estimate	95% CI	p-value
Median index	-0.512	-0.535- -0.489	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.512	-0.559- -0.465	0.000

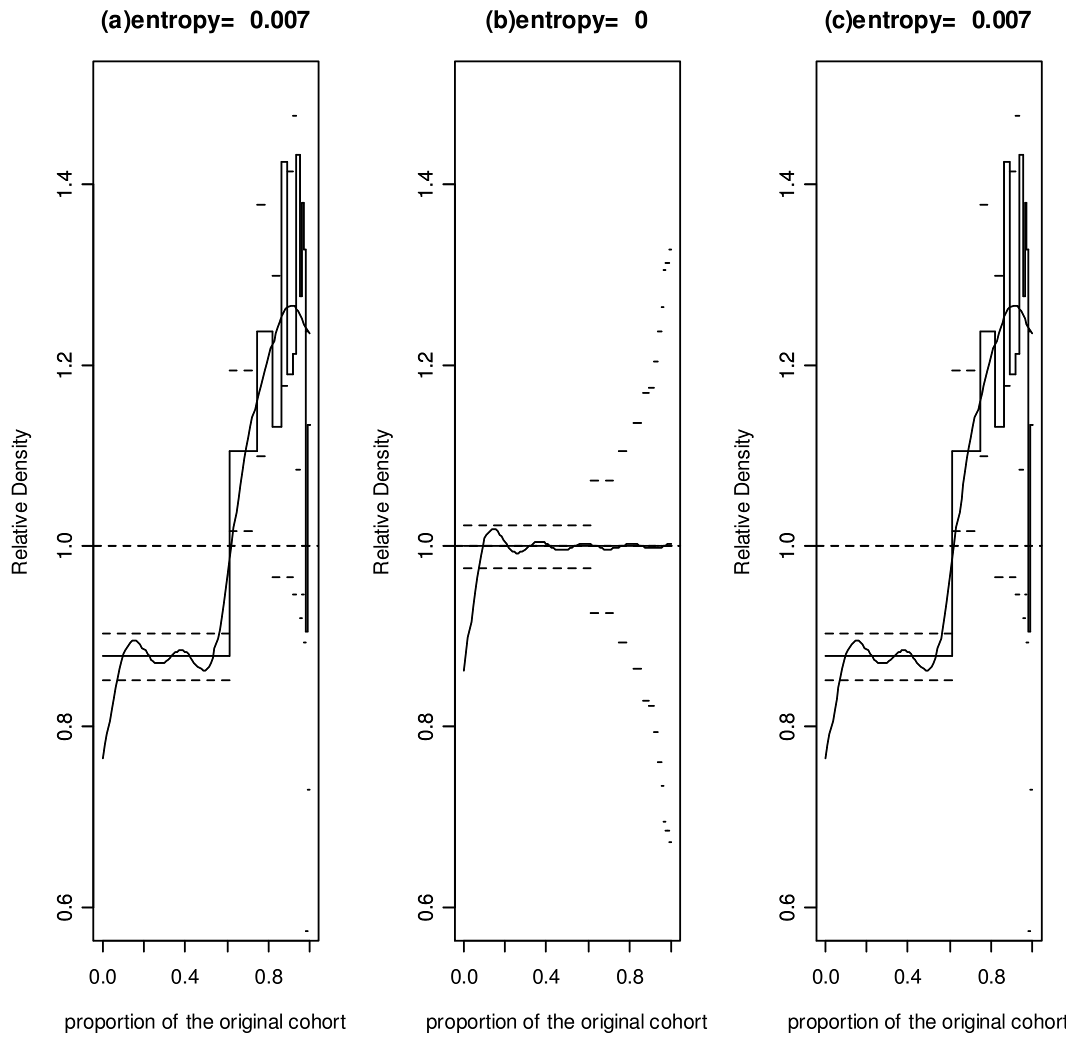
00-01



Entropy	Estimate		
Overall change	0.0014		
Median effect	0		
Shape effect	0.0014		

Polarization index	Estimate	95% CI	p-value
Median index	-0.149	-0.166- -0.131	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.149	-0.183- -0.114	0.000

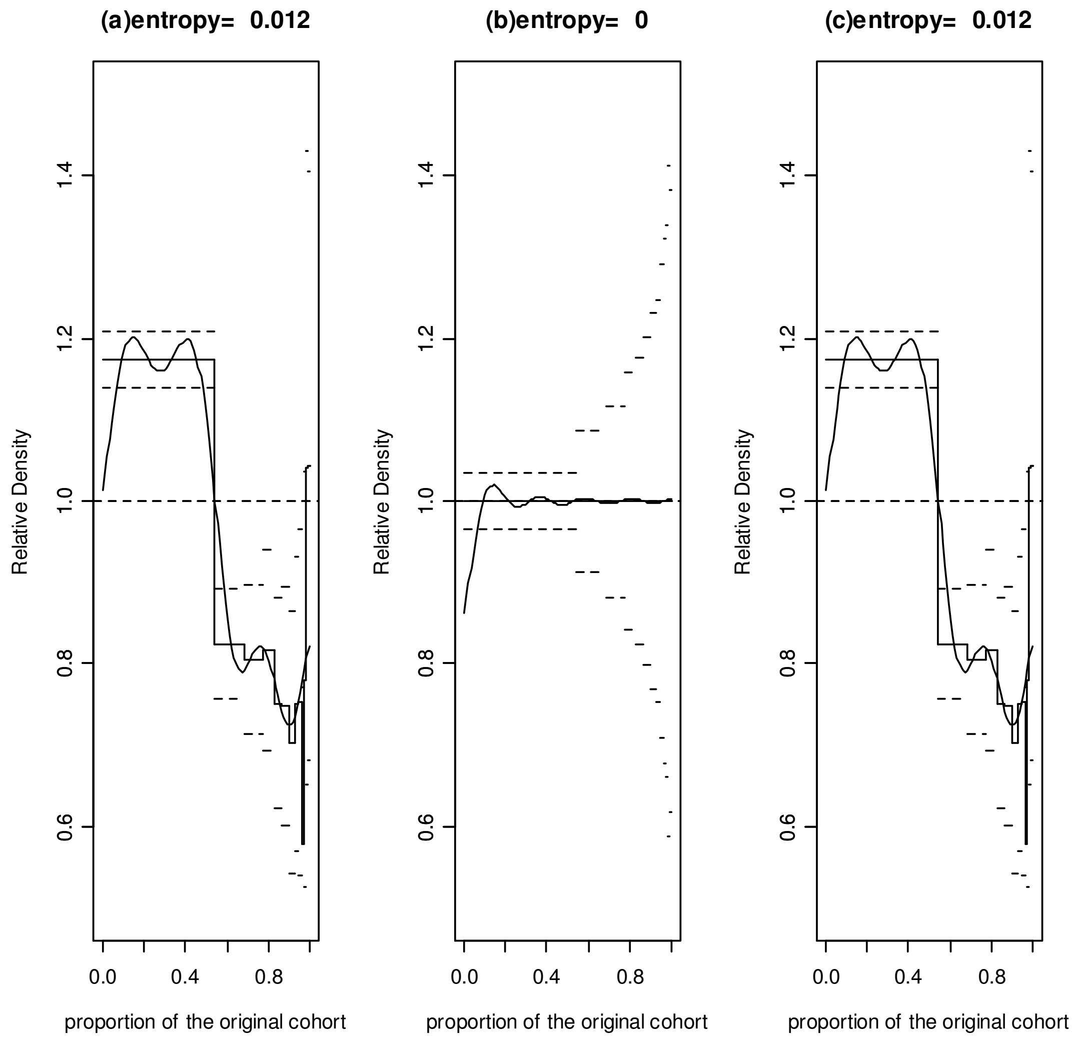
01-02



Entropy	Estimate
Overall change	0.007
Median effect	0
Shape effect	0.007

Polarization index	Estimate	95% CI	p-value
Median index	-0.1165	-0.1344- -0.0986	0.000
Lower index	NaN	NaN	NaN
Upper index	-1.16e-01	-1.52e-01- -8.06e-02	9.58e-11

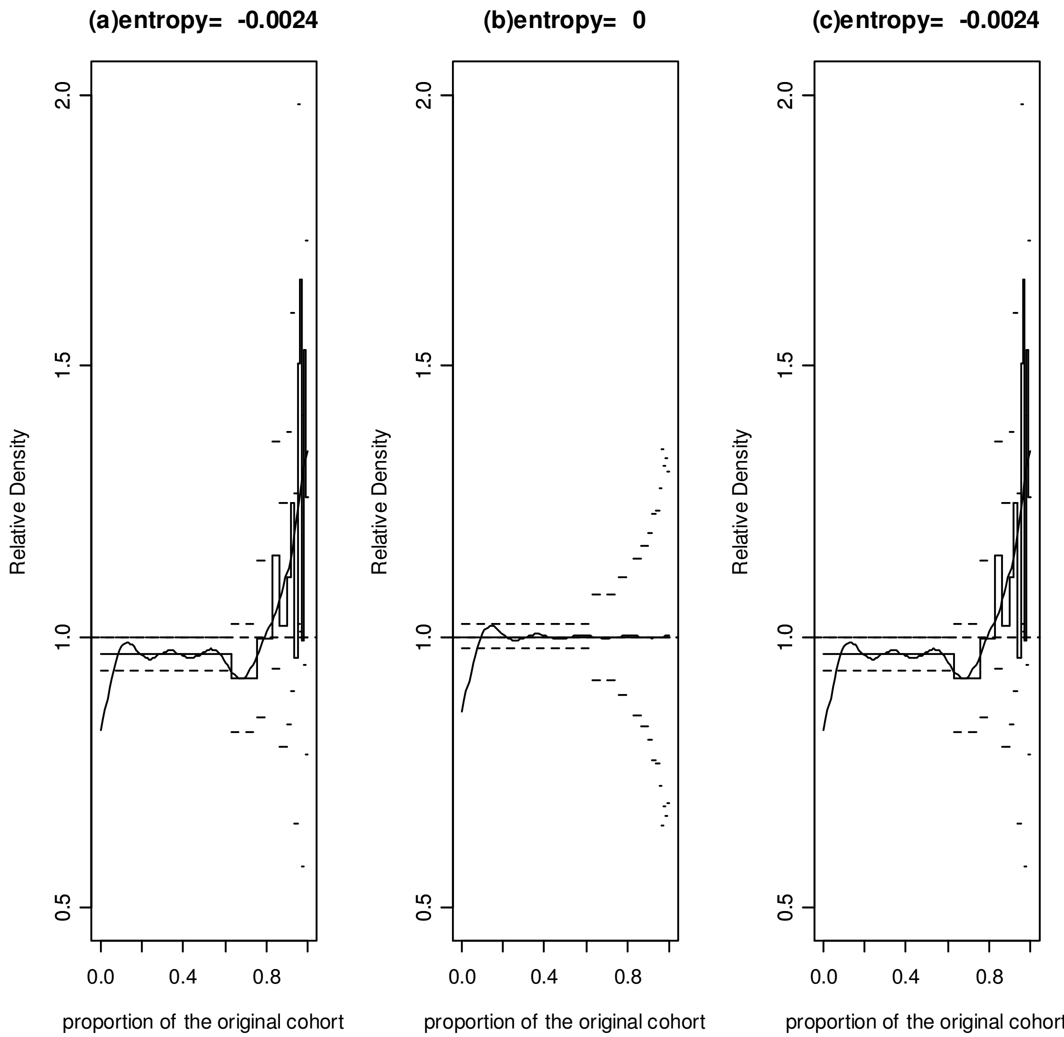
02-03



Entropy	Estimate
Overall change	0.012
Median effect	0
Shape effect	0.012

Polarization index	Estimate	95% CI	p-value
Median index	-0.452	-0.469- -0.434	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.452	-0.487- -0.417	0.000

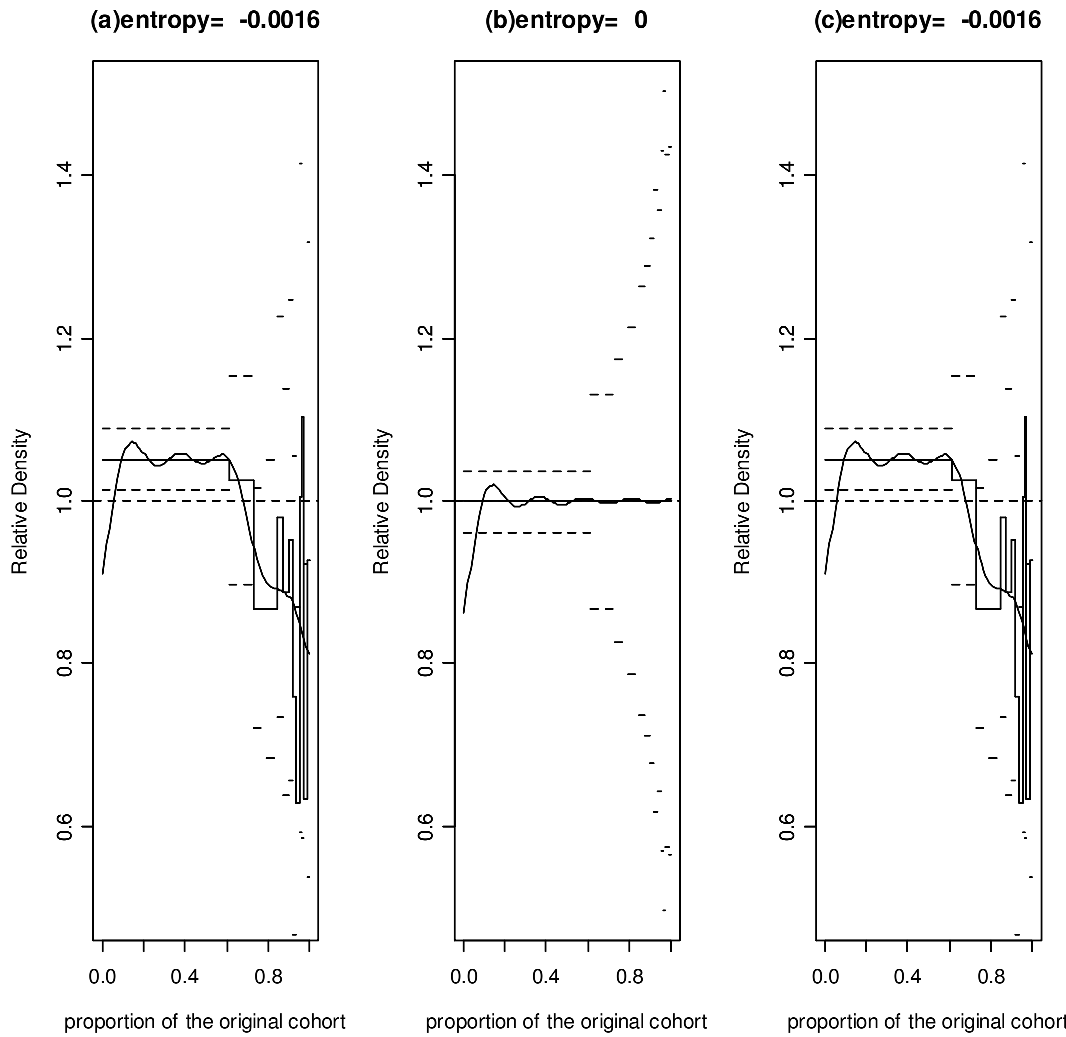
03-04



Entropy	Estimate
Overall change	-0.0024
Median effect	0
Shape effect	-0.0024

Polarization index	Estimate	95% CI	p-value
Median index	-0.1189	-0.1380--0.0998	0.000
Lower index	NaN	NaN	NaN
Upper index	-1.19e-01	-1.57e-01- -8.07e-02	5.12e-10

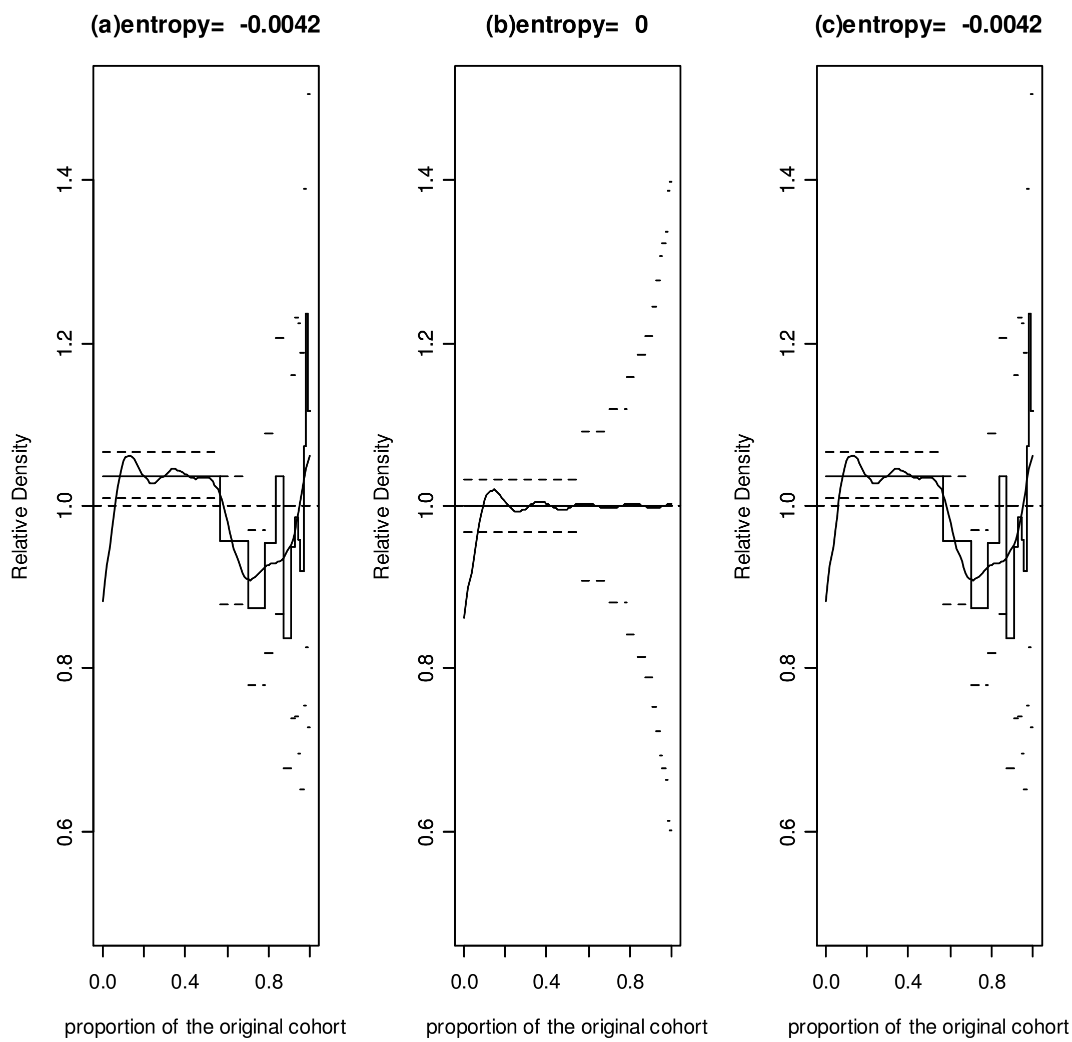
04-05



Entropy	Estimate
Overall change	-0.0016
Median effect	0
Shape effect	-0.0016

Polarization index	Estimate	95% CI	p-value
Median index	-0.241	-0.262- -0.220	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.241	-0.283- -0.199	0.000

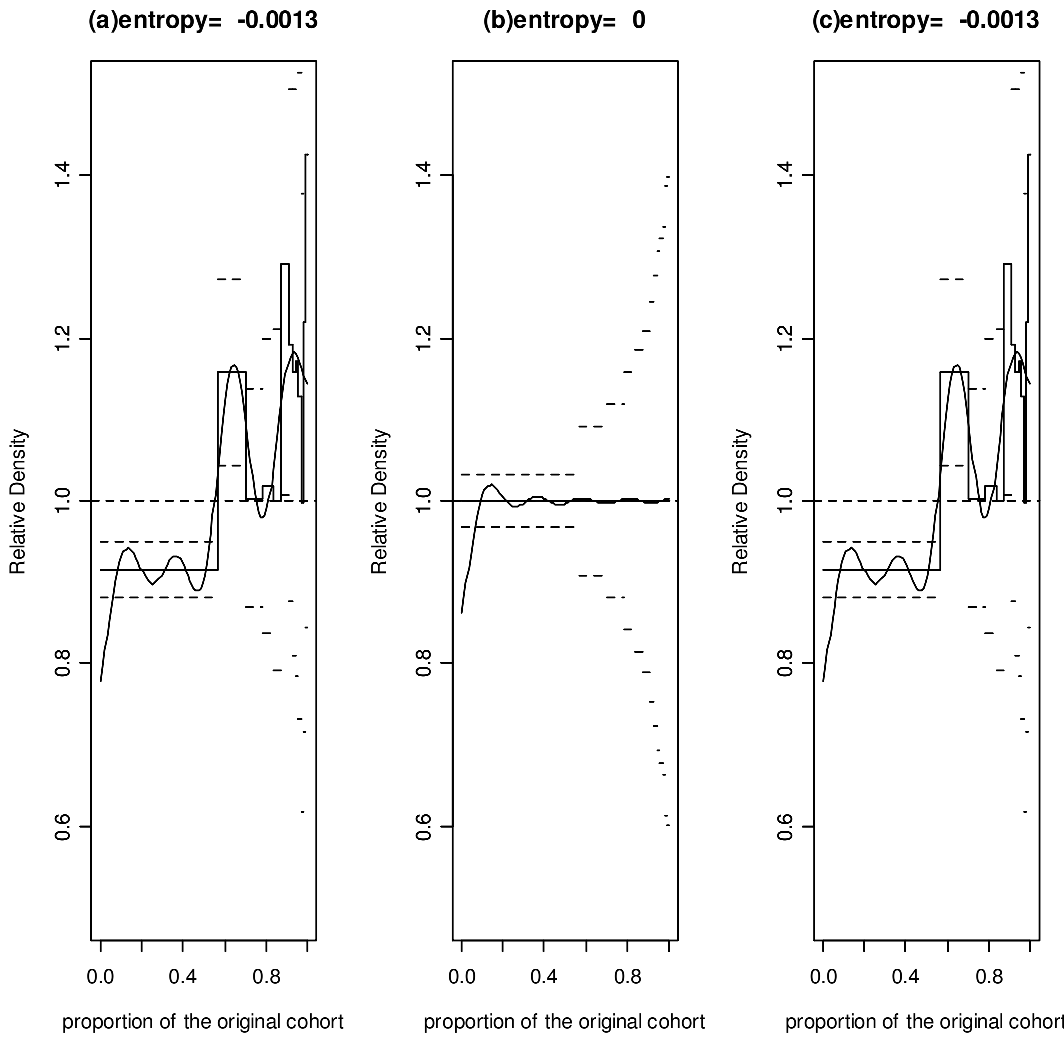
97-98



Entropy	Estimate
Overall change	-0.0042
Median effect	0
Shape effect	-0.0042

Polarization index	Estimate	95% CI	p-value
Median index	-0.316	-0.334- -0.298	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.316	-0.352- -0.280	0.000

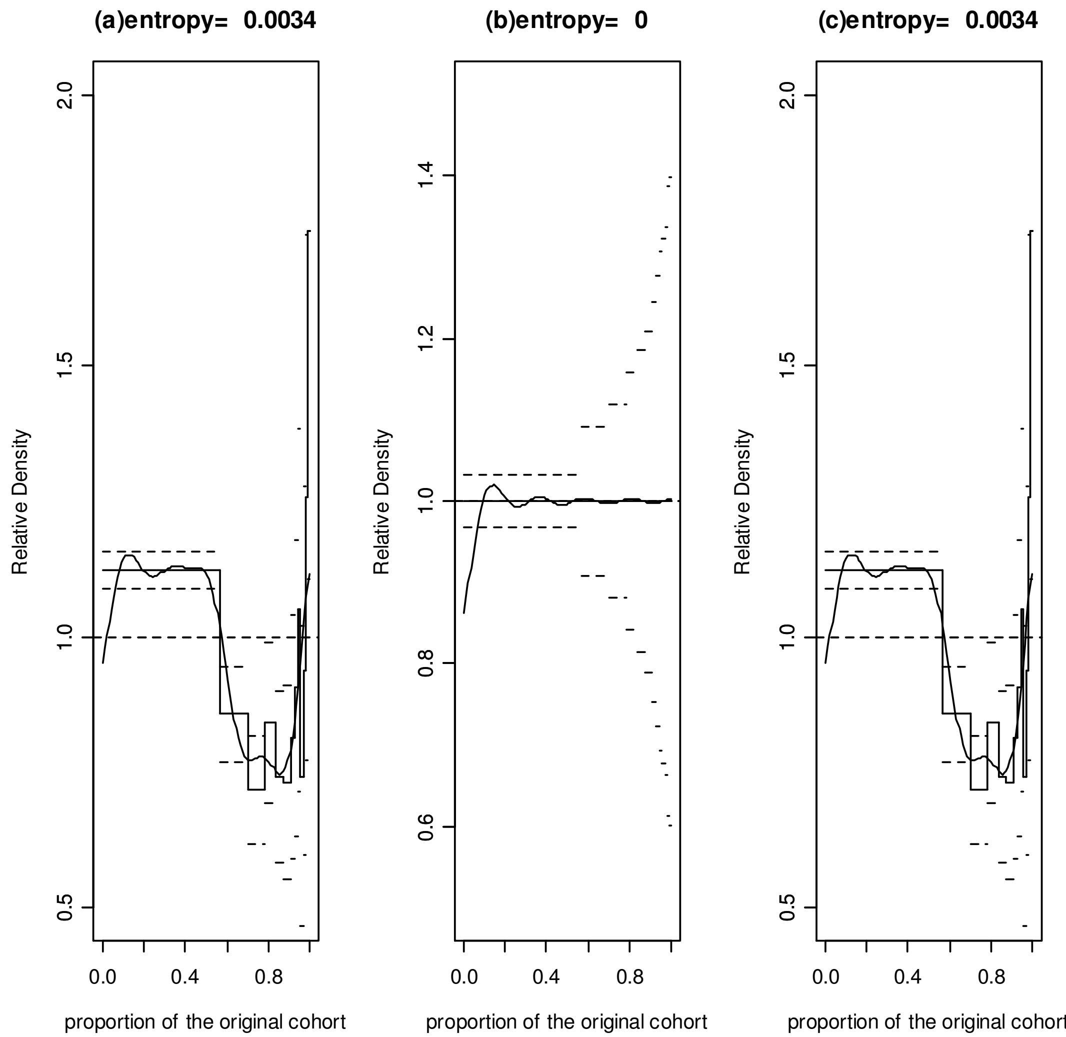
97-99



Entropy	Estimate		
Overall change	-0.0013		
Median effect	0		
Shape effect	-0.0013		

Polarization index	Estimate	95% CI	p-value
Median index	-0.247	-0.272- -0.222	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.247	-0.297- -0.198	0.000

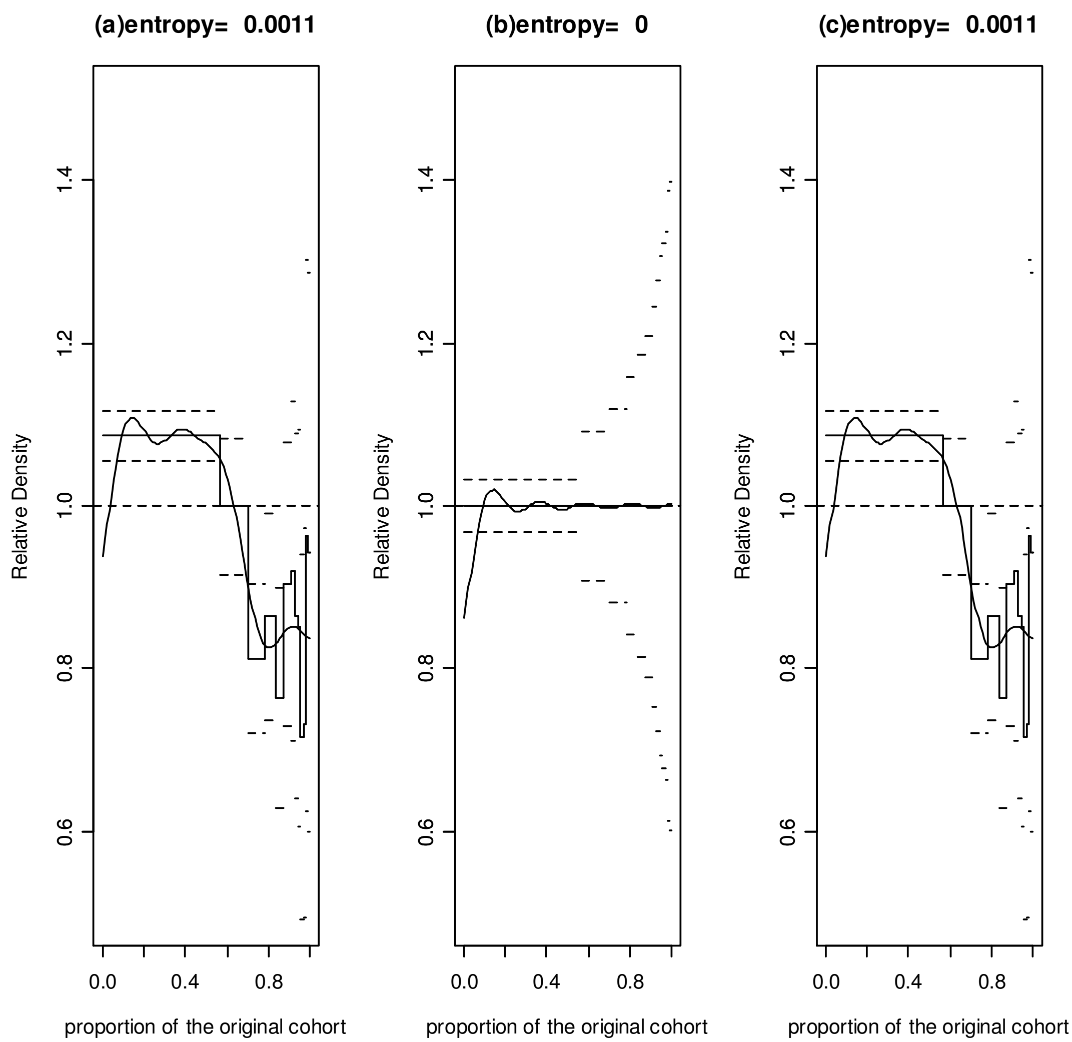
97-00



Entropy	Estimate
Overall change	0.0034
Median effect	0
Shape effect	0.0034

Polarization index	Estimate	95% CI	p-value
Median index	-0.361	-0.381- -0.341	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.361	-0.401- -0.321	0.000

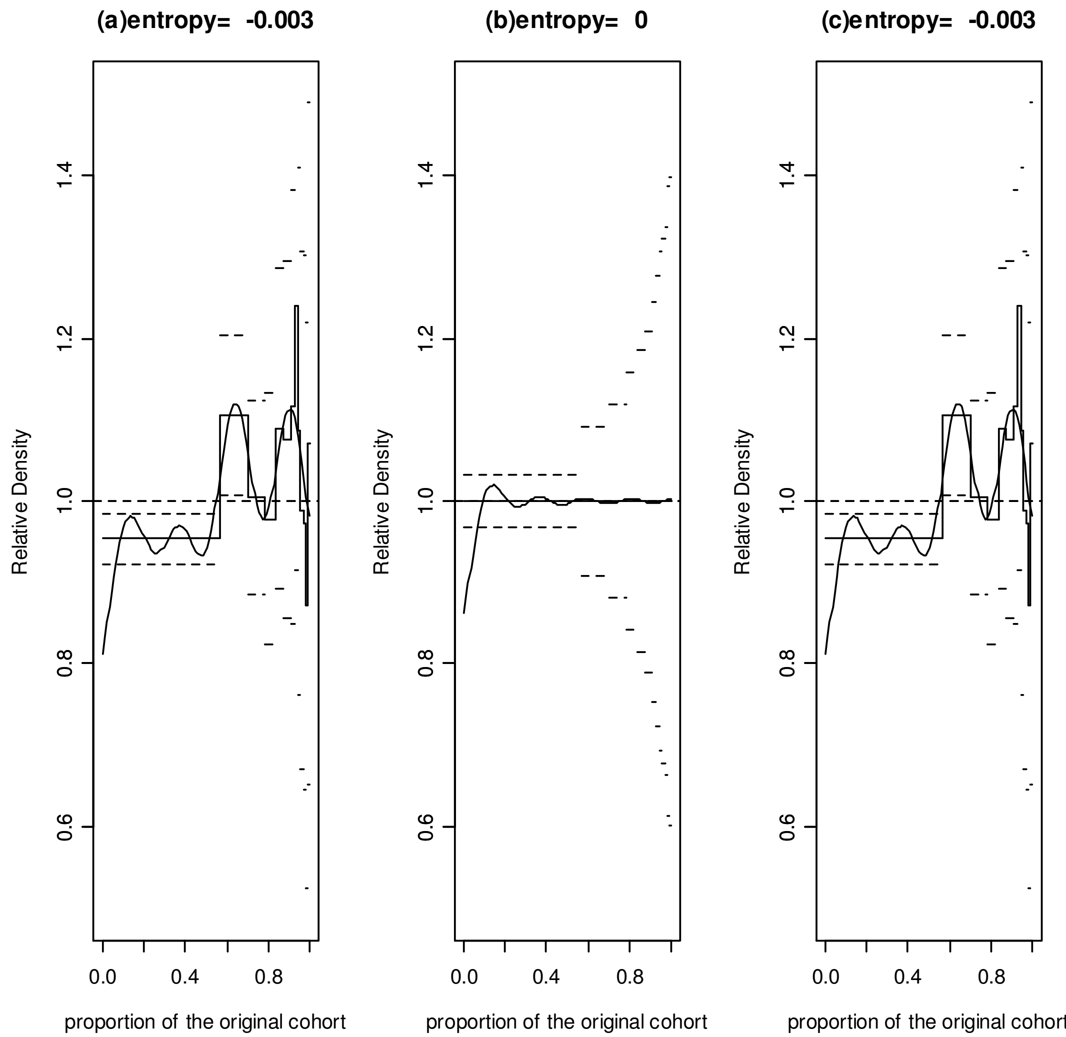
97-01



Entropy	Estimate
Overall change	0.0011
Median effect	0
Shape effect	0.0011

Polarization index	Estimate	95% CI	p-value
Median index	-0.357	-0.374- -0.340	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.357	-0.392- -0.322	0.000

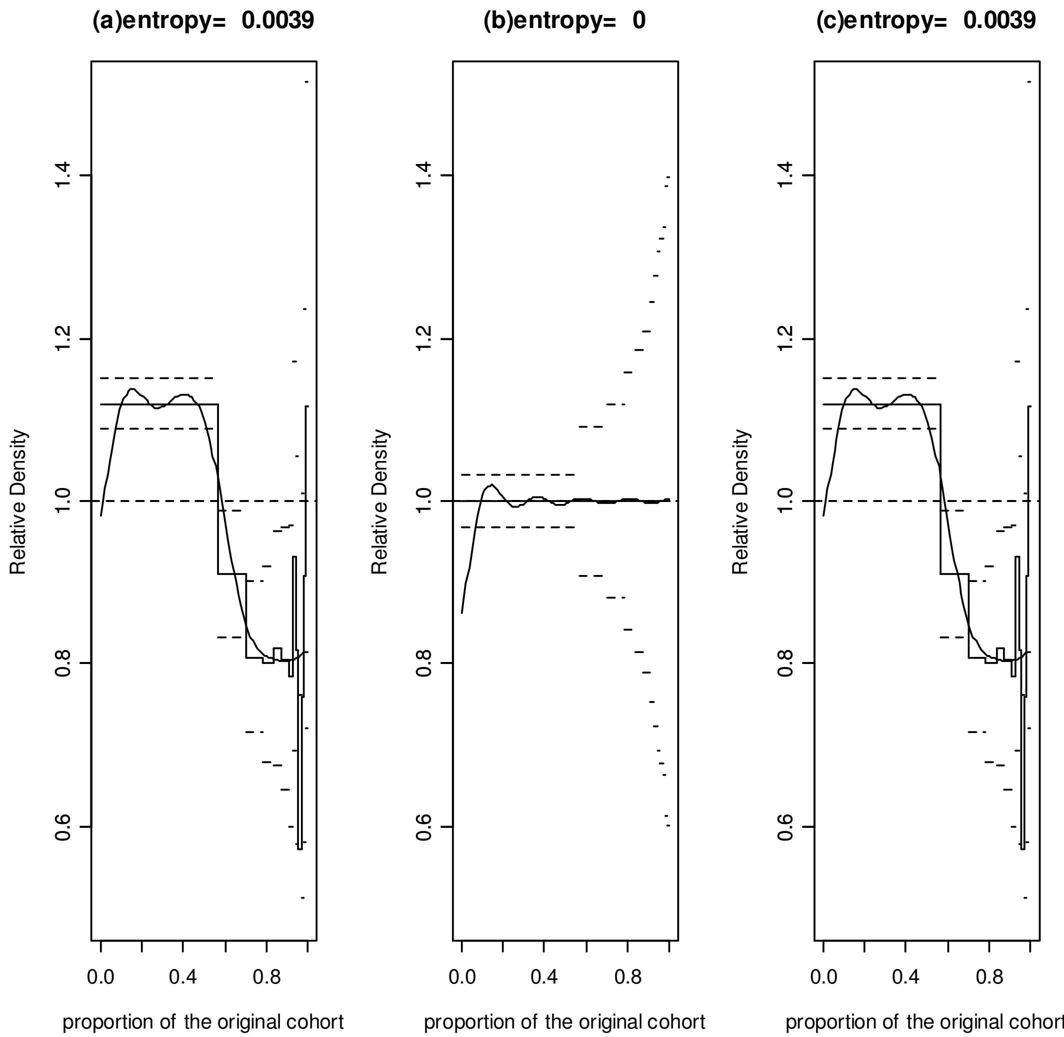
97-02



Entropy	Estimate
Overall change	-0.003
Median effect	0
Shape effect	-0.003

Polarization index	Estimate	95% CI	p-value
Median index	-0.274	-0.295- -0.252	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.274	-0.317- -0.231	0.000

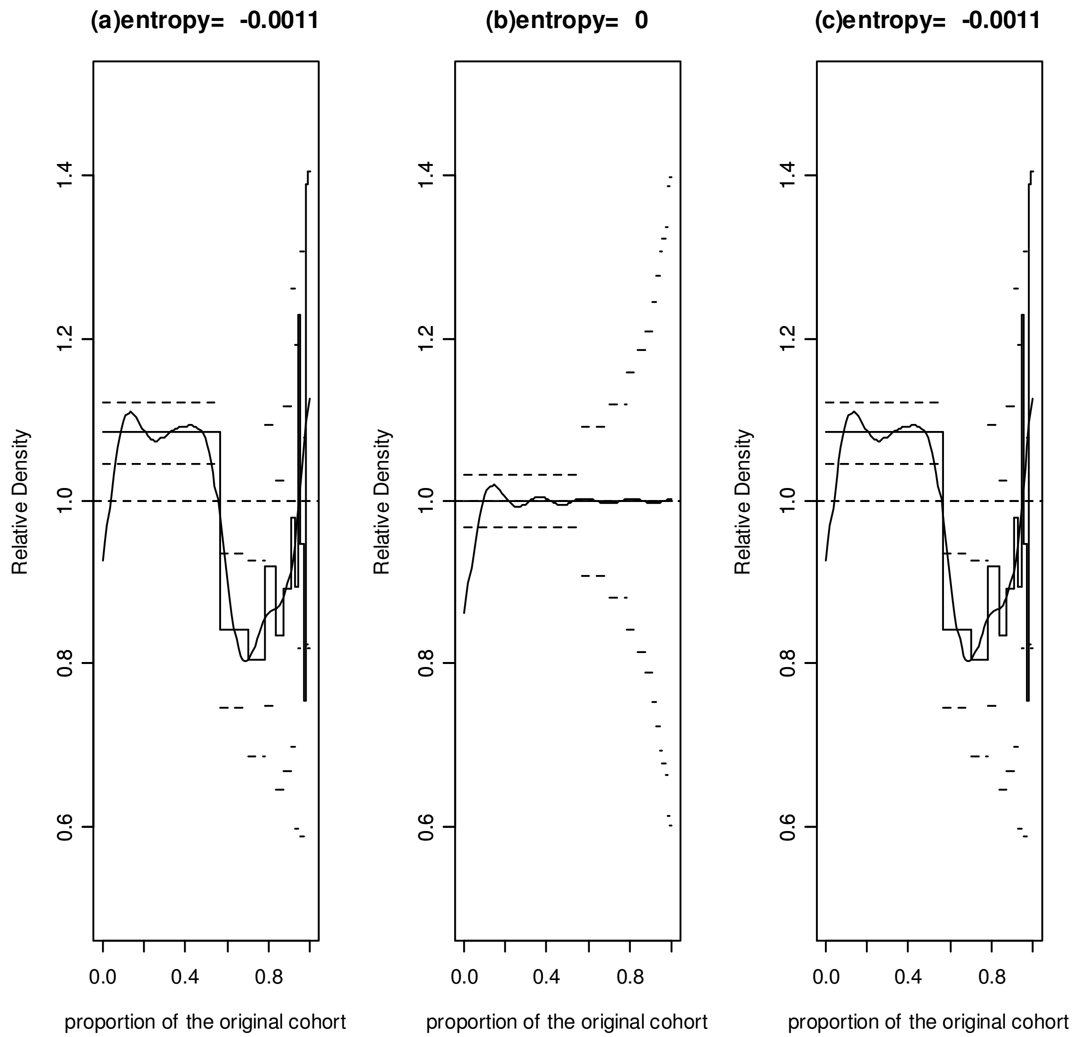
97-03



Entropy	Estimate
Overall change	0.0039
Median effect	0
Shape effect	0.0039

Polarization index	Estimate	95% CI	p-value
Median index	-0.373	-0.390- -0.356	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.373	-0.407- -0.339	0.000

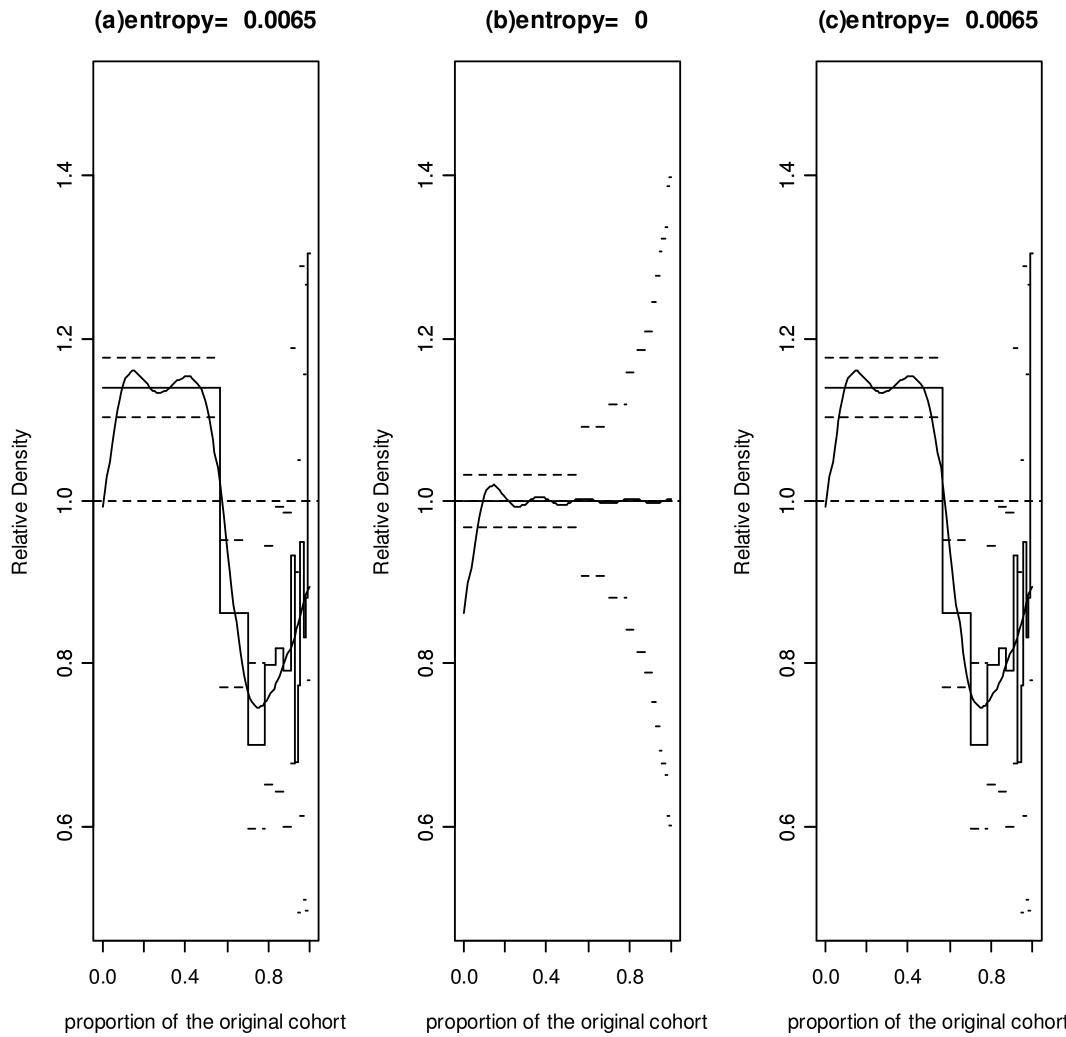
97-04



Entropy	Estimate
Overall change	-0.0011
Median effect	0
Shape effect	-0.0011

Polarization index	Estimate	95% CI	p-value
Median index	-0.334	-0.357 – -0.311	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.334	-0.380 – -0.288	0.000

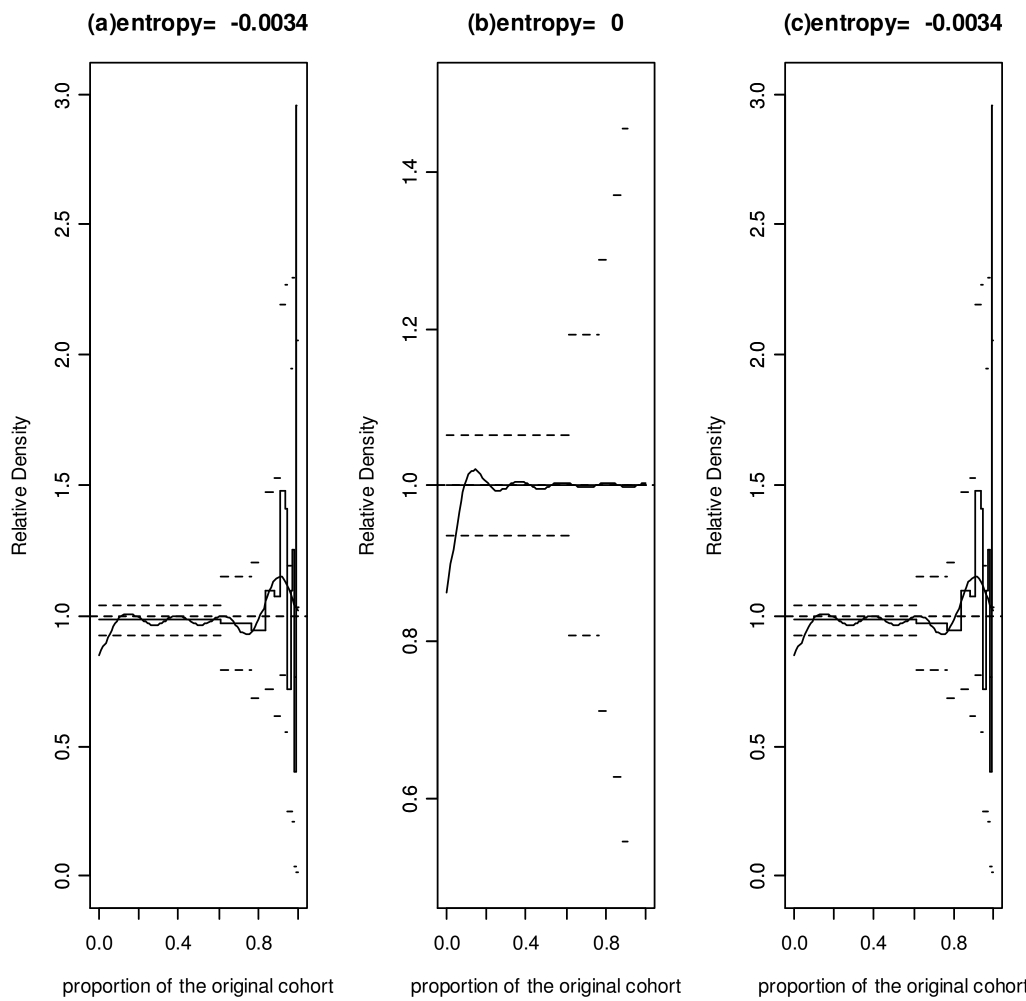
97-05



Entropy	Estimate
Overall change	0.0065
Median effect	0
Shape effect	0.0065

Polarization index	Estimate	95% CI	p-value
Median index	-0.377	-0.397 - -0.356	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.377	-0.418 - -0.336	0.000

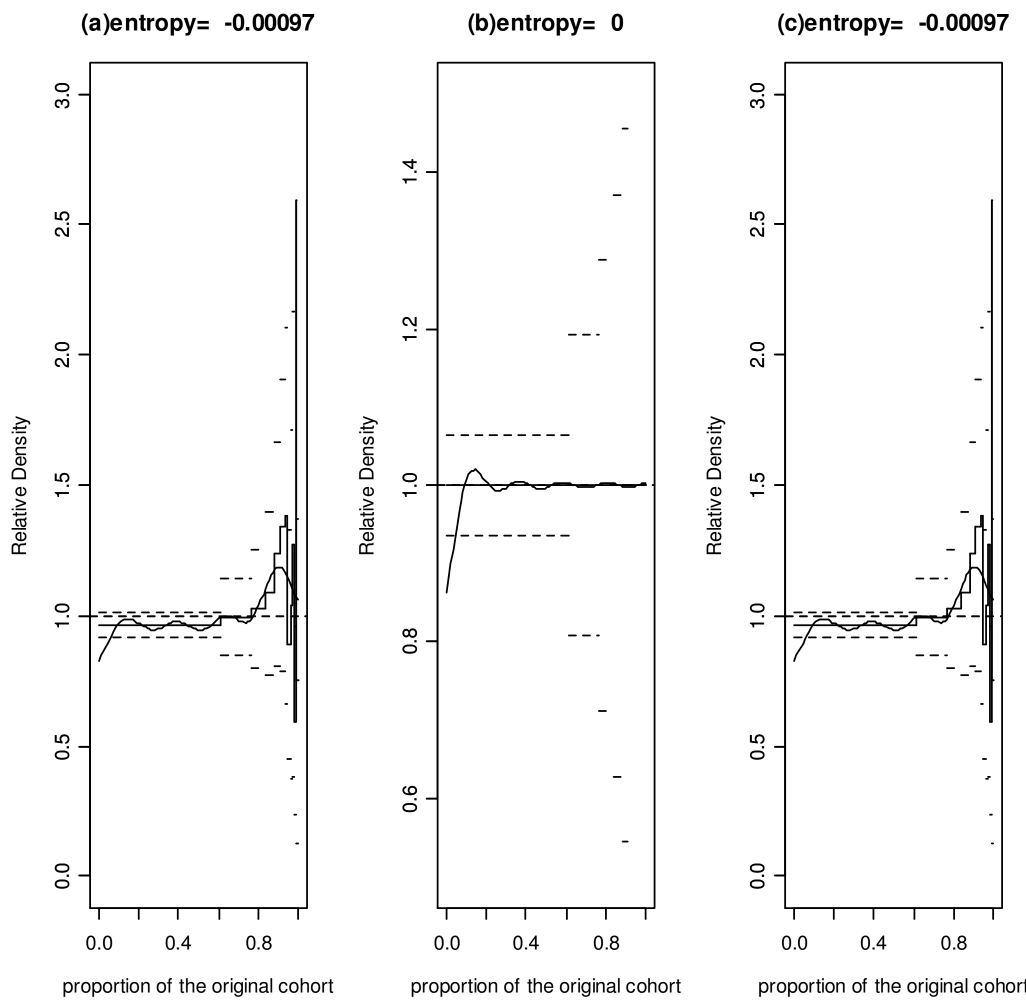
91-92 male



Entropy	Estimate		
Overall change	-0.0034		
Median effect	0		
Shape effect	-0.0034		

Polarization index	Estimate	95% CI	p-value
Median index	-0.166	-0.205- -0.127	0.000
Lower index	NaN	NaN	NaN
Upper index	-1.66e-01	-2.43e-01- -8.88e-02	1.28e-05

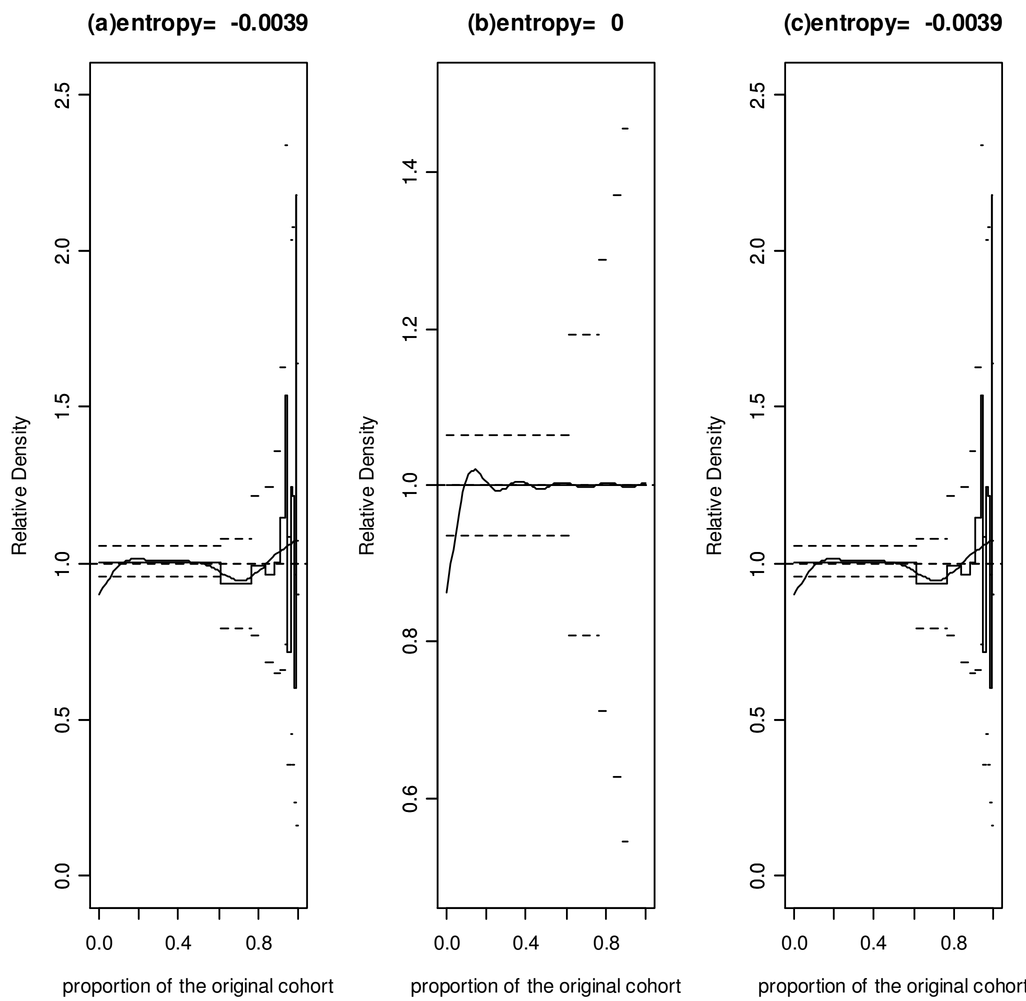
91-93 male



Entropy	Estimate
Overall change	-0.00097
Median effect	0
Shape effect	-0.00097

Polarization index	Estimate	95% CI	p-value
Median index	-0.155	-0.187 - -0.122	0.000
Lower index	NaN	NaN	NaN
Upper index	-1.55e-01	-2.19e-01 - -9.01e-02	1.33e-06

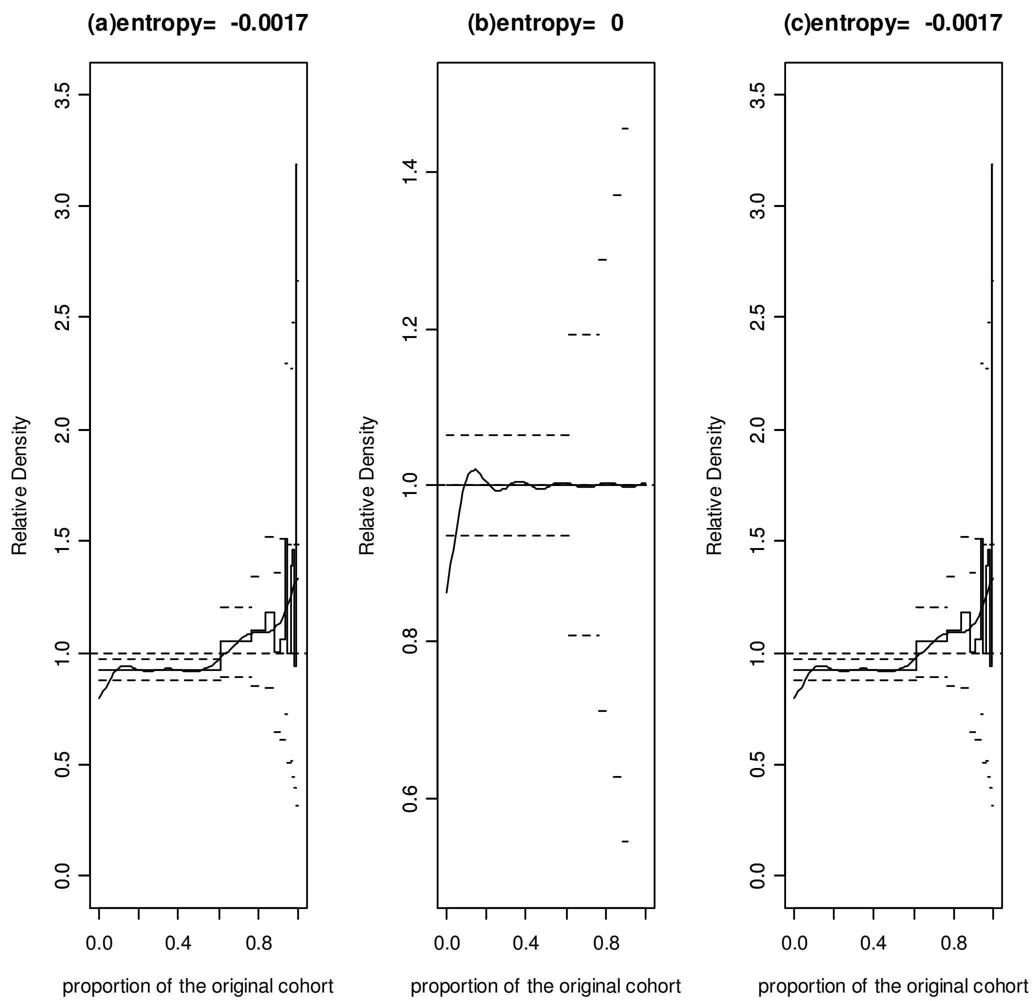
91-94 male



Entropy	Estimate		
Overall change	-0.0039		
Median effect	0		
Shape effect	-0.0039		

Polarization index	Estimate	95% CI	p-value
Median index	-0.181	-0.211 - -0.150	0.000
Lower index	NaN	NaN	NaN
Upper index	-1.81e-01	-2.42e-01 - -1.20e-01	3.35e-09

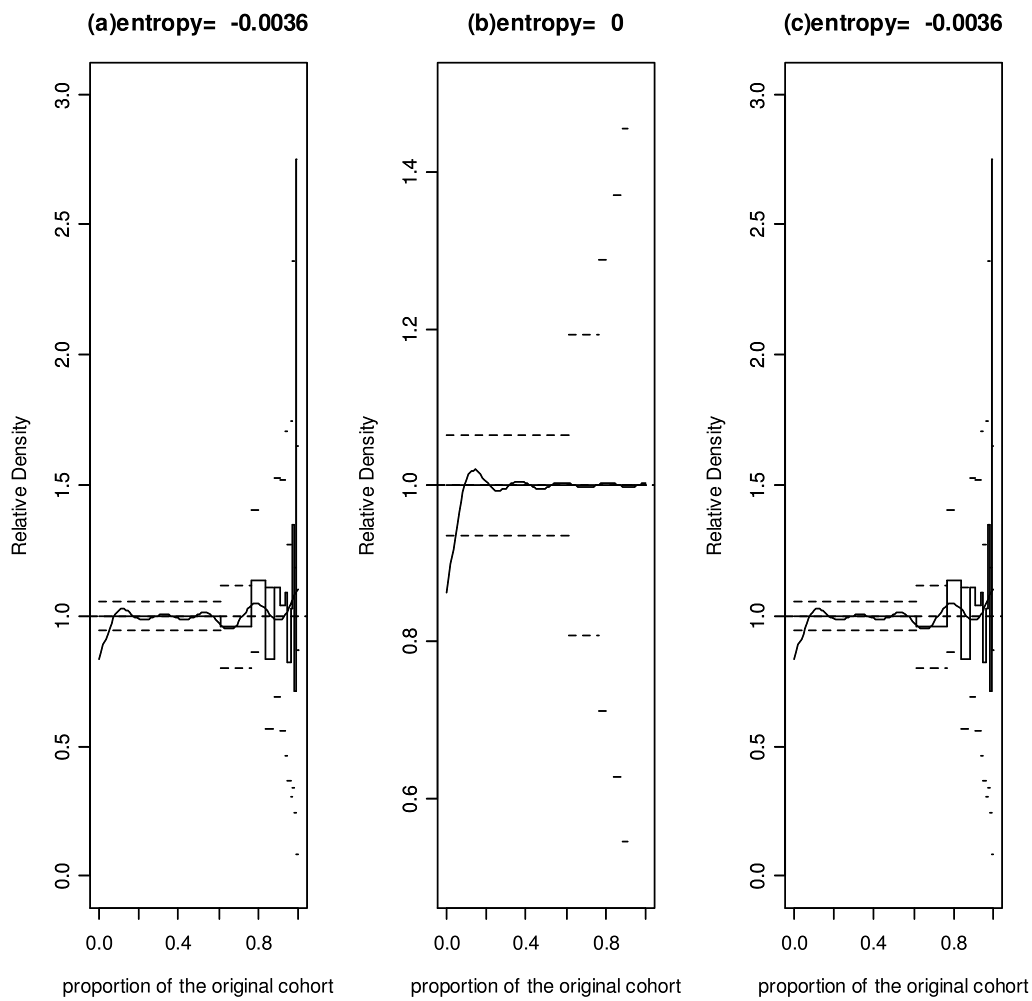
91-95 male



Entropy	Estimate
Overall change	-0.0017
Median effect	0
Shape effect	-0.0017

Polarization index	Estimate	95% CI	p-value
Median index	-1.30e-01	-1.64e-01 - -9.60e-02	2.39e-14
Lower index	NaN	NaN	NaN
Upper index	-0.129798	-0.197297 - -0.062299	0.000082

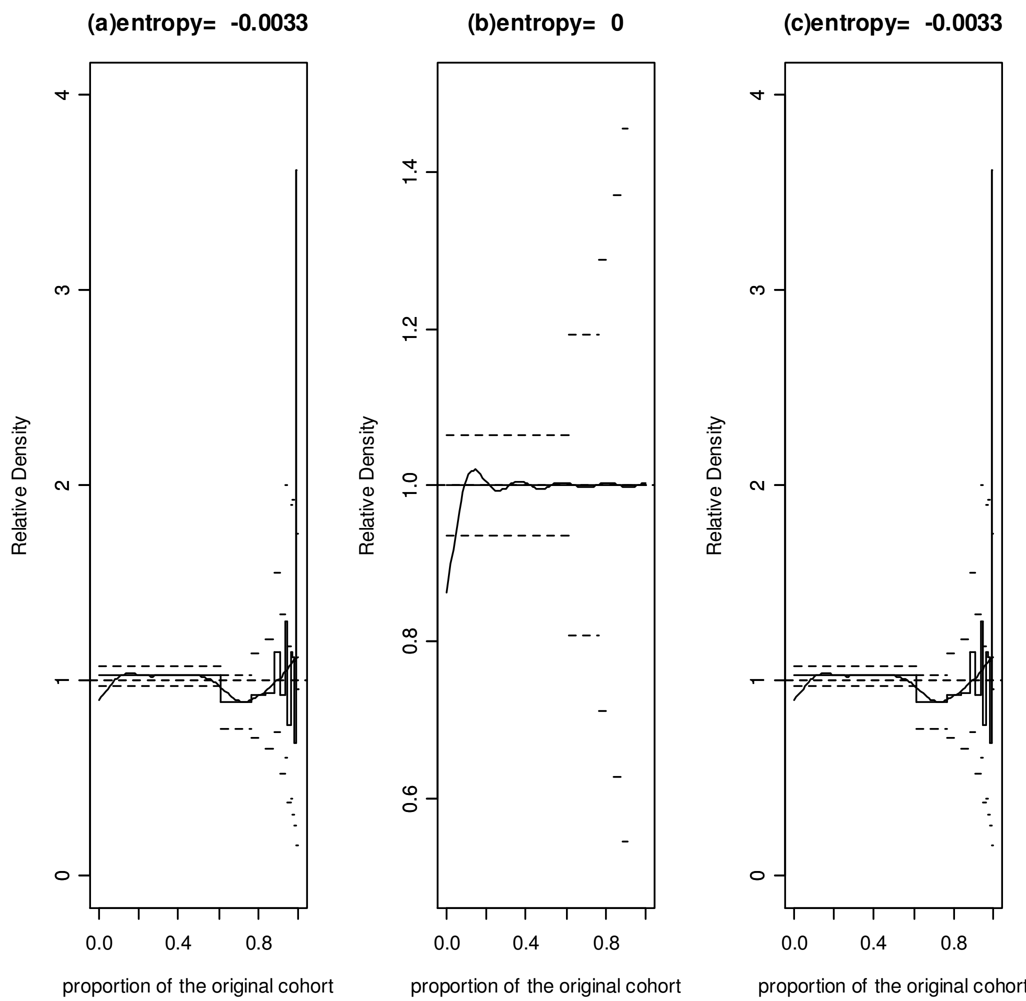
91-97 male



Entropy	Estimate
Overall change	-0.0036
Median effect	0
Shape effect	-0.0036

Polarization index	Estimate	95% CI	p-value
Median index	-0.178	-0.212 - -0.144	0.000
Lower index	NaN	NaN	NaN
Upper index	-1.78e-01	-2.46e-01 - -1.10e-01	1.47e-07

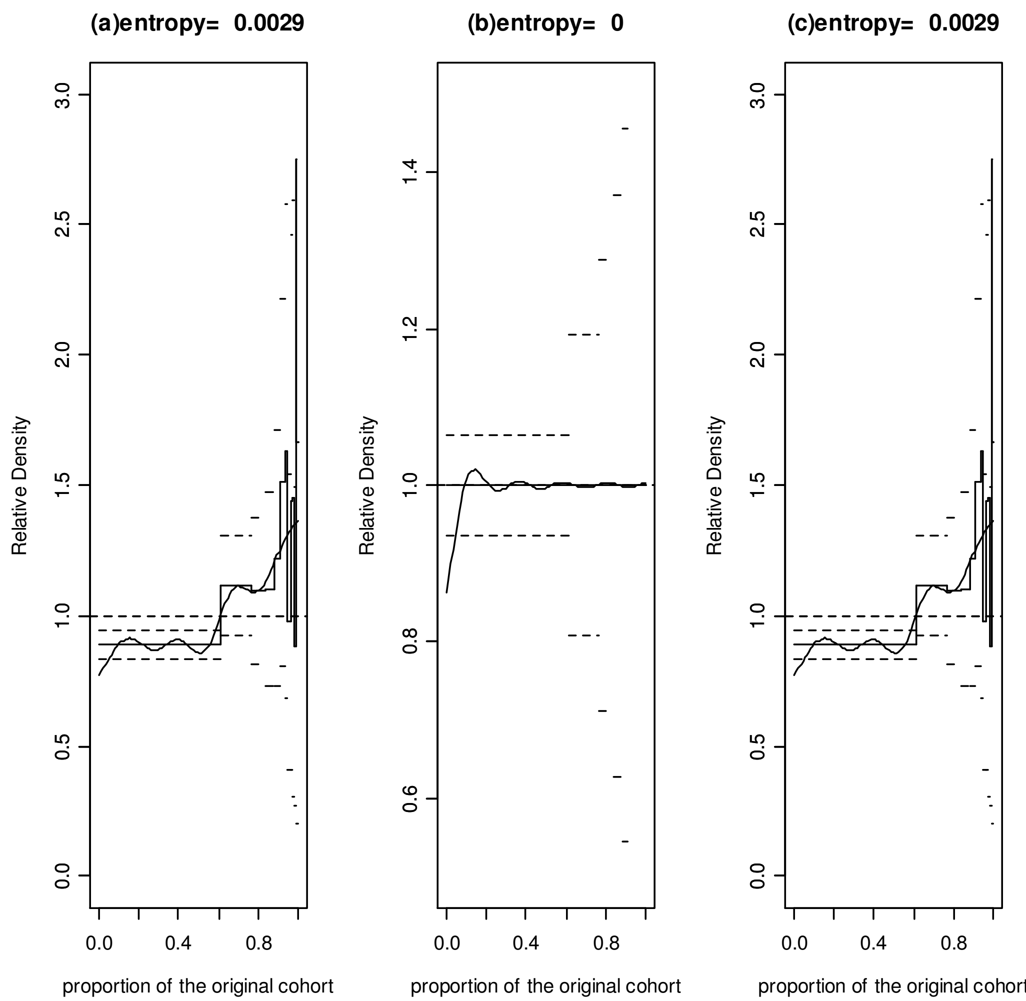
91-98 male



Entropy	Estimate
Overall change	-0.0033
Median effect	0
Shape effect	-0.0033

Polarization index	Estimate	95% CI	p-value
Median index	-0.189	-0.219 - -0.159	0.000
Lower index	NaN	NaN	NaN
Upper index	-1.89e-01	-2.49e-01 - -1.28e-01	4.48e-10

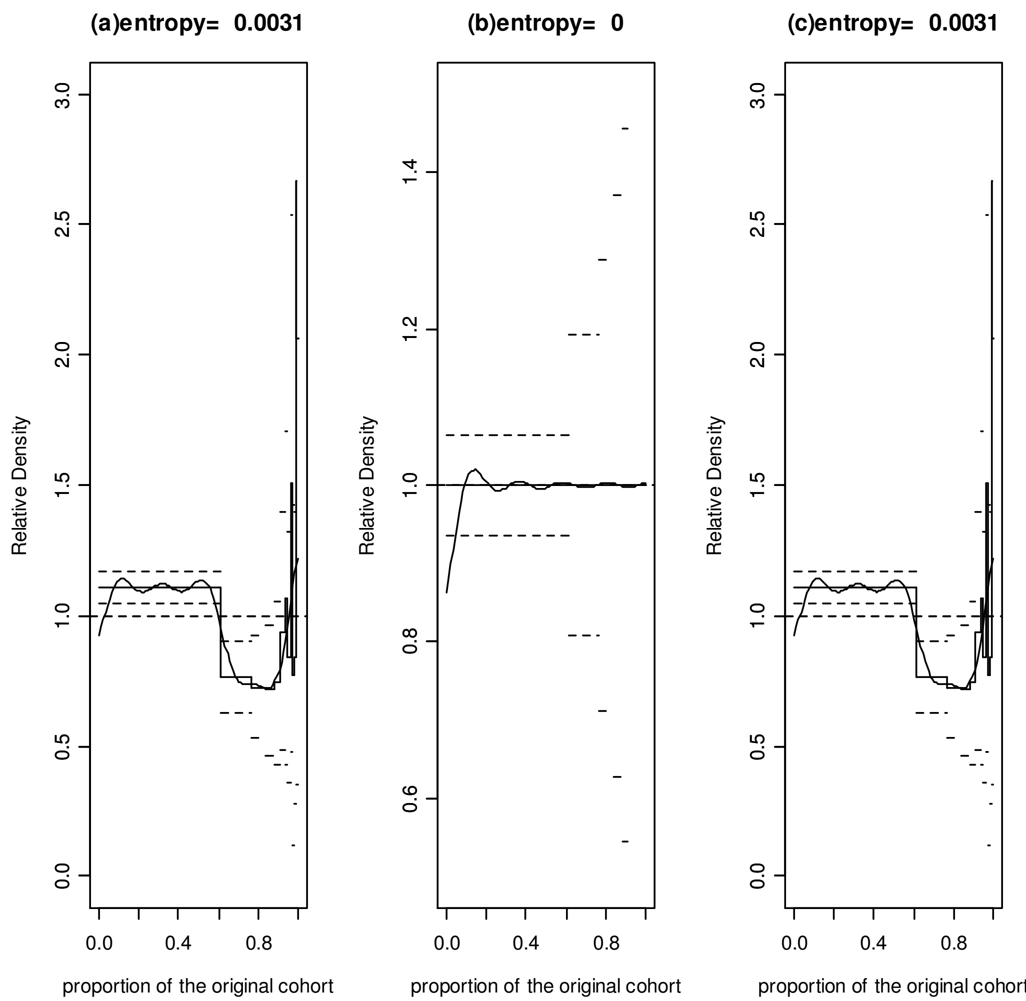
91-99 male



Entropy	Estimate
Overall change	0.0029
Median effect	0
Shape effect	0.0029

Polarization index	Estimate	95% CI	p-value
Median index	-1.07e-01	-1.48e-01 – -6.62e-02	1.39e-07
Lower index	NaN	NaN	NaN
Upper index	-0.1071	-0.1888 – -0.0254	0.0051

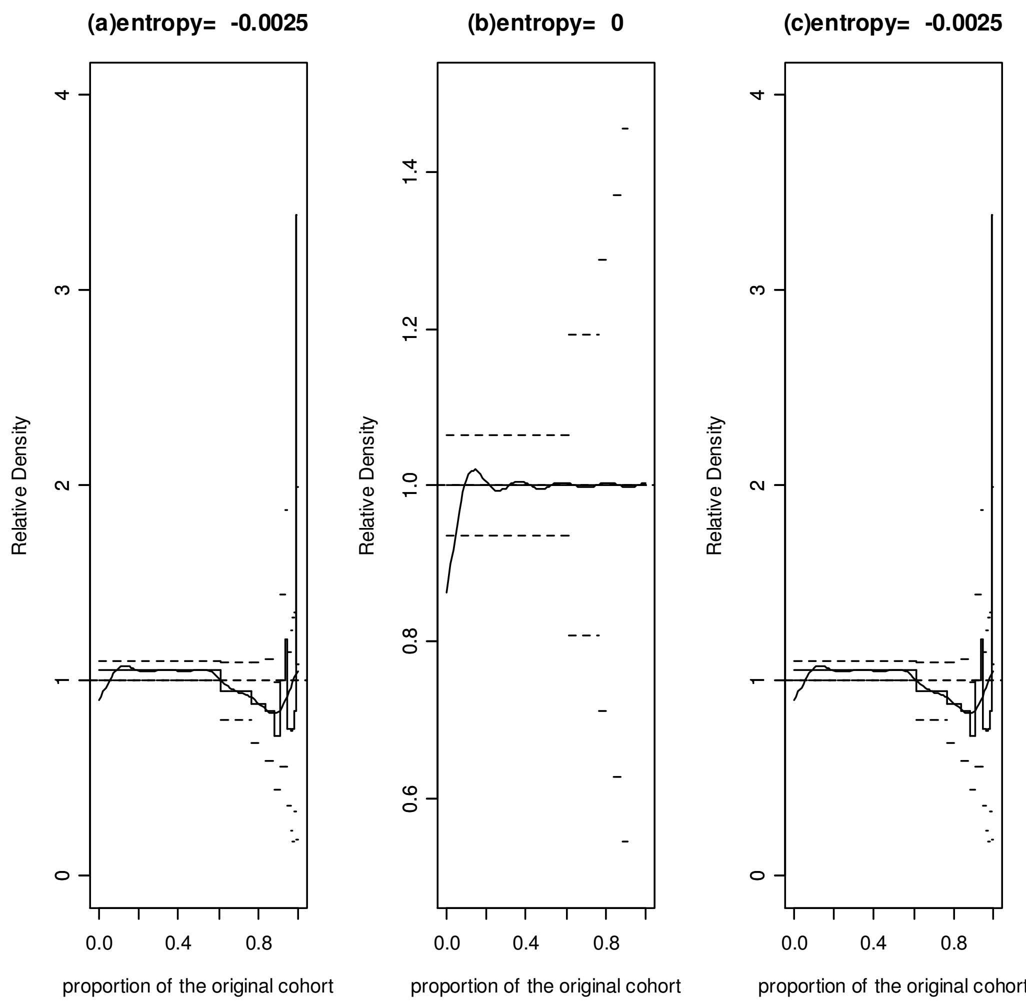
91-00 male



Entropy	Estimate
Overall change	0.0031
Median effect	0
Shape effect	0.0031

Polarization index	Estimate	95% CI	p-value
Median index	-0.231	-0.261 – -0.200	0.000
Lower index	NaN	NaN	NaN
Upper index	-2.31e-01	-2.91e-01 – -1.70e-01	3.34e-14

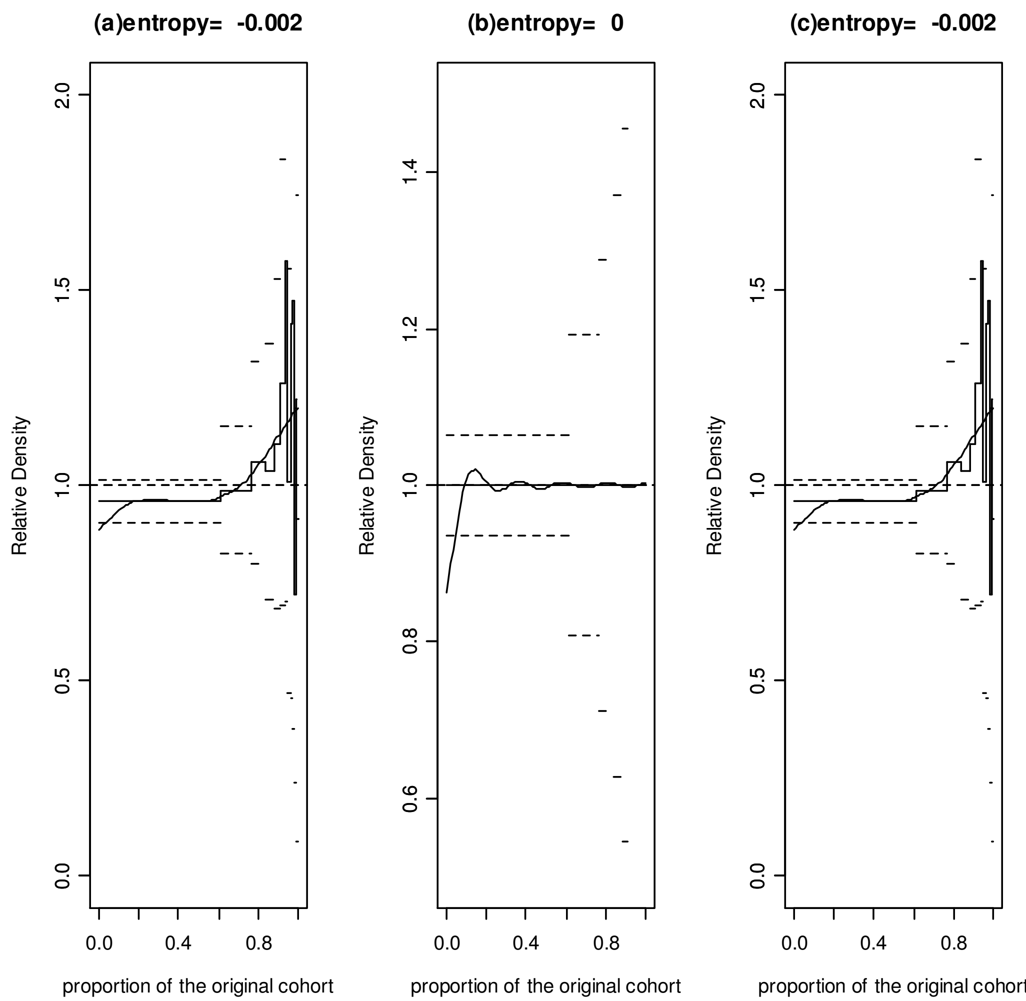
91-01 male



Entropy	Estimate
Overall change	-0.0025
Median effect	0
Shape effect	-0.0025

Polarization index	Estimate	95% CI	p-value
Median index	-0.213	-0.243 – -0.183	0.000
Lower index	NaN	NaN	NaN
Upper index	-2.13e-01	-2.73e-01 – -1.53e-01	1.28e-12

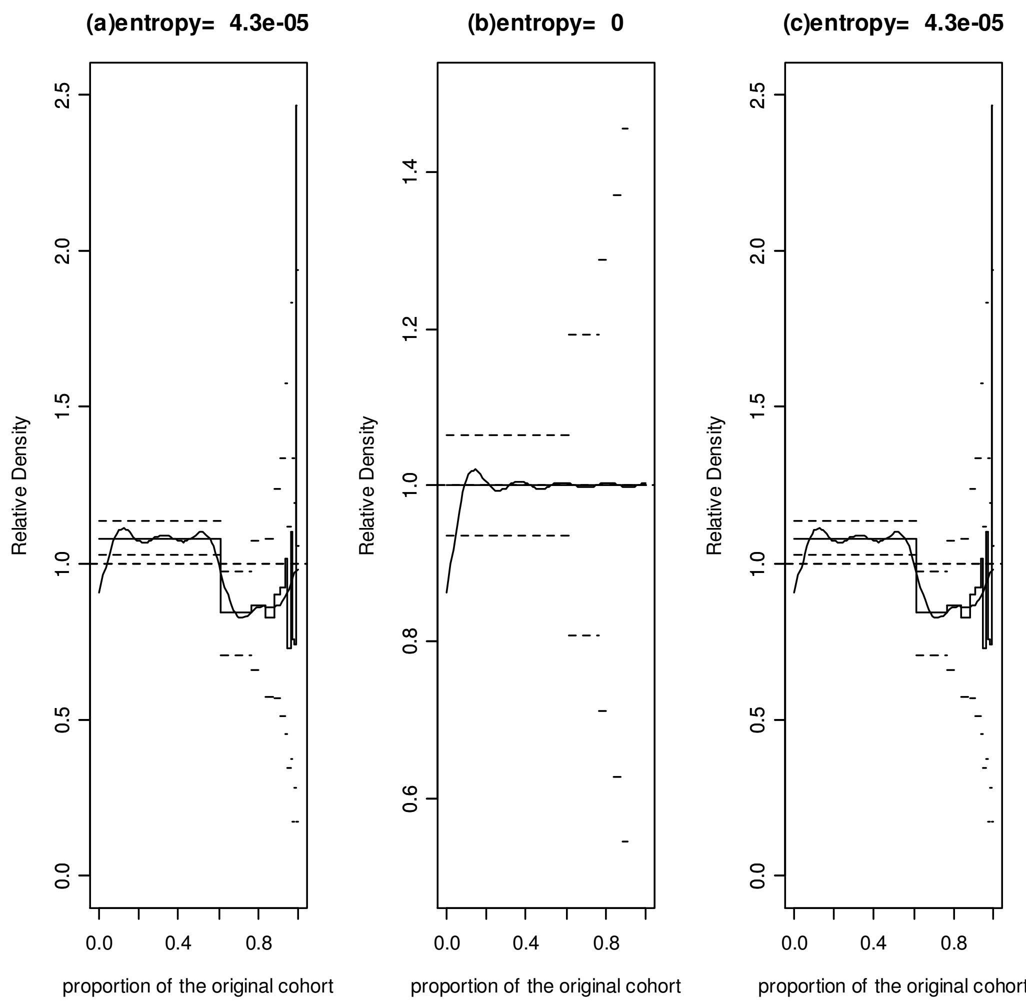
91-02 male



Entropy	Estimate
Overall change	-0.002
Median effect	0
Shape effect	-0.002

Polarization index	Estimate	95% CI	p-value
Median index	-0.151	-0.186 – -0.115	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.150894	-0.222013 – -0.079775	0.000016

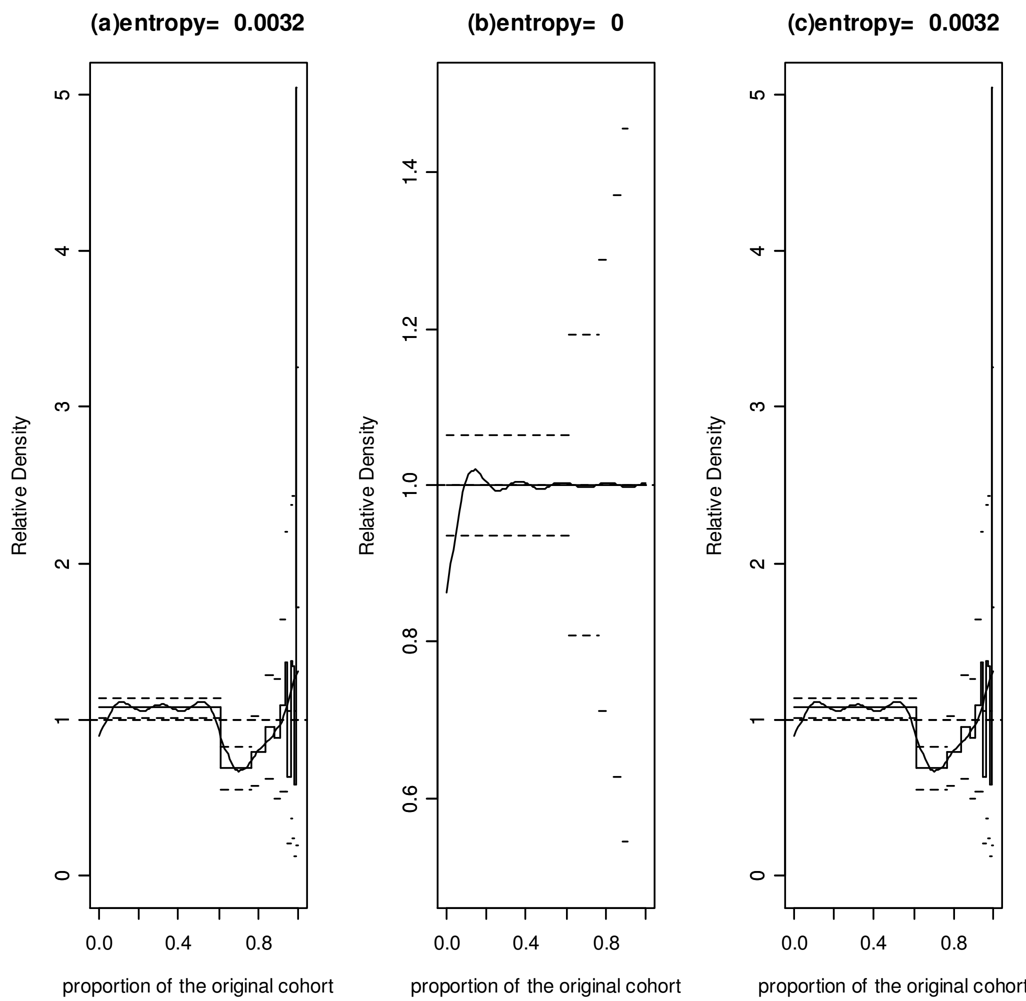
91-03 male



Entropy	Estimate
Overall change	4.3e-05
Median effect	0
Shape effect	4.3e-05

Polarization index	Estimate	95% CI	p-value
Median index	-0.225	-0.254 – -0.196	0.000
Lower index	NaN	NaN	NaN
Upper index	-2.25e-01	-2.82e-01 – -1.68e-01	6.66e-15

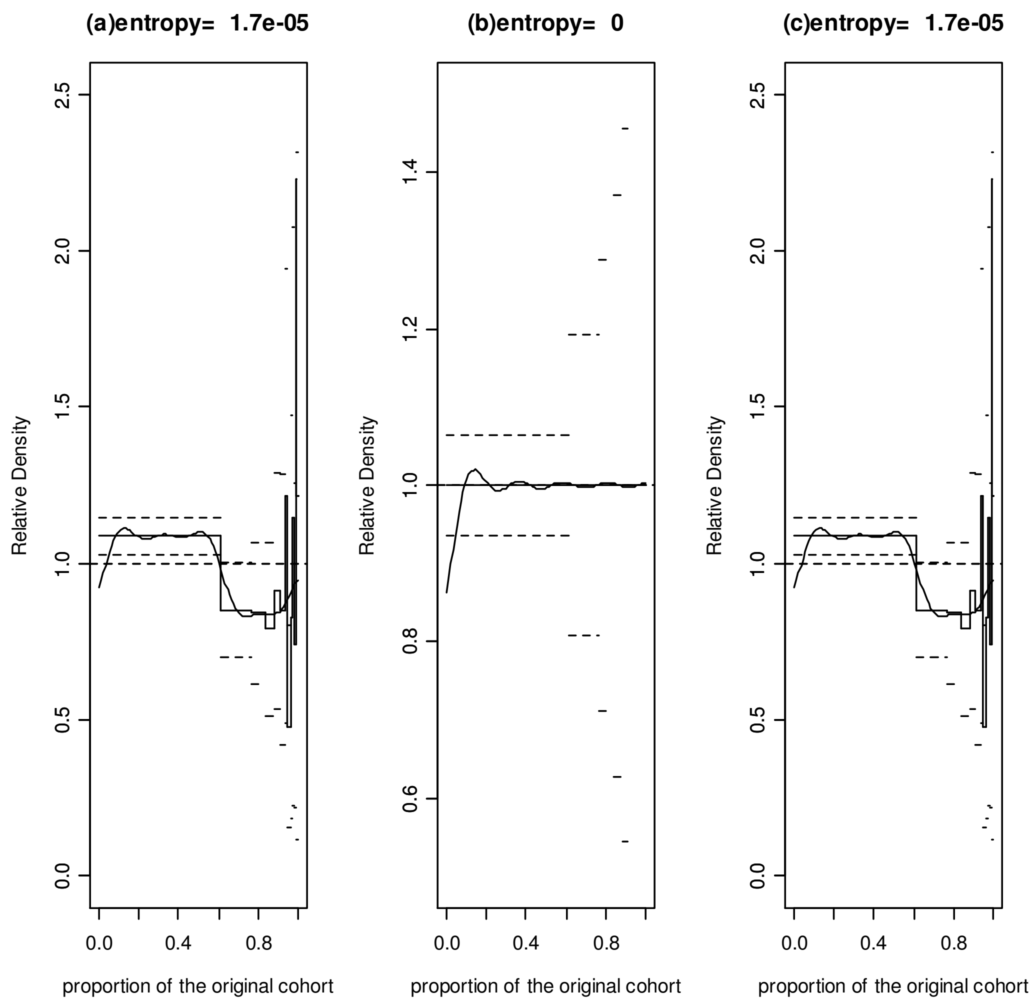
91-04 male



Entropy	Estimate		
Overall change	0.0032		
Median effect	0		
Shape effect	0.0032		

Polarization index	Estimate	95% CI	p-value
Median index	-0.205	-0.239 – -0.171	0.000
Lower index	NaN	NaN	NaN
Upper index	-2.05e-01	-2.73e-01 – -1.37e-01	1.74e-09

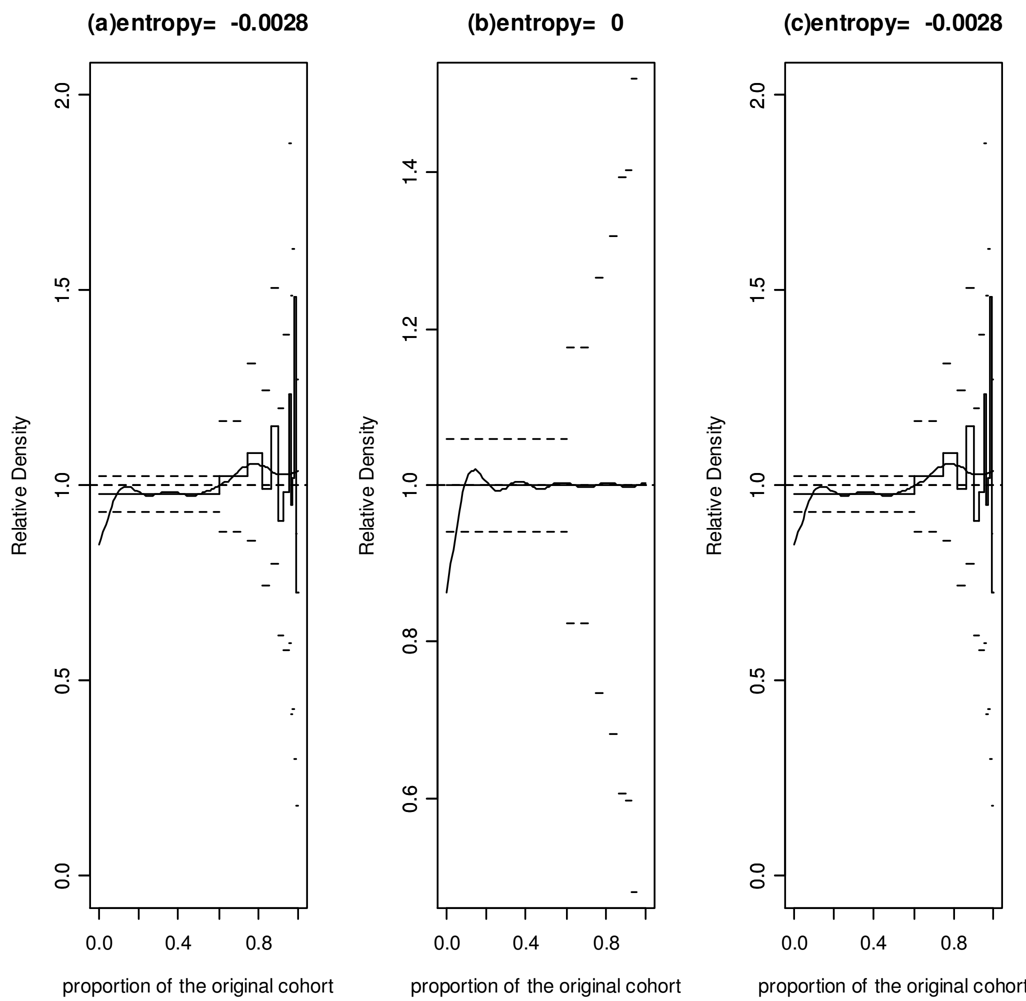
91-05 male



Entropy	Estimate
Overall change	0.0032
Median effect	0
Shape effect	0.0032

Polarization index	Estimate	95% CI	p-value
Median index	-0.230	-0.262 – -0.198	0.000
Lower index	NaN	NaN	NaN
Upper index	-2.30e-01	-2.95e-01 – -1.65e-01	1.59e-12

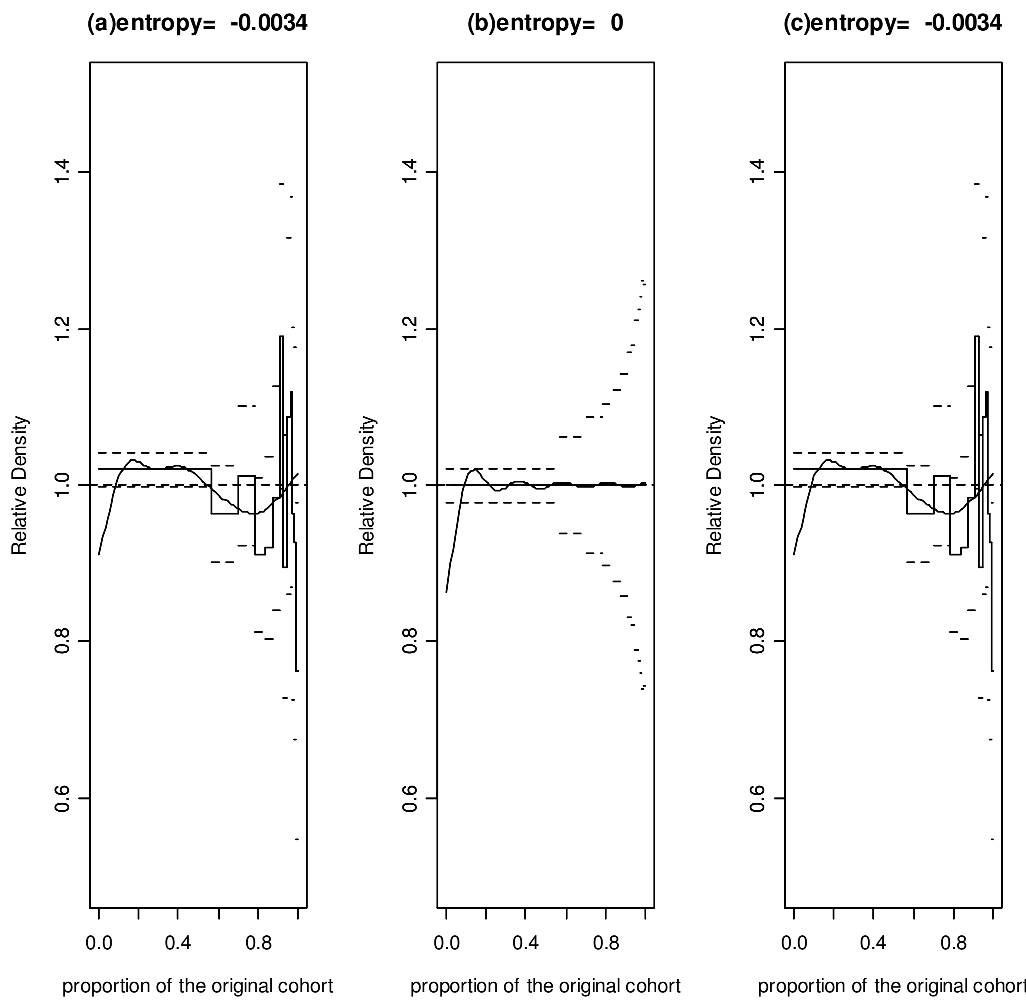
92-93 male



Entropy	Estimate
Overall change	-0.0028
Median effect	0
Shape effect	-0.0028

Polarization index	Estimate	95% CI	p-value
Median index	-0.199	-0.229 – -0.169	0.000
Lower index	NaN	NaN	NaN
Upper index	-1.99e-01	-2.59e-01 – -1.38e-01	5.04e-11

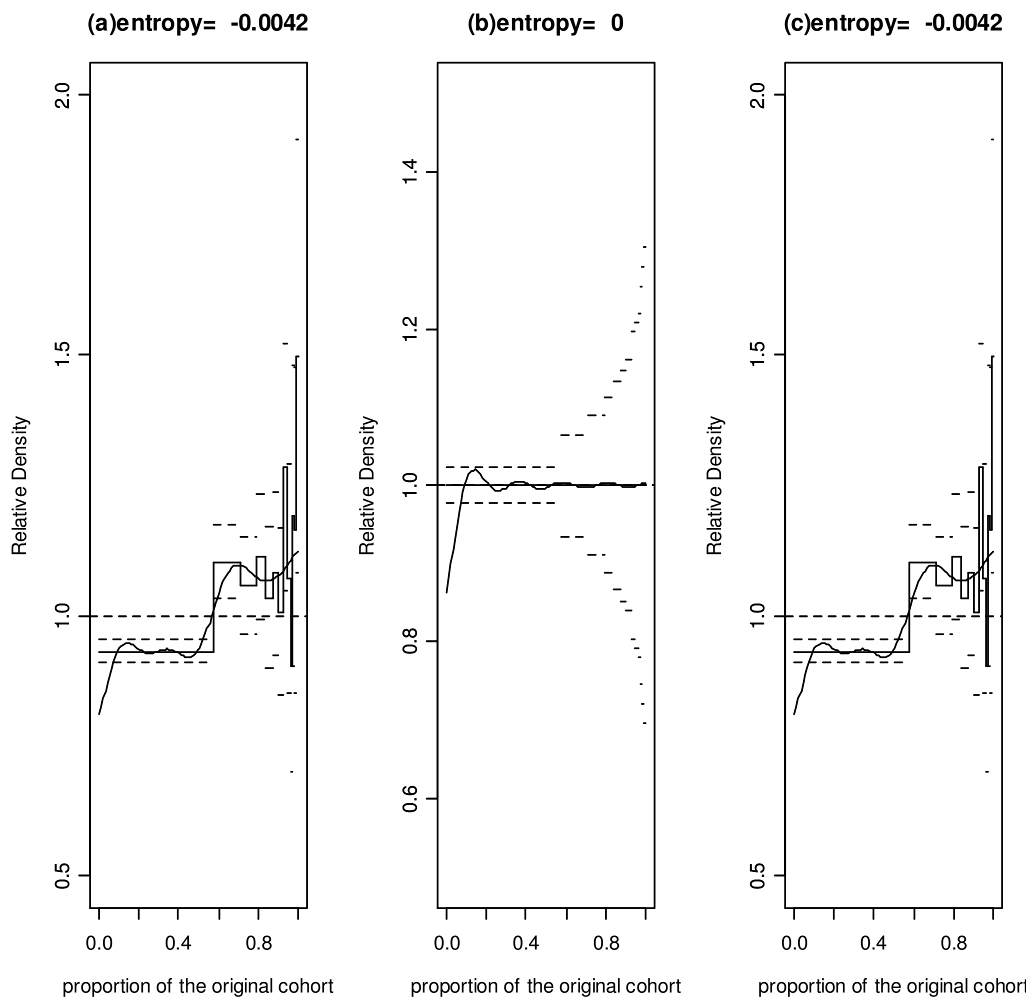
93-94 male



Entropy	Estimate
Overall change	-0.0034
Median effect	0
Shape effect	-0.0034

Polarization index	Estimate	95% CI	p-value
Median index	-0.304	-0.318 – -0.290	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.304	-0.332 – -0.276	0.000

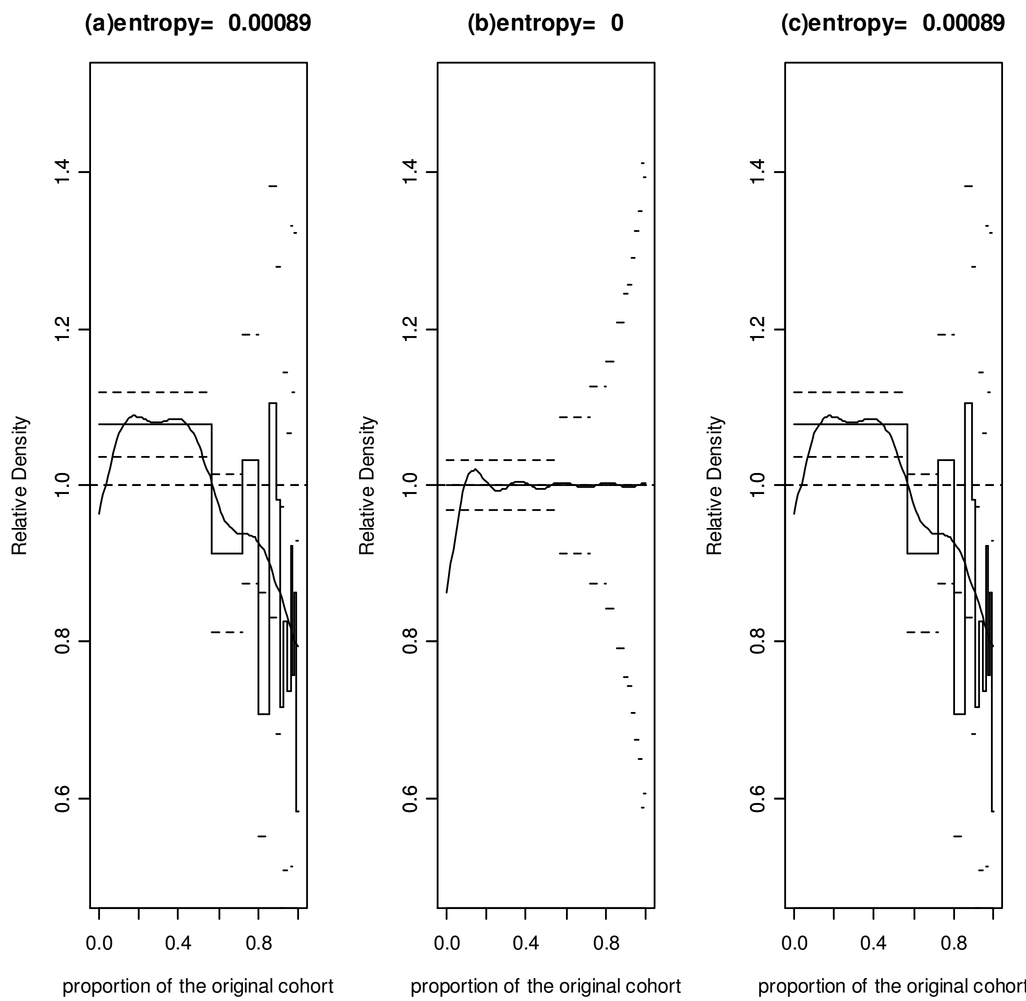
94-95 male



Entropy	Estimate
Overall change	-0.0042
Median effect	0
Shape effect	-0.0042

Polarization index	Estimate	95% CI	p-value
Median index	-0.232	-0.247 – -0.217	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.232	-0.261 – -0.202	0.000

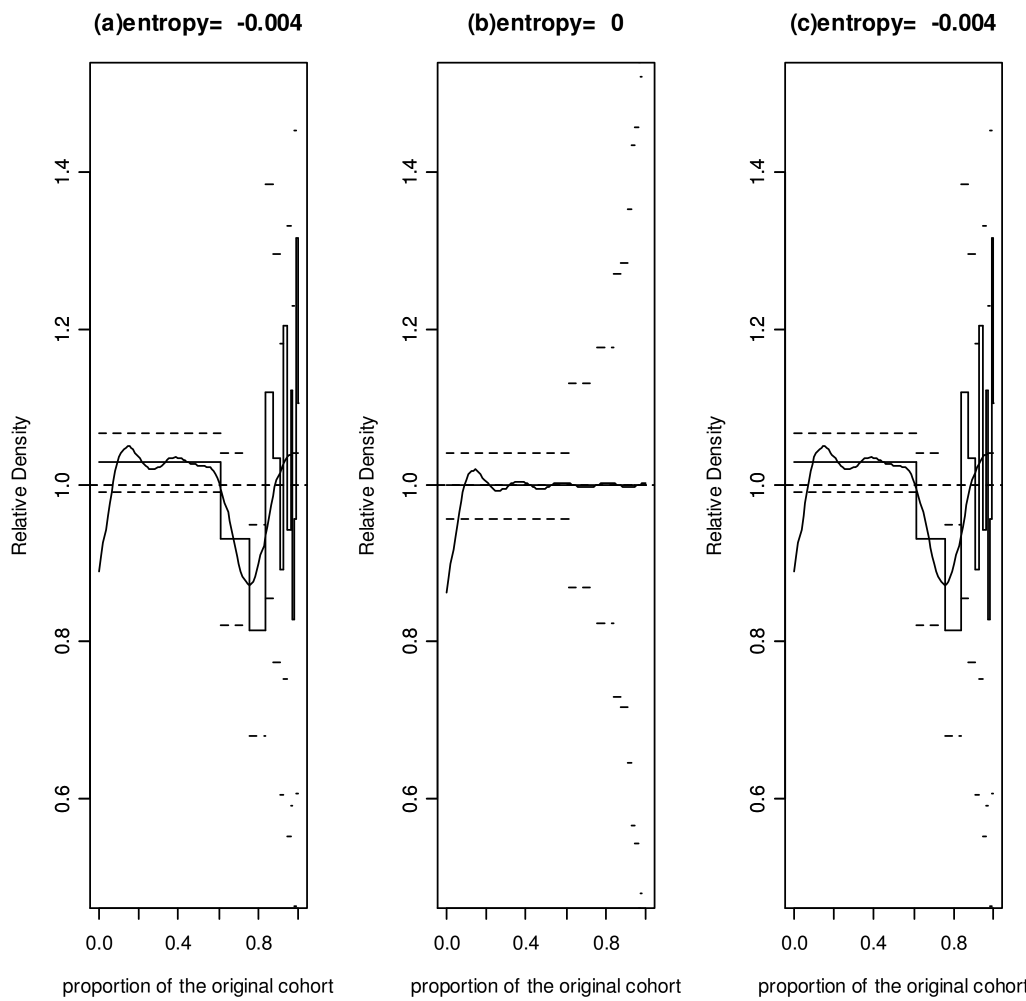
95-97 male



Entropy	Estimate
Overall change	0.00089
Median effect	0
Shape effect	0.00089

Polarization index	Estimate	95% CI	p-value
Median index	-0.335	-0.360 – -0.311	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.335	-0.385 – -0.286	0.000

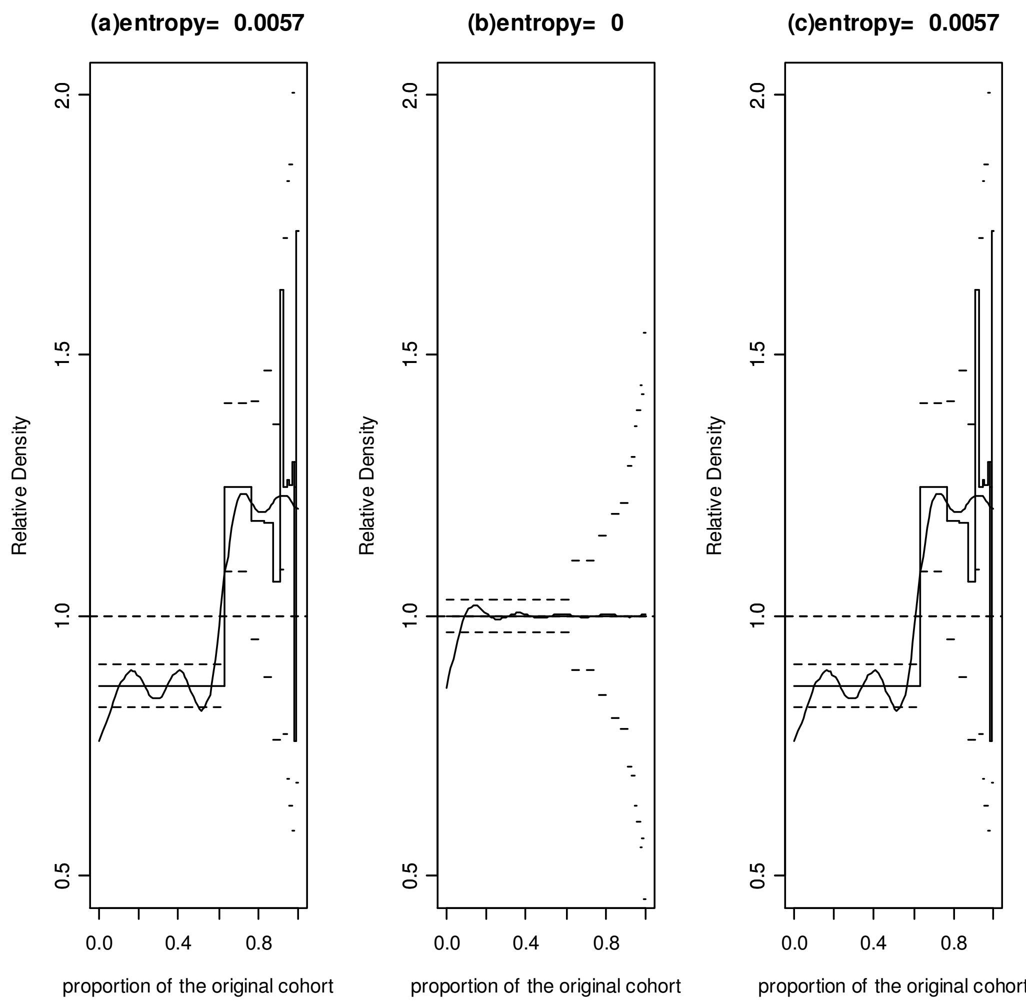
97-98 male



Entropy	Estimate
Overall change	-0.004
Median effect	0
Shape effect	-0.004

Polarization index	Estimate	95% CI	p-value
Median index	-0.200	-0.223 – -0.177	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.200	-0.245 – -0.154	0.000

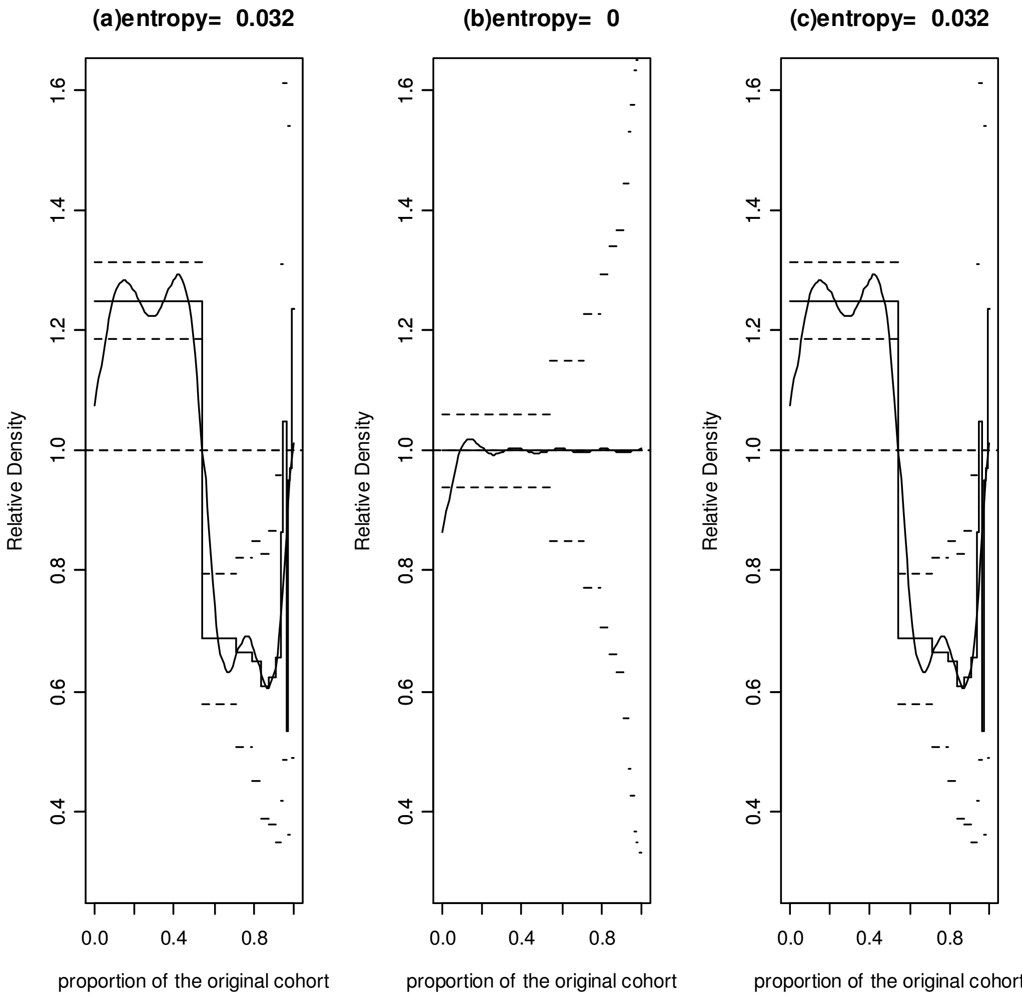
98-99 male



Entropy	Estimate
Overall change	0.0057
Median effect	0
Shape effect	0.0057

Polarization index	Estimate	95% CI	p-value
Median index	-7.89e-02	-1.08e-01 – -5.03e-02	3.27e-08
Lower index	NaN	NaN	NaN
Upper index	-0.07893	-0.13620 – -0.02167	0.00345

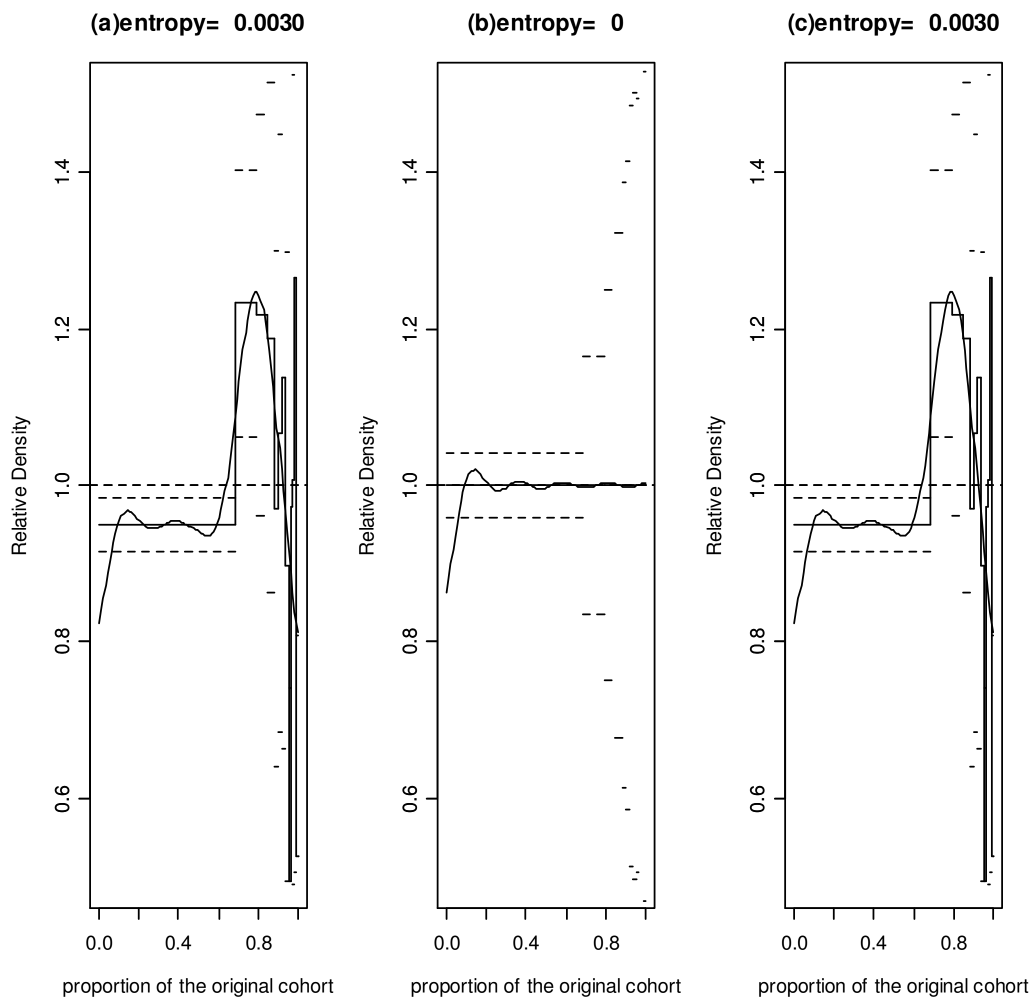
99-00 male



Entropy	Estimate
Overall change	0.032
Median effect	0
Shape effect	0.032

Polarization index	Estimate	95% CI	p-value
Median index	-0.465	-0.495 – -0.434	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.465	-0.526 – -0.403	0.000

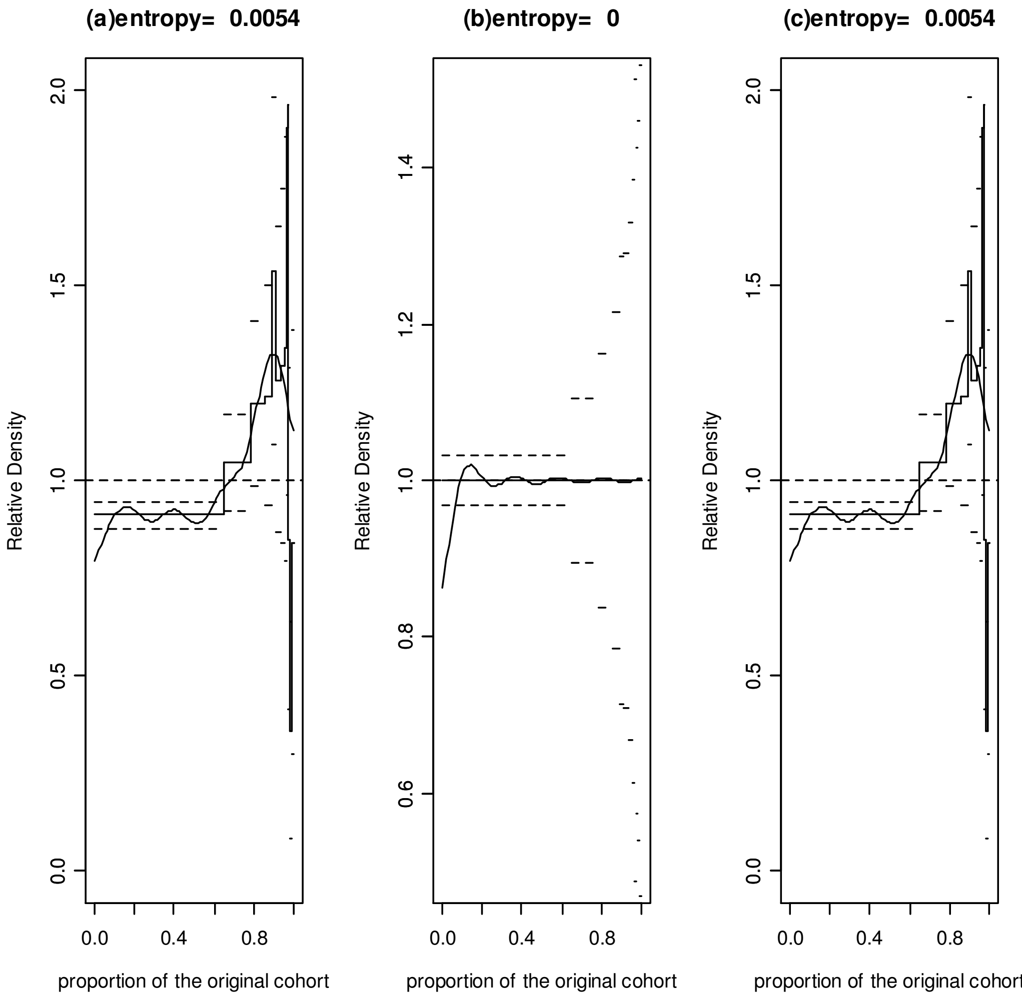
00-01 male



Entropy	Estimate
Overall change	0.0030
Median effect	0
Shape effect	0.0030

Polarization index	Estimate	95% CI	p-value
Median index	-0.02365	-0.04574 – -0.00155	0.01796
Lower index	NaN	NaN	NaN
Upper index	-0.0236	-0.0678 – 0.0205	0.1471

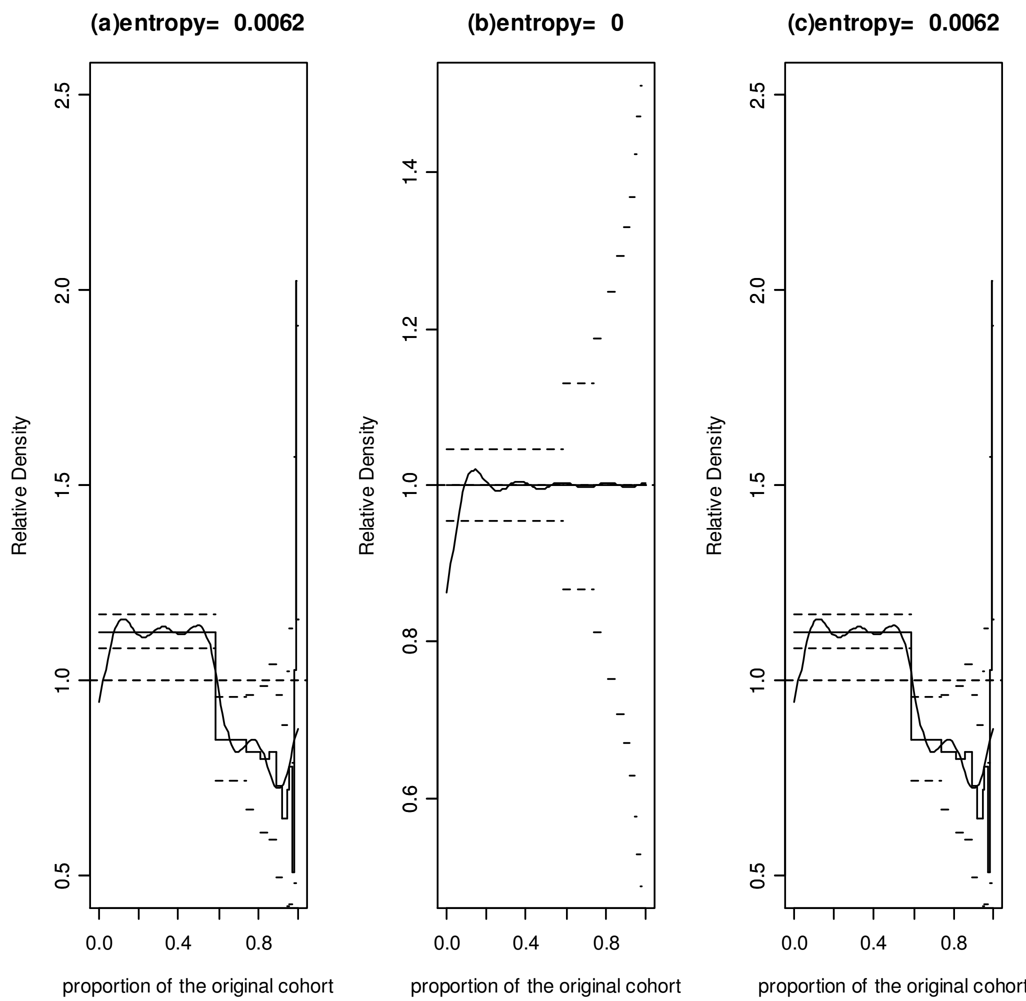
01-02 male



Entropy	Estimate
Overall change	0.0054
Median effect	0
Shape effect	0.0054

Polarization index	Estimate	95% CI	p-value
Median index	-5.38e-02	-7.76e-02 – -3.01e-02	4.38e-06
Lower index	NaN	NaN	NaN
Upper index	-0.05382	-0.10129 – -0.00636	0.01312

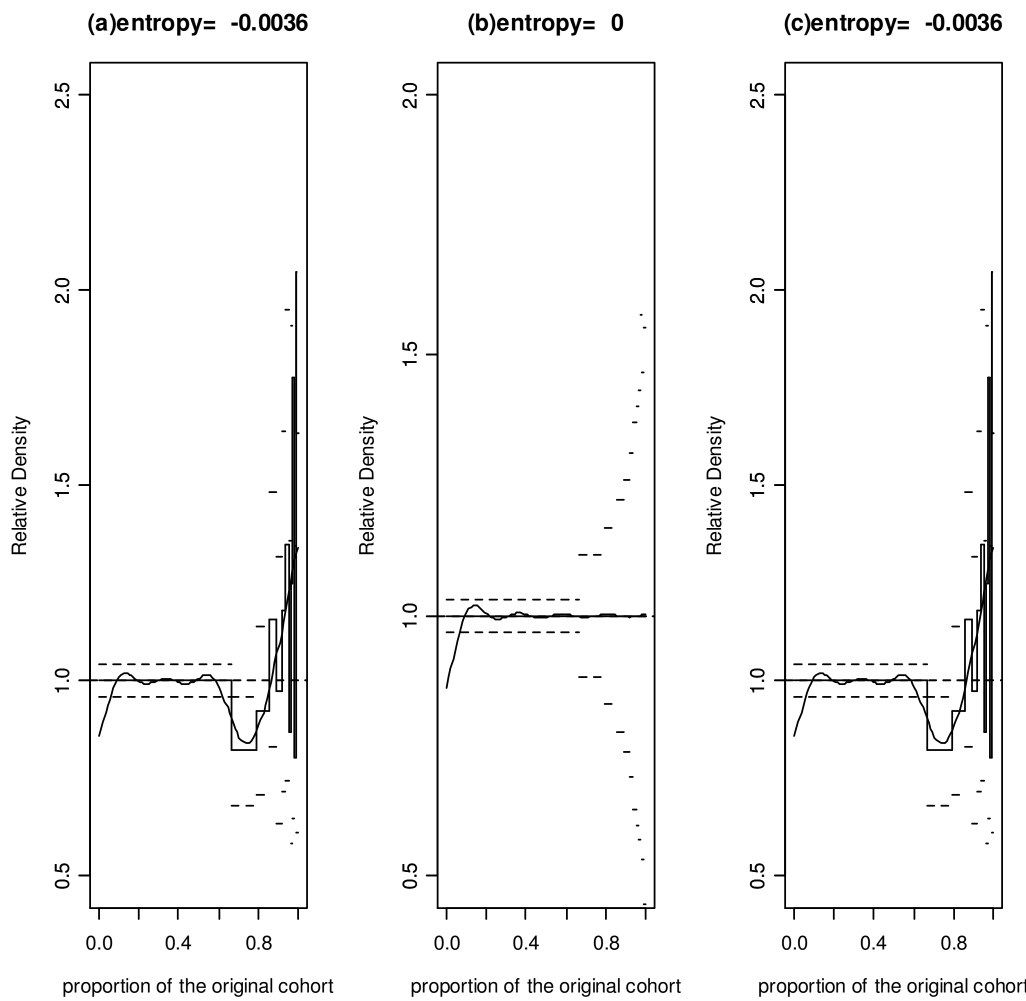
02-03 male



Entropy	Estimate
Overall change	0.0062
Median effect	0
Shape effect	0.0062

Polarization index	Estimate	95% CI	p-value
Median index	-0.317	-0.340 – -0.294	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.317	-0.363 – -0.271	0.000

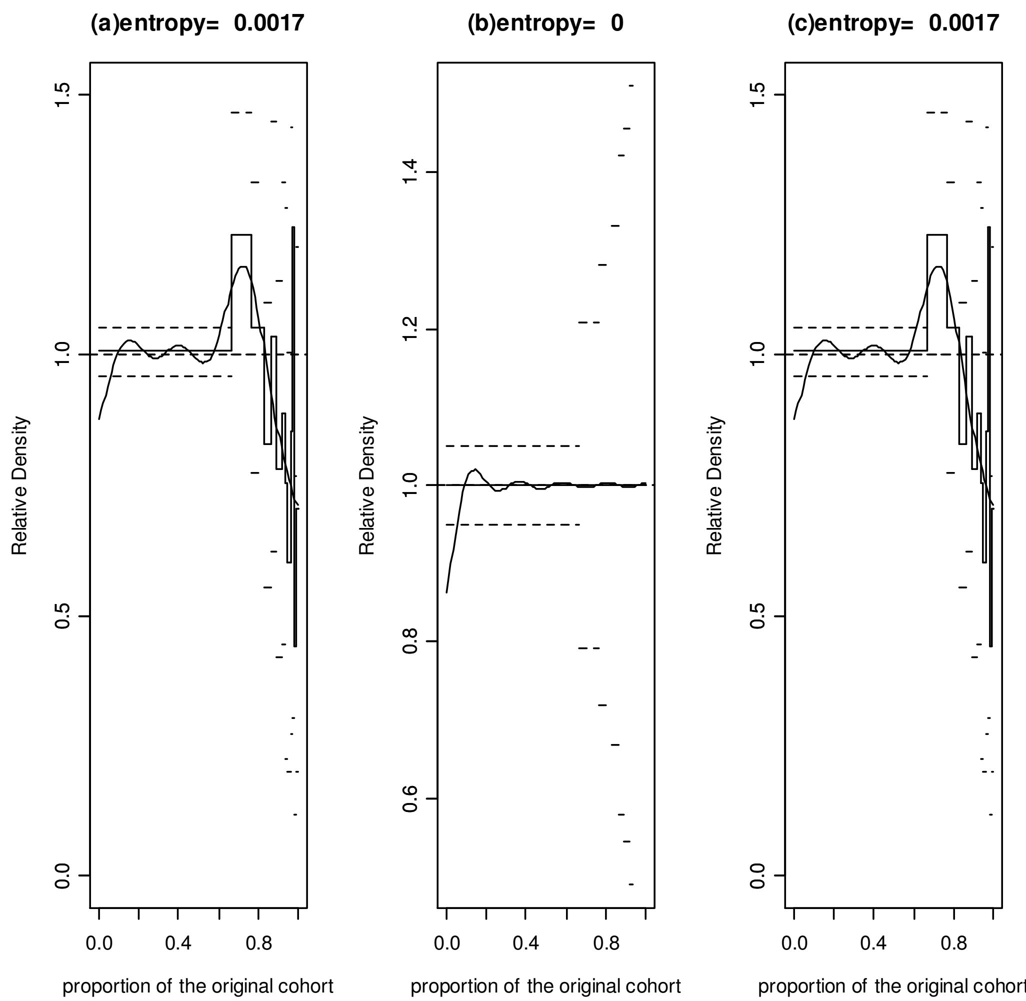
03-04 male



Entropy	Estimate
Overall change	-0.0036
Median effect	0
Shape effect	-0.0036

Polarization index	Estimate	95% CI	p-value
Median index	-5.57e-02	-8.06e-02 – -3.07e-02	6.04e-06
Lower index	NaN	NaN	NaN
Upper index	-0.0557	-0.1055 – -0.0058	0.0143

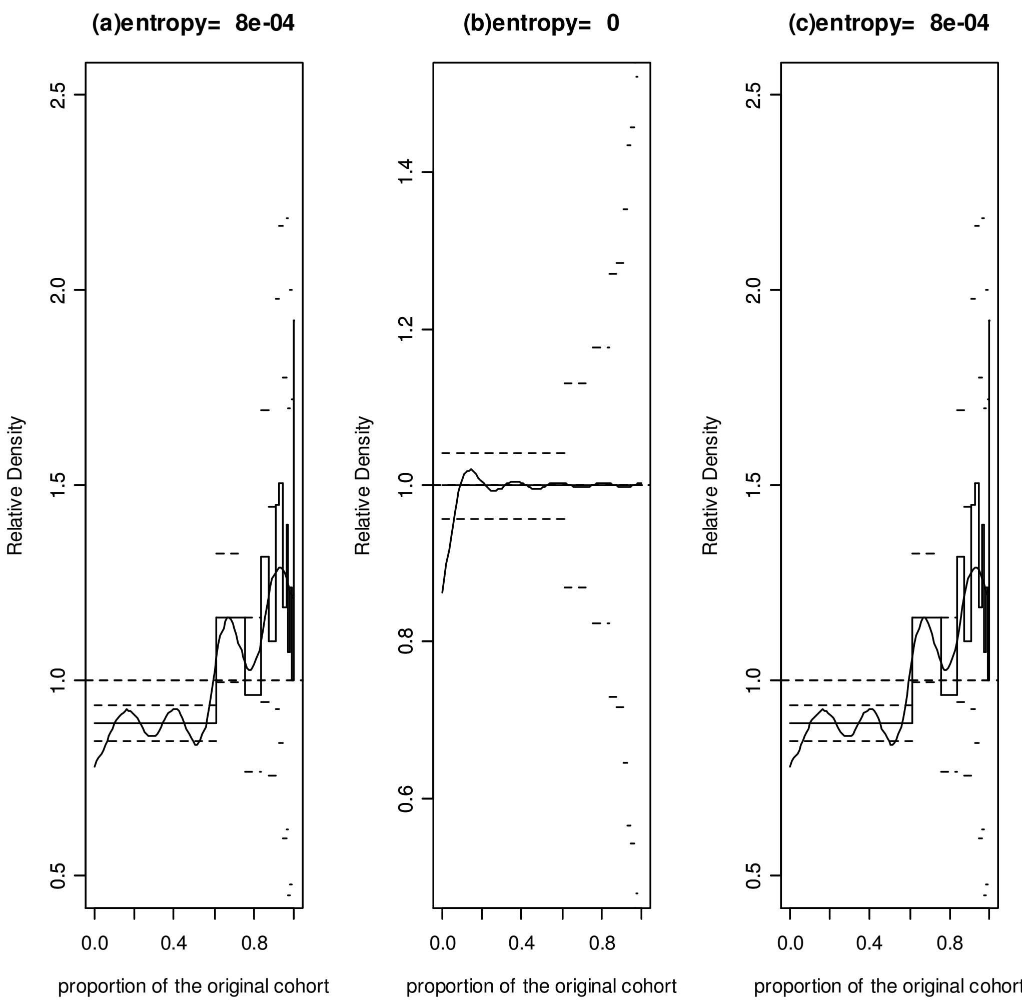
04-05 male



Entropy	Estimate
Overall change	0.0017
Median effect	0
Shape effect	0.0017

Polarization index	Estimate	95% CI	p-value
Median index	-1.07e-01	-1.34e-01 – -7.92e-02	1.62e-14
Lower index	NaN	NaN	NaN
Upper index	-1.07e-01	-1.62e-01 – -5.16e-02	7.41e-05

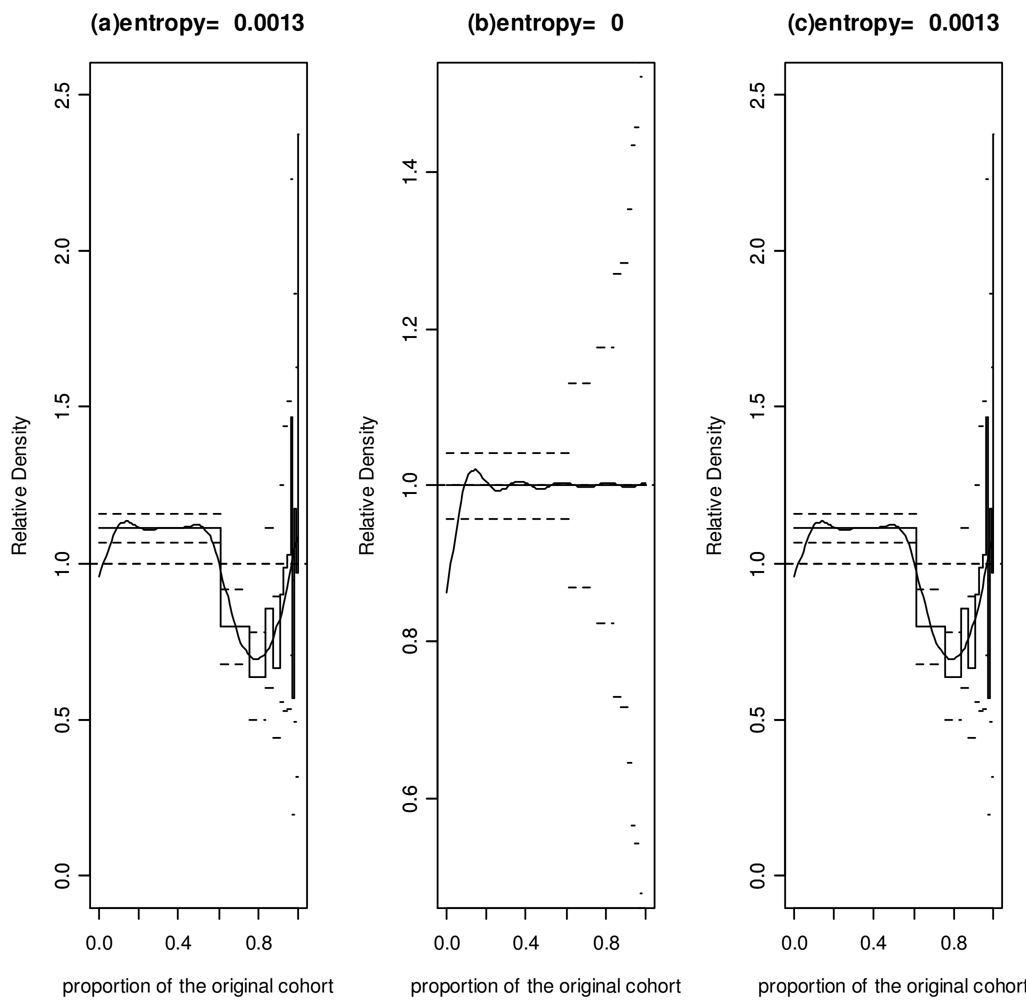
97-99 male



Entropy	Estimate
Overall change	8e-04
Median effect	0
Shape effect	8e-04

Polarization index	Estimate	95% CI	p-value
Median index	-1.19e-01	-1.52e-01 – -8.59e-02	7.51e-13
Lower index	NaN	NaN	NaN
Upper index	-0.118767	-0.184578 – -0.052957	0.000202

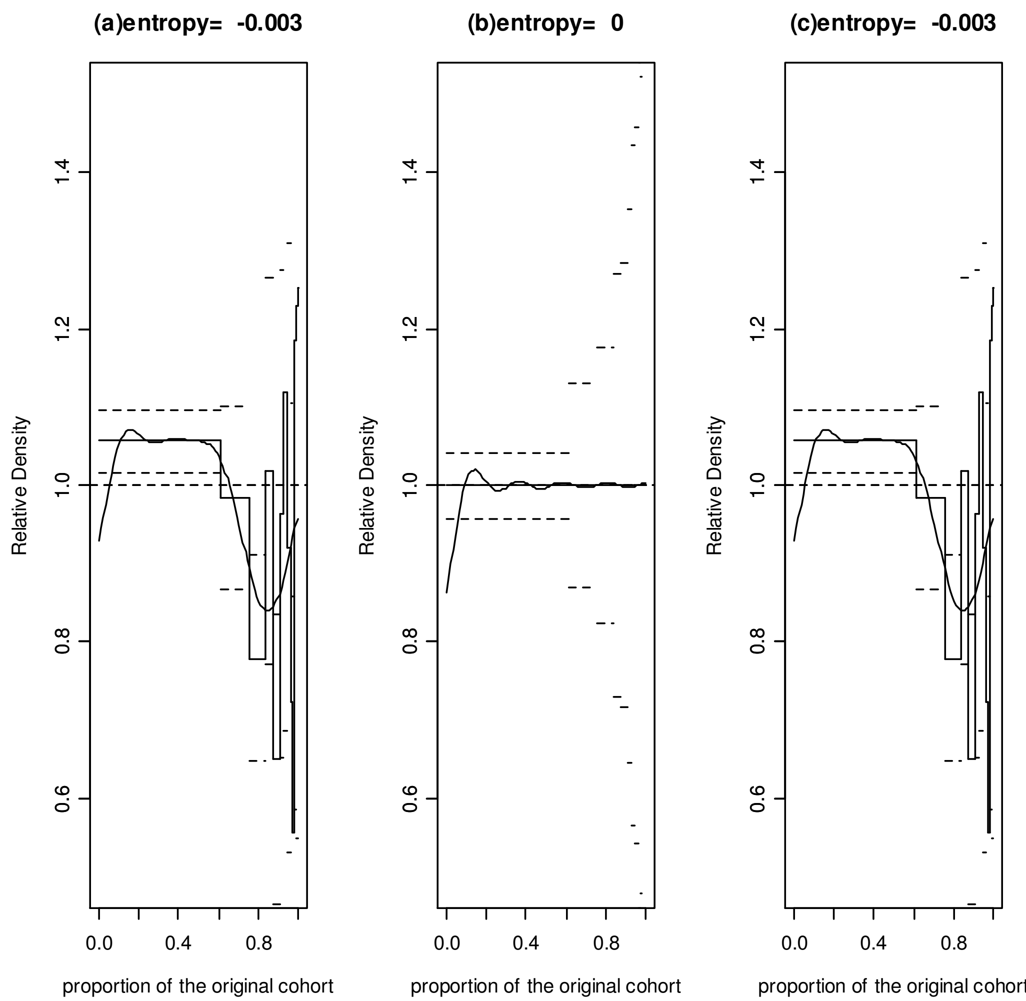
97-00 male



Entropy	Estimate		
Overall change	0.0013		
Median effect	0		
Shape effect	0.0013		

Polarization index	Estimate	95% CI	p-value
Median index	-0.241	-0.267 – -0.216	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.241	-0.292 – -0.191	0.000

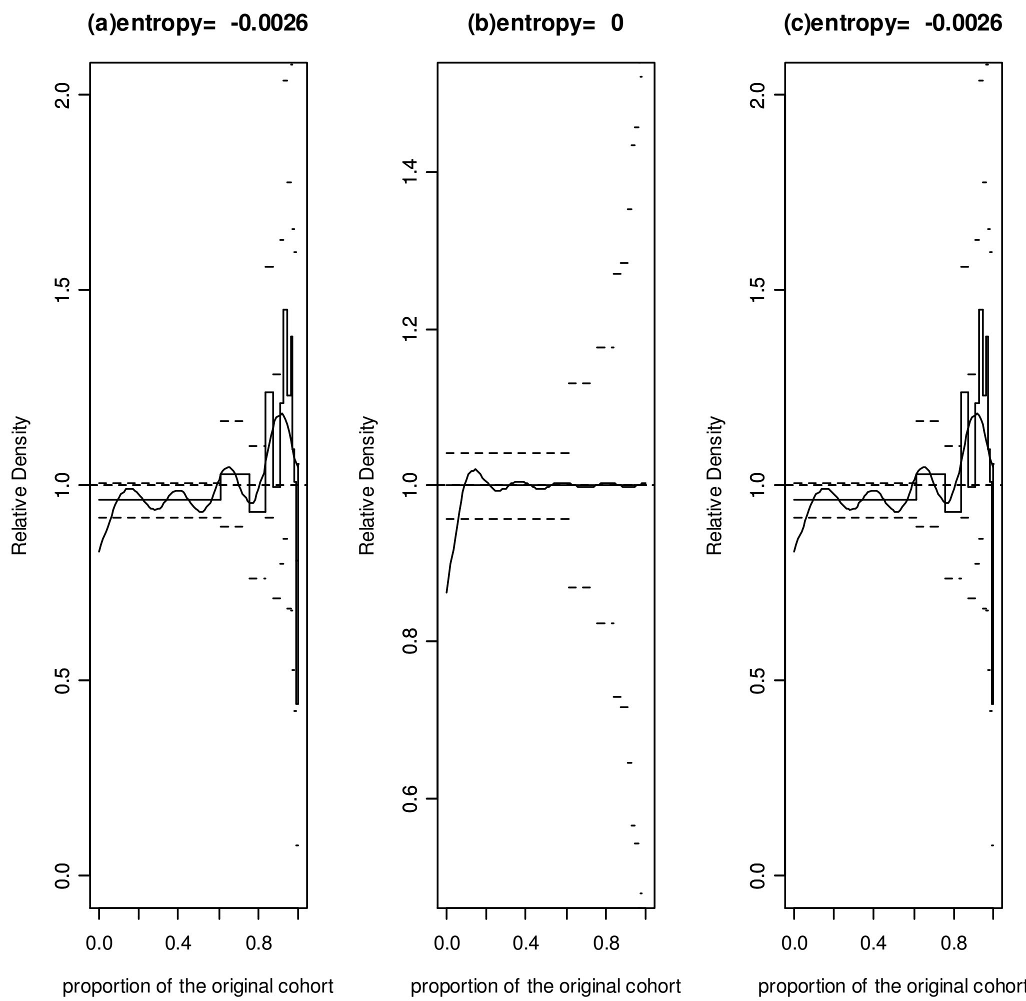
97-01 male



Entropy	Estimate
Overall change	-0.003
Median effect	0
Shape effect	-0.003

Polarization index	Estimate	95% CI	p-value
Median index	-0.224	-0.247 – -0.202	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.224	-0.270 – -0.179	0.000

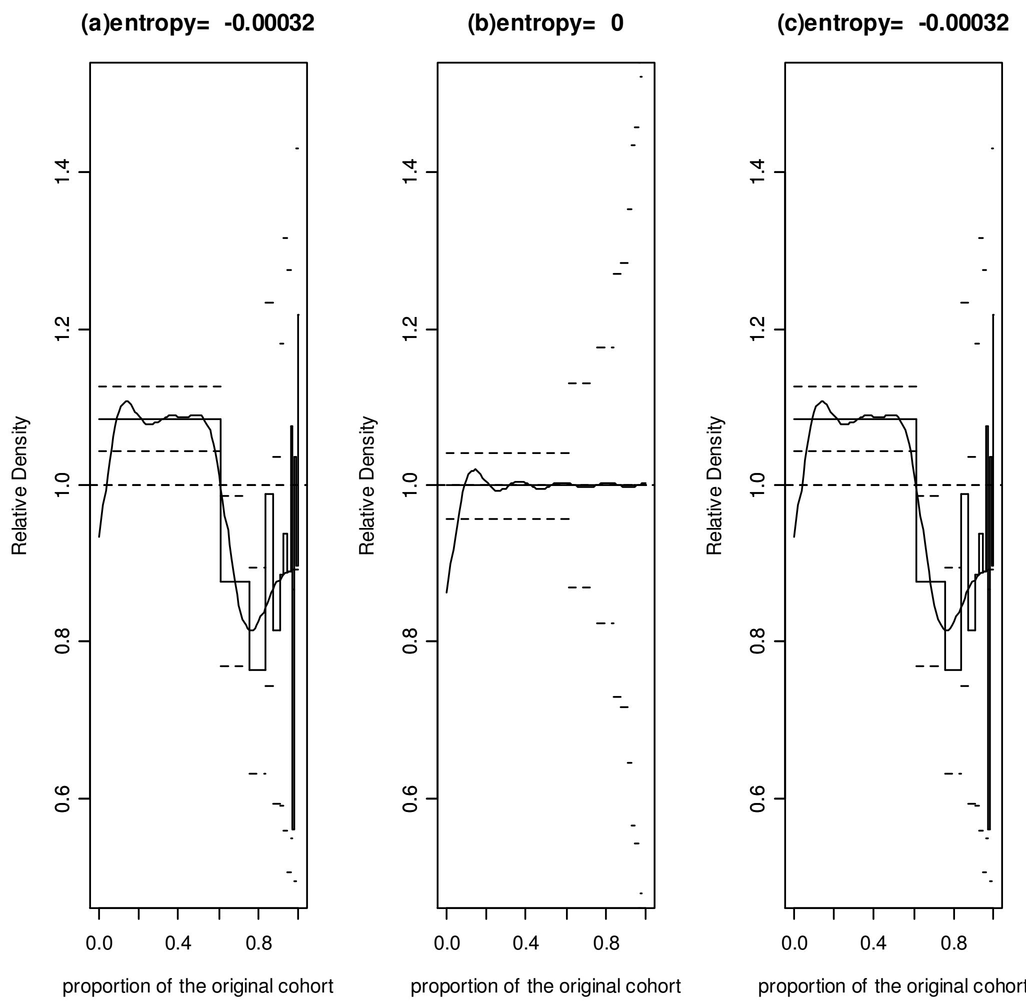
97-02 male



Entropy	Estimate
Overall change	-0.0026
Median effect	0
Shape effect	-0.0026

Polarization index	Estimate	95% CI	p-value
Median index	-0.162	-0.190 – -0.134	0.000
Lower index	NaN	NaN	NaN
Upper index	-1.62e-01	-2.18e-01 – -1.06e-01	5.82e-09

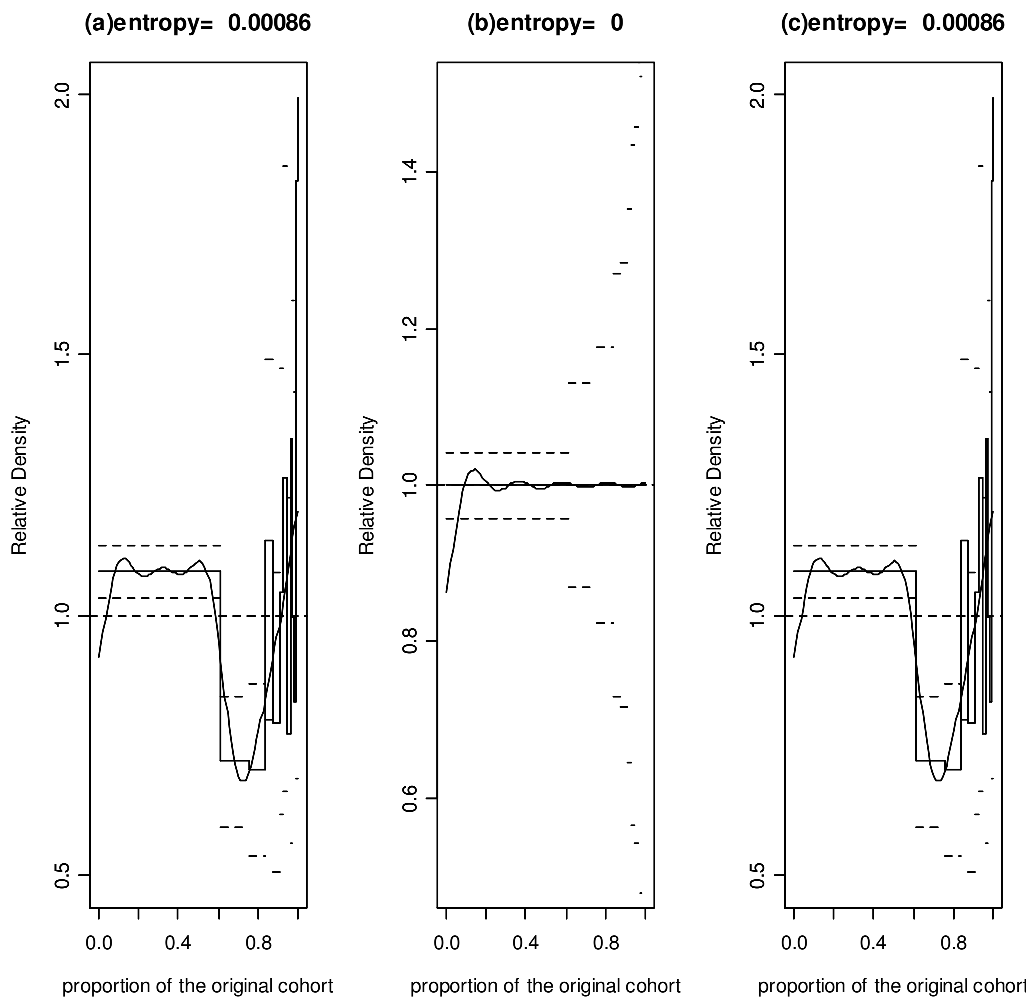
97-03 male



Entropy	Estimate
Overall change	-0.00032
Median effect	0
Shape effect	-0.00032

Polarization index	Estimate	95% CI	p-value
Median index	-0.236	-0.258 – -0.214	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.236	-0.280 – -0.192	0.000

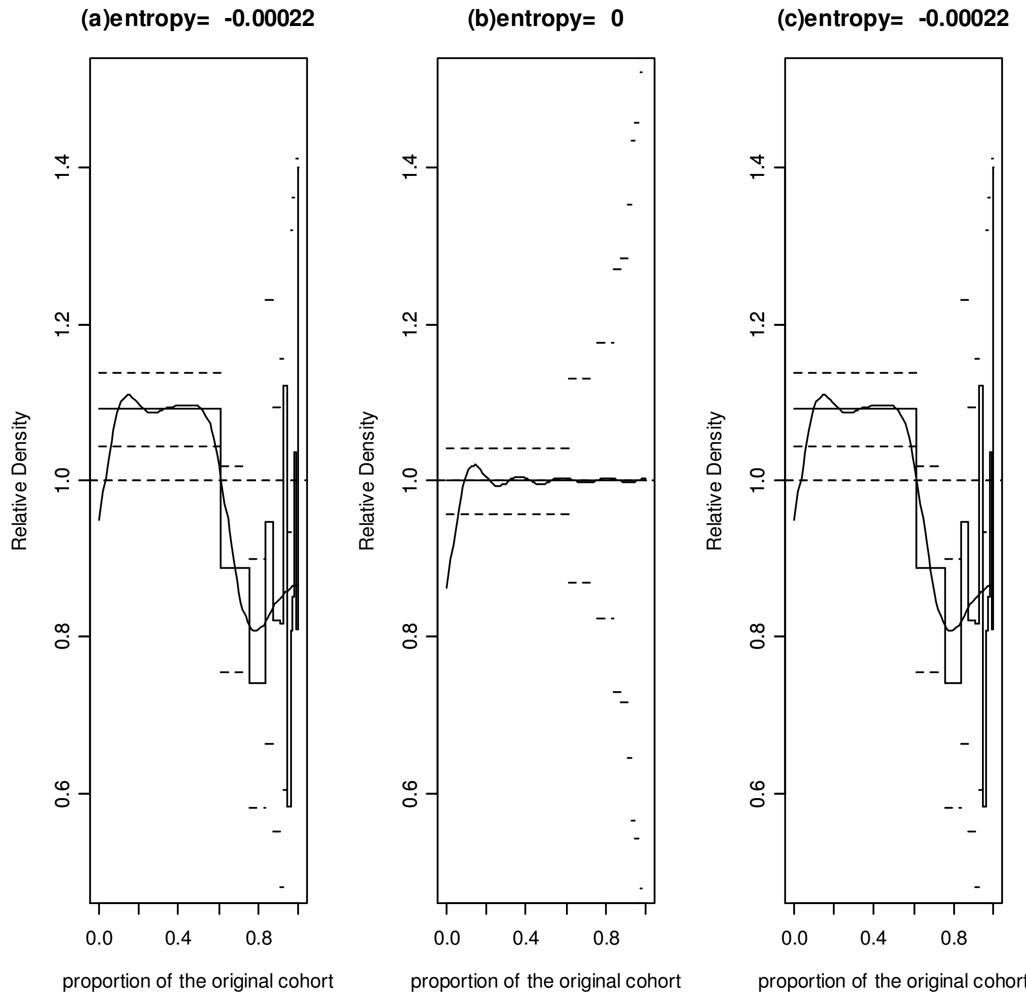
97-04 male



Entropy	Estimate
Overall change	0.00086
Median effect	0
Shape effect	0.00086

Polarization index	Estimate	95% CI	p-value
Median index	-0.215	-0.245 – -0.186	0.000
Lower index	NaN	NaN	NaN
Upper index	-2.15e-01	-2.74e-01 – -1.56e-01	4.80e-13

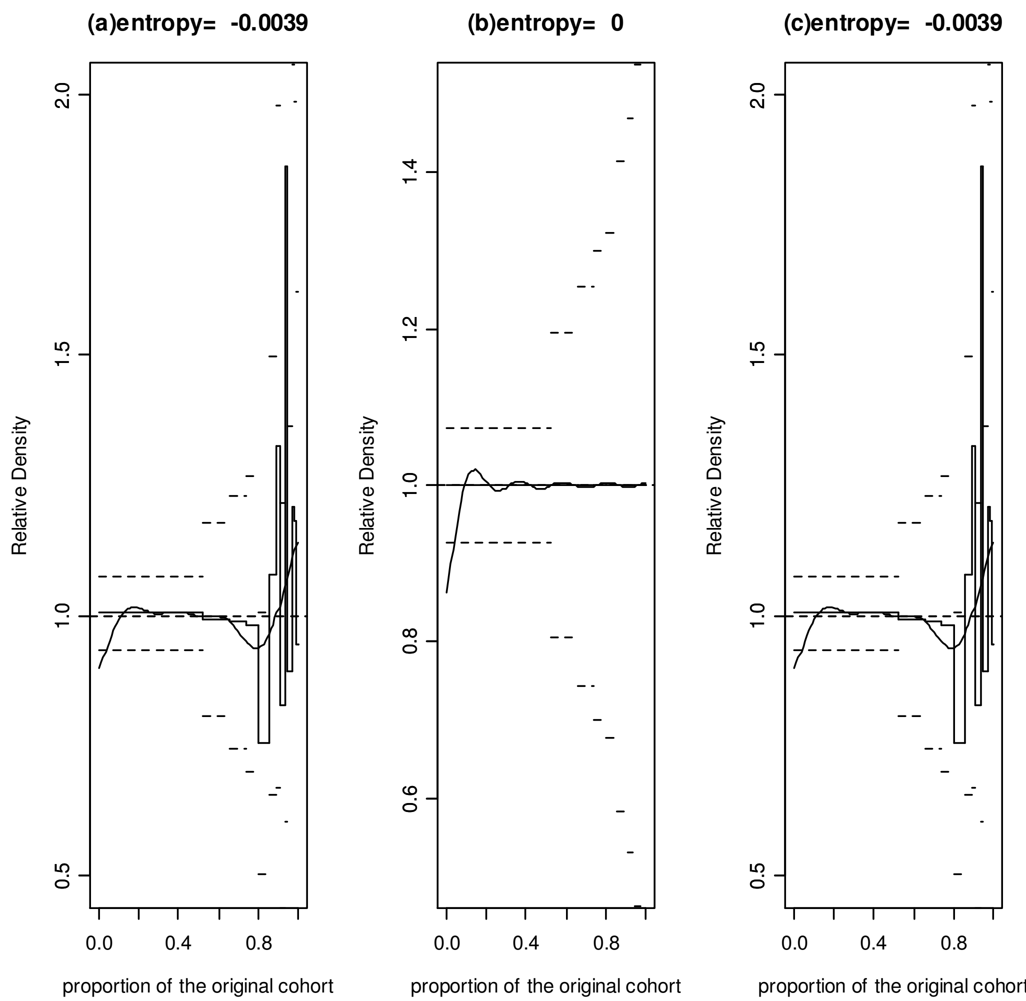
97-05 male



Entropy	Estimate
Overall change	-0.00022
Median effect	0
Shape effect	-0.00022

Polarization index	Estimate	95% CI	p-value
Median index	-0.241	-0.268 – -0.214	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.241	-0.294 – -0.187	0.000

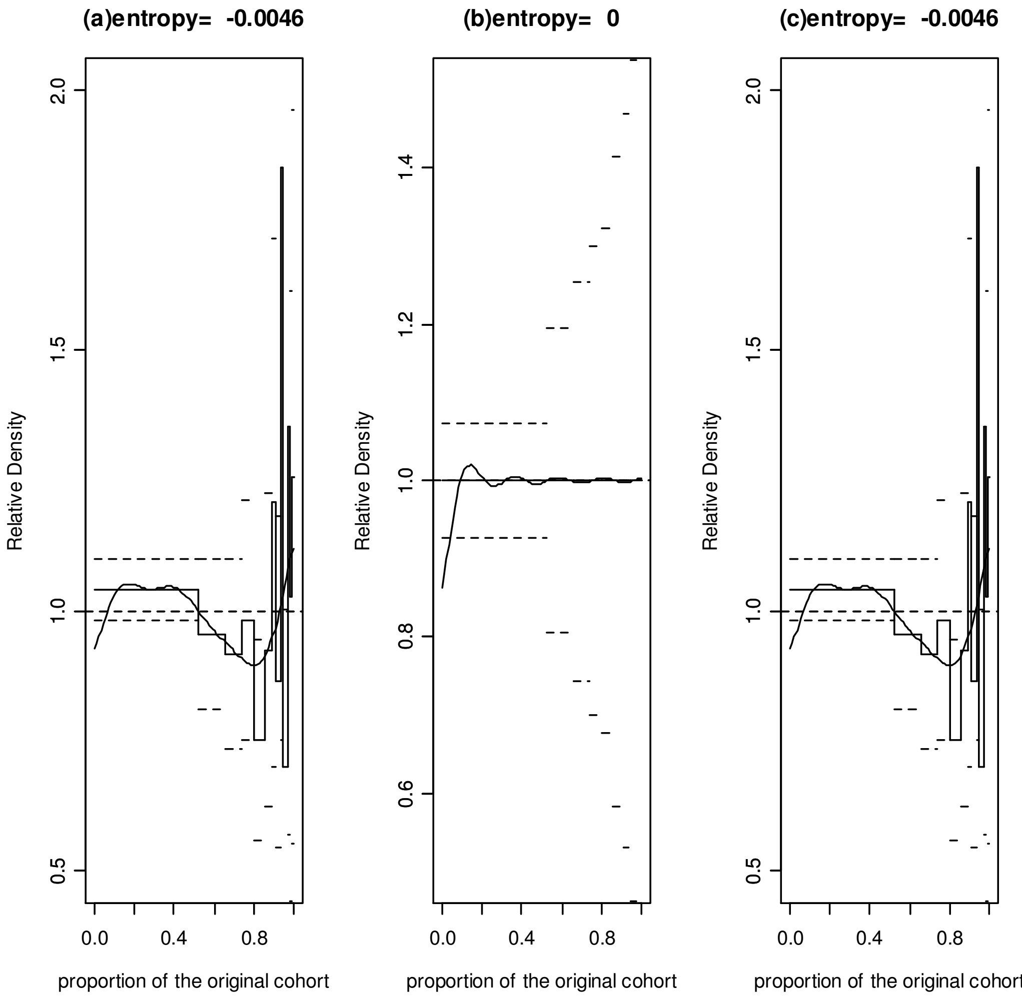
91-92 female



Entropy	Estimate
Overall change	-0.0039
Median effect	0
Shape effect	-0.0039

Polarization index	Estimate	95% CI	p-value
Median index	-0.380	-0.427 – -0.334	0.000
Lower index	NaN	NaN	NaN
Upper index	-3.80e-01	-4.73e-01 – -2.87e-01	5.55e-16

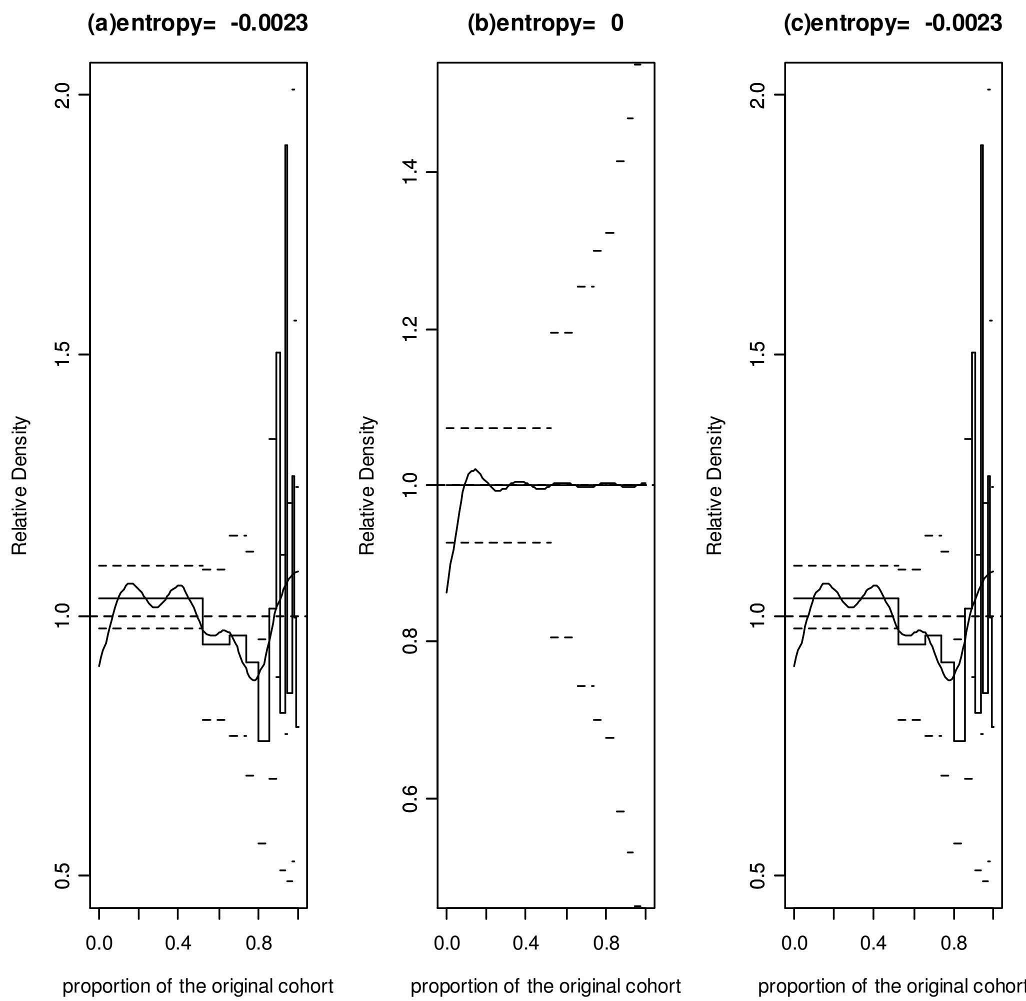
91-93 female



Entropy	Estimate
Overall change	-0.0046
Median effect	0
Shape effect	-0.0046

Polarization index	Estimate	95% CI	p-value
Median index	-0.400	-0.435 – -0.364	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.400	-0.471 – -0.328	0.000

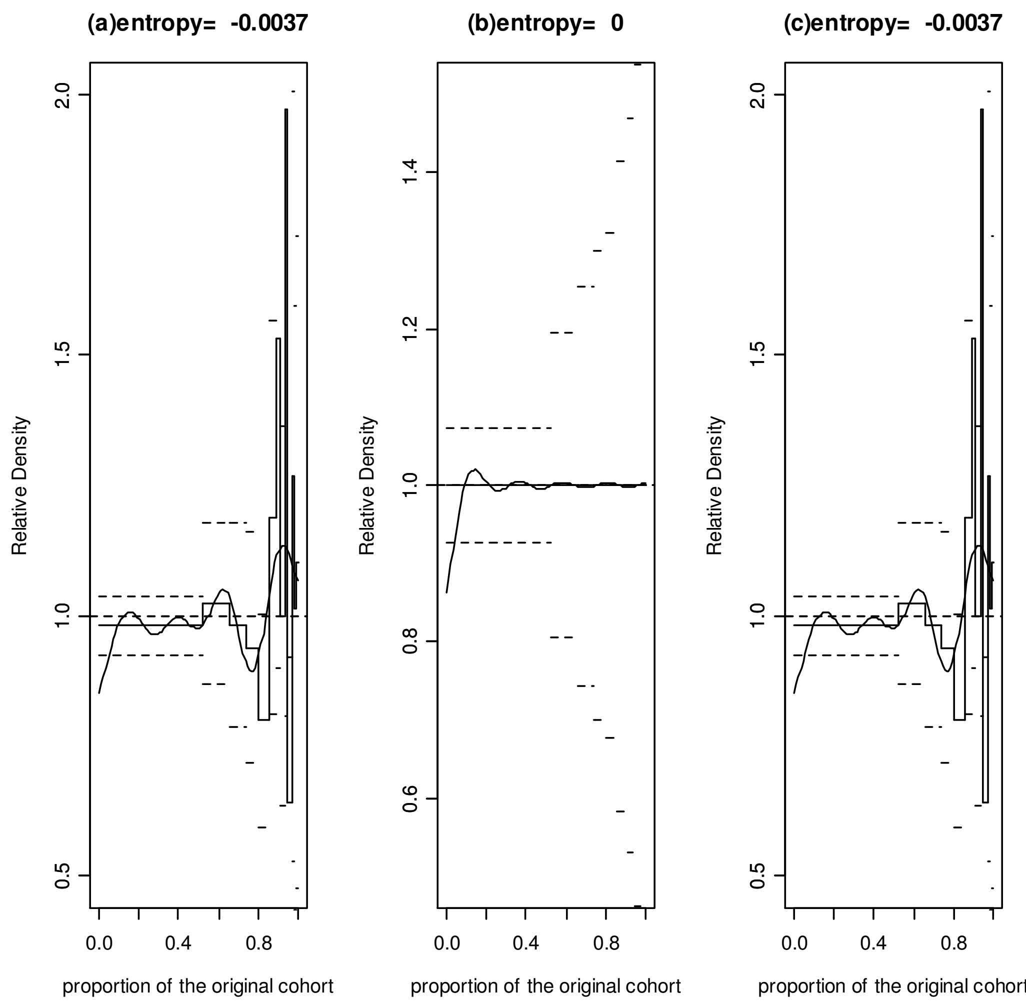
91-94 female



Entropy	Estimate
Overall change	-0.0023
Median effect	0
Shape effect	-0.0023

Polarization index	Estimate	95% CI	p-value
Median index	-0.396	-0.433 – -0.360	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.396	-0.469 – -0.323	0.000

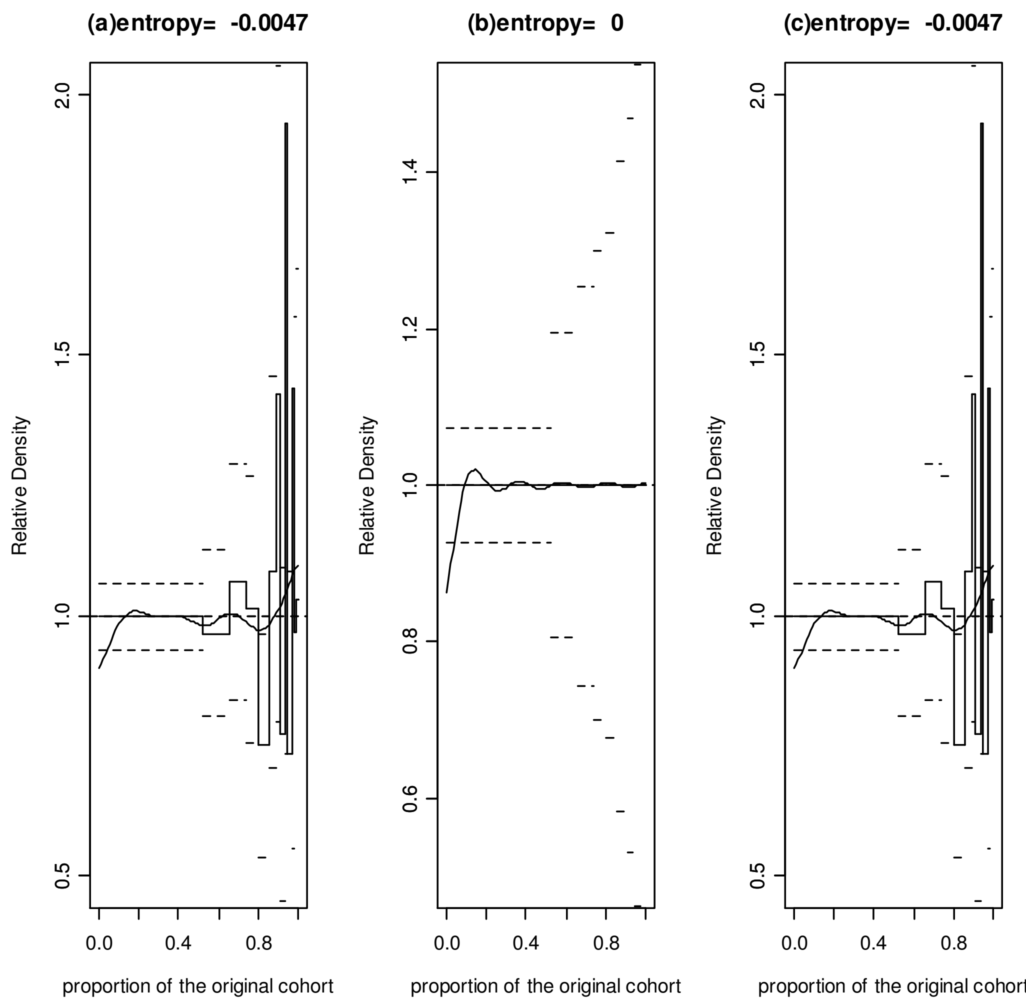
91-95 female



Entropy	Estimate		
Overall change	-0.0037		
Median effect	0		
Shape effect	-0.0037		

Polarization index	Estimate	95% CI	p-value
Median index	-0.366	-0.404 – -0.327	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.366	-0.442 – -0.289	0.000

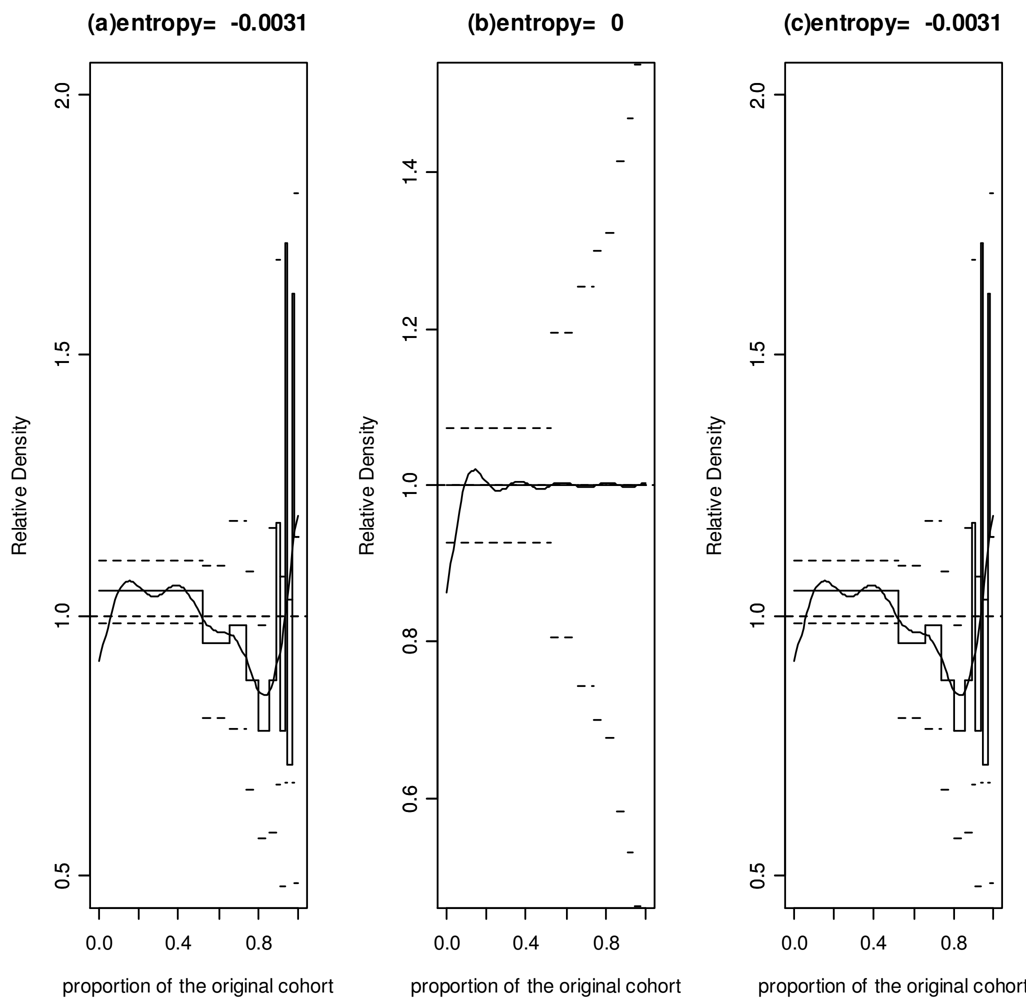
91-97 female



Entropy	Estimate
Overall change	-0.0047
Median effect	0
Shape effect	-0.0047

Polarization index	Estimate	95% CI	p-value
Median index	-0.377	-0.418 – -0.336	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.377	-0.459 – -0.295	0.000

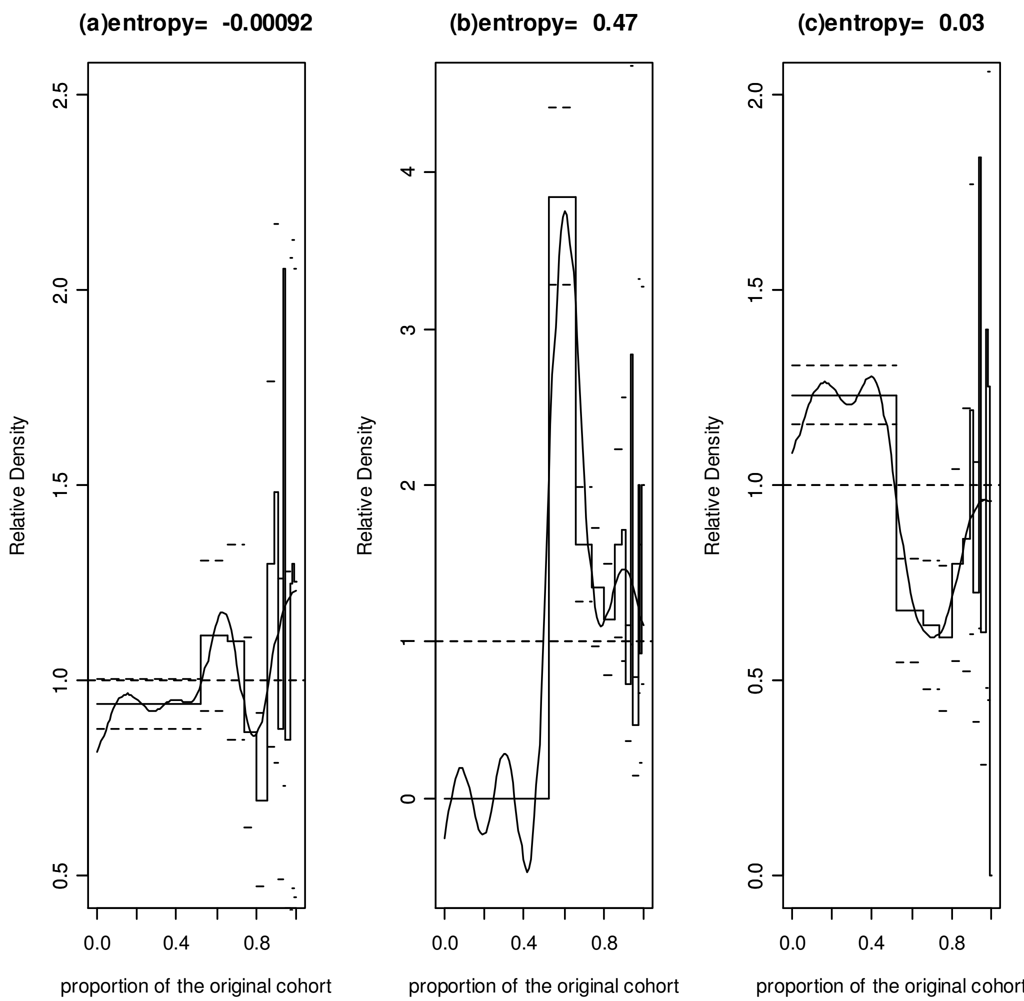
91-98 female



Entropy	Estimate
Overall change	-0.0031
Median effect	0
Shape effect	-0.0031

Polarization index	Estimate	95% CI	p-value
Median index	-0.404	-0.441 – -0.368	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.404	-0.477 – -0.331	0.000

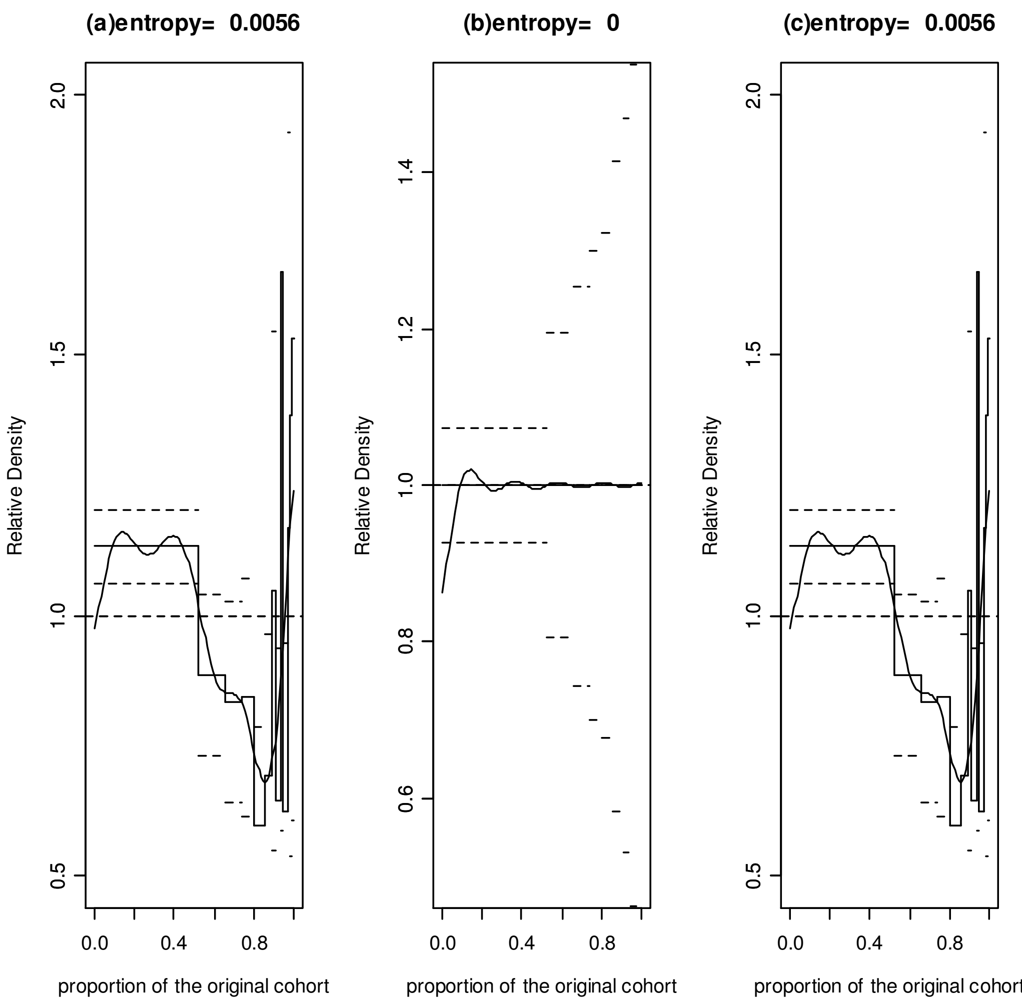
91-99 female



Entropy	Estimate		
Overall change	-0.00092		
Median effect	0.47		
Shape effect	0.03		

Polarization index	Estimate	95% CI	p-value
Median index	0.443	0.402 – 0.483	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.09718	-0.17294 – -0.02142	0.00596

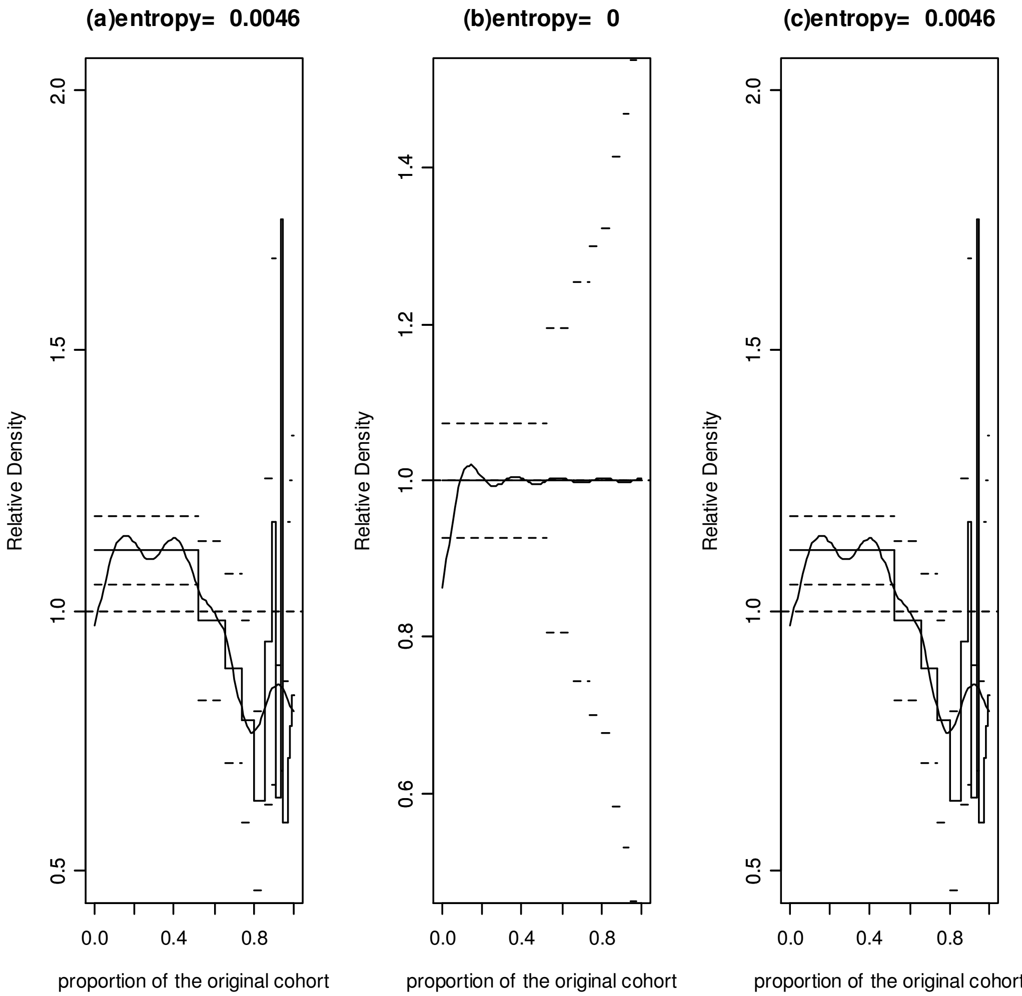
91-00 female



Entropy	Estimate
Overall change	0.0056
Median effect	0
Shape effect	0.0056

Polarization index	Estimate	95% CI	p-value
Median index	-0.454	-0.492 – -0.416	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.454	-0.530 – -0.378	0.000

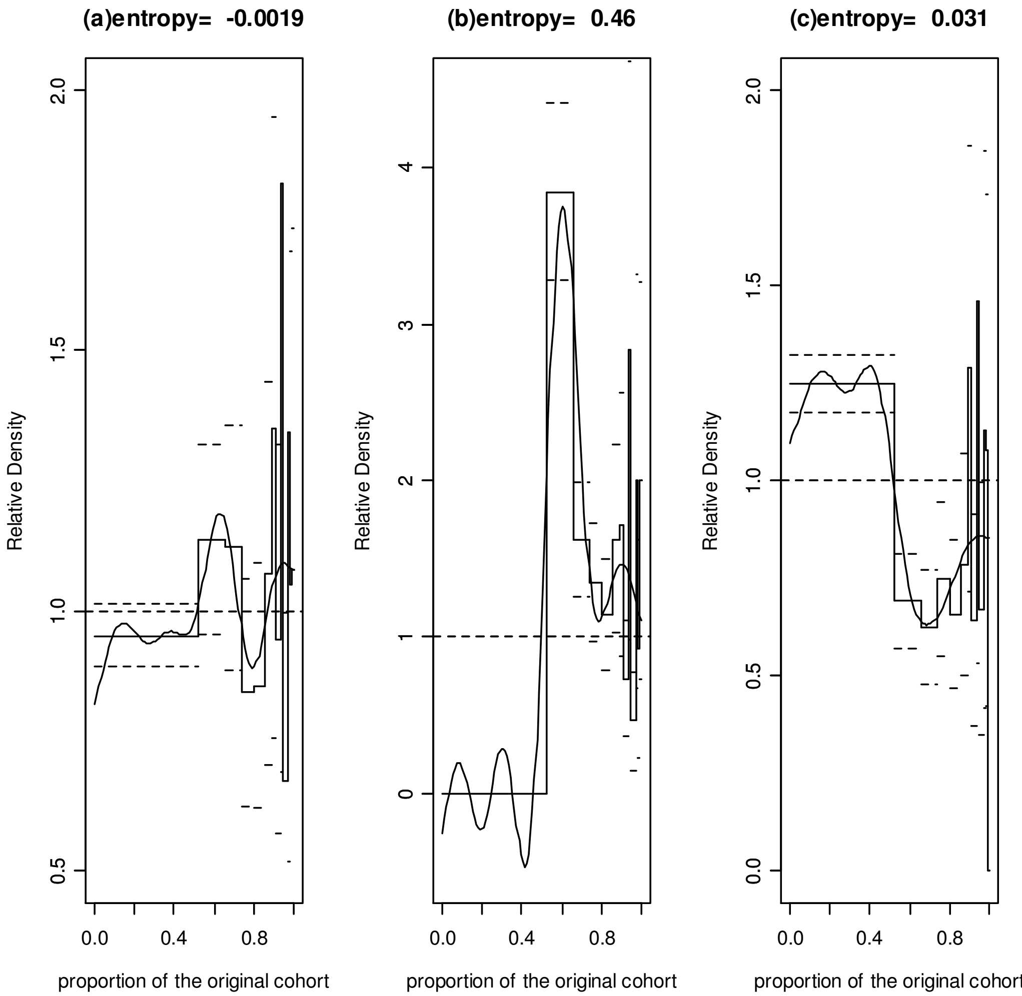
91-01 female



Entropy	Estimate
Overall change	0.0046
Median effect	0
Shape effect	0.0046

Polarization index	Estimate	95% CI	p-value
Median index	-0.463	-0.498 – -0.428	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.463	-0.533 – -0.392	0.000

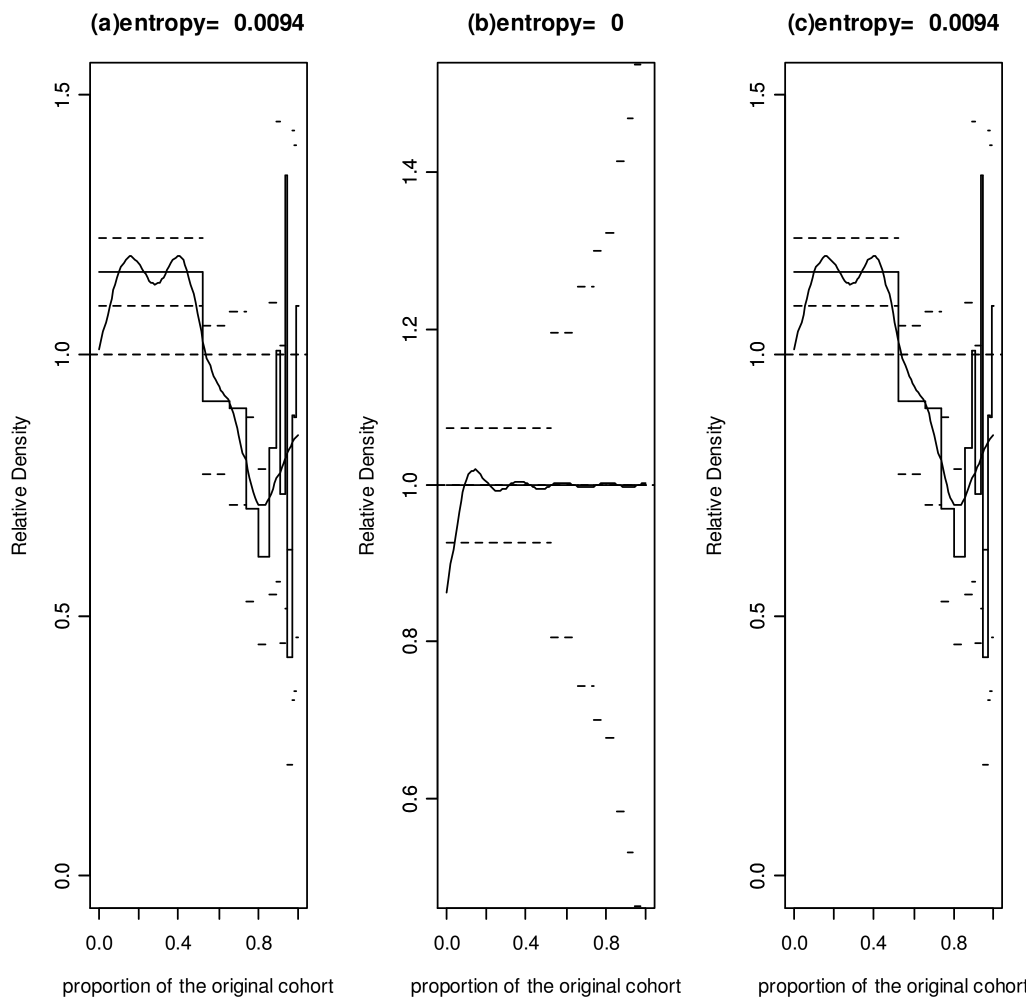
91-02 female



Entropy	Estimate
Overall change	-0.0019
Median effect	0.46
Shape effect	0.031

Polarization index	Estimate	95% CI	p-value
Median index	0.436	0.401 – 0.471	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.123664	-0.189842 – -0.057486	0.000125

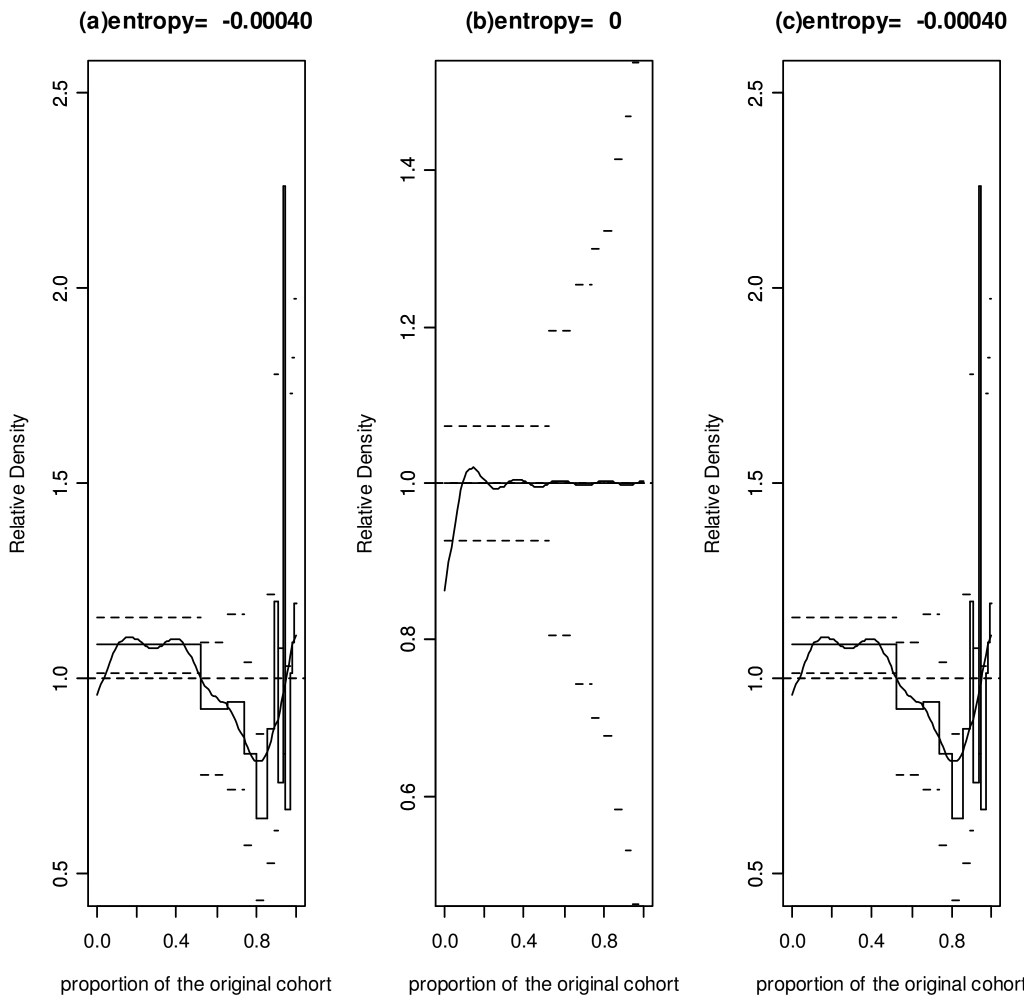
91-03 female



Entropy	Estimate
Overall change	0.0094
Median effect	0
Shape effect	0.0094

Polarization index	Estimate	95% CI	p-value
Median index	-0.484	-0.517 - 0.450	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.484	-0.551 - -0.416	0.000

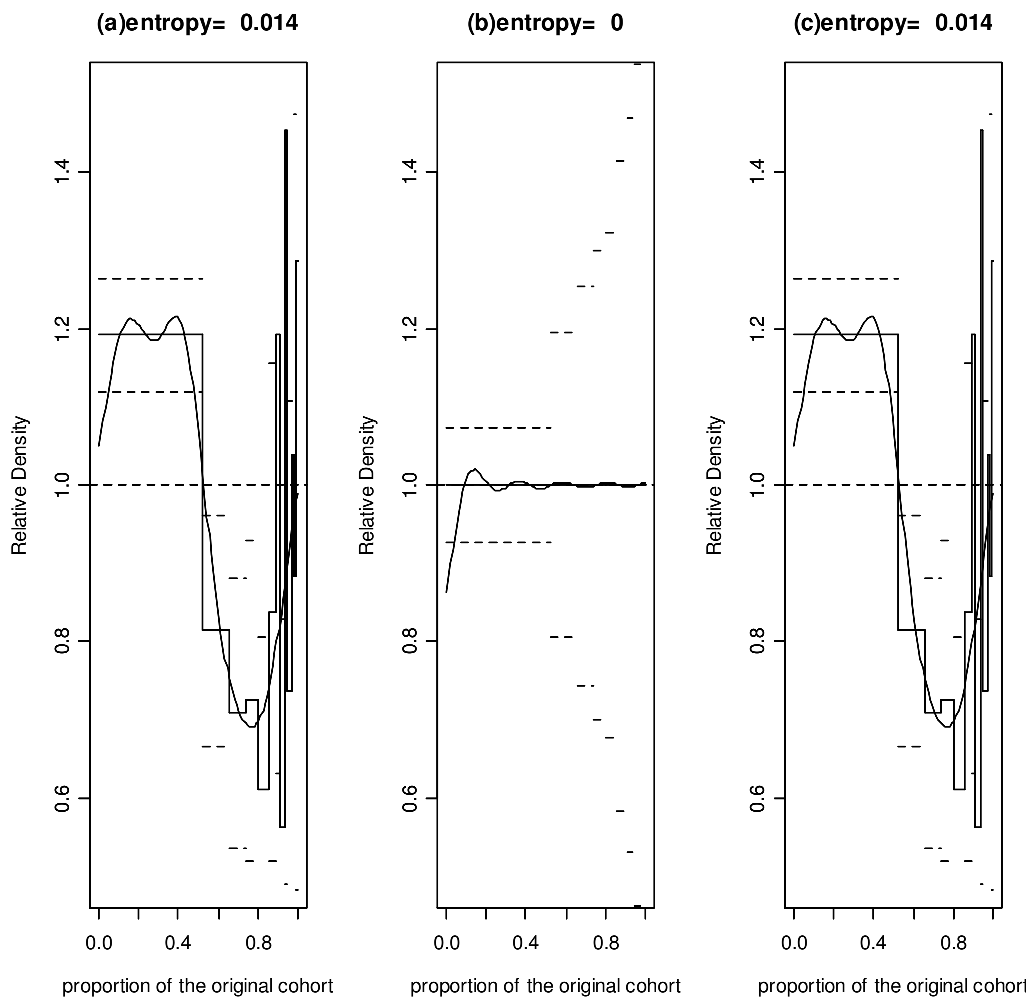
91-04 female



Entropy	Estimate		
Overall change	-0.00040		
Median effect	0		
Shape effect	-0.00040		

Polarization index	Estimate	95% CI	p-value
Median index	-0.429	-0.471 – -0.387	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.429	-0.513 – -0.345	0.000

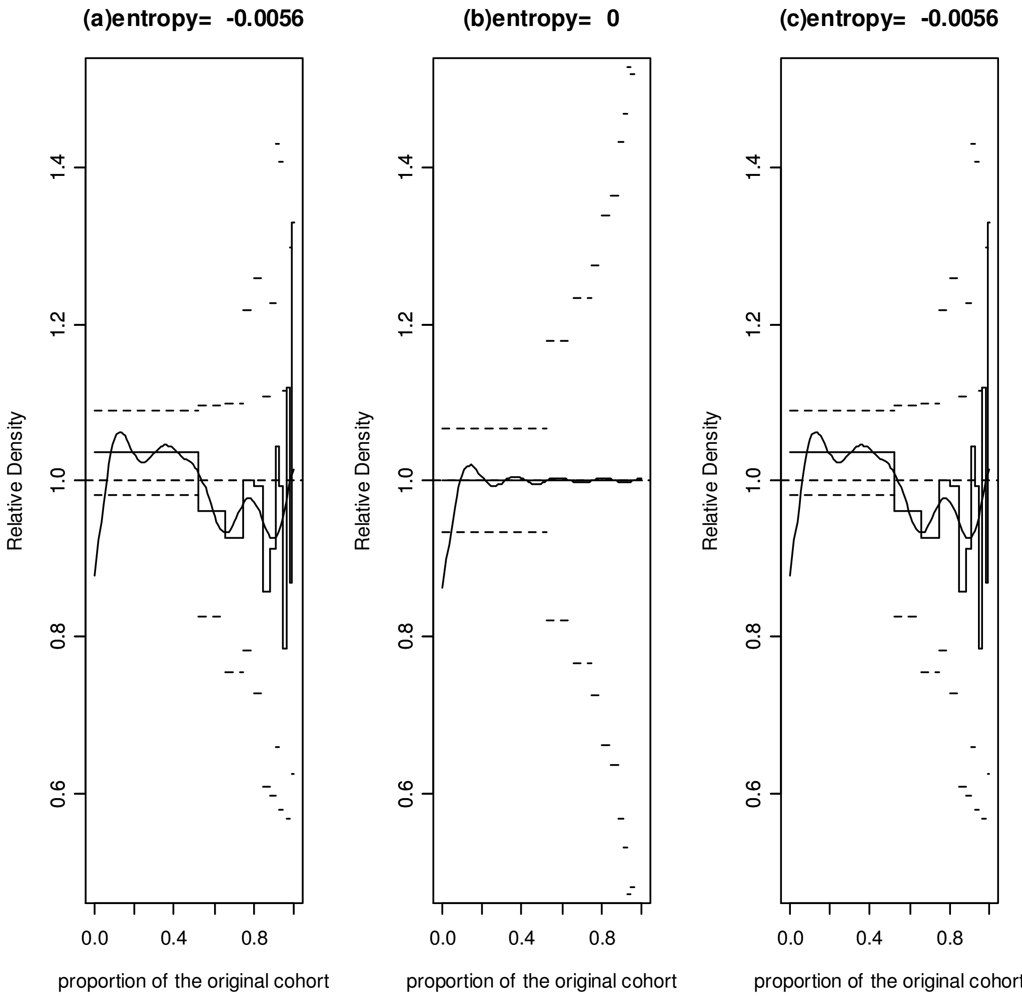
91-05 female



Entropy	Estimate		
Overall change	0.014		
Median effect	0		
Shape effect	0.014		

Polarization index	Estimate	95% CI	p-value
Median index	-0.485	-0.521 – -0.448	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.485	-0.558 – -0.412	0.000

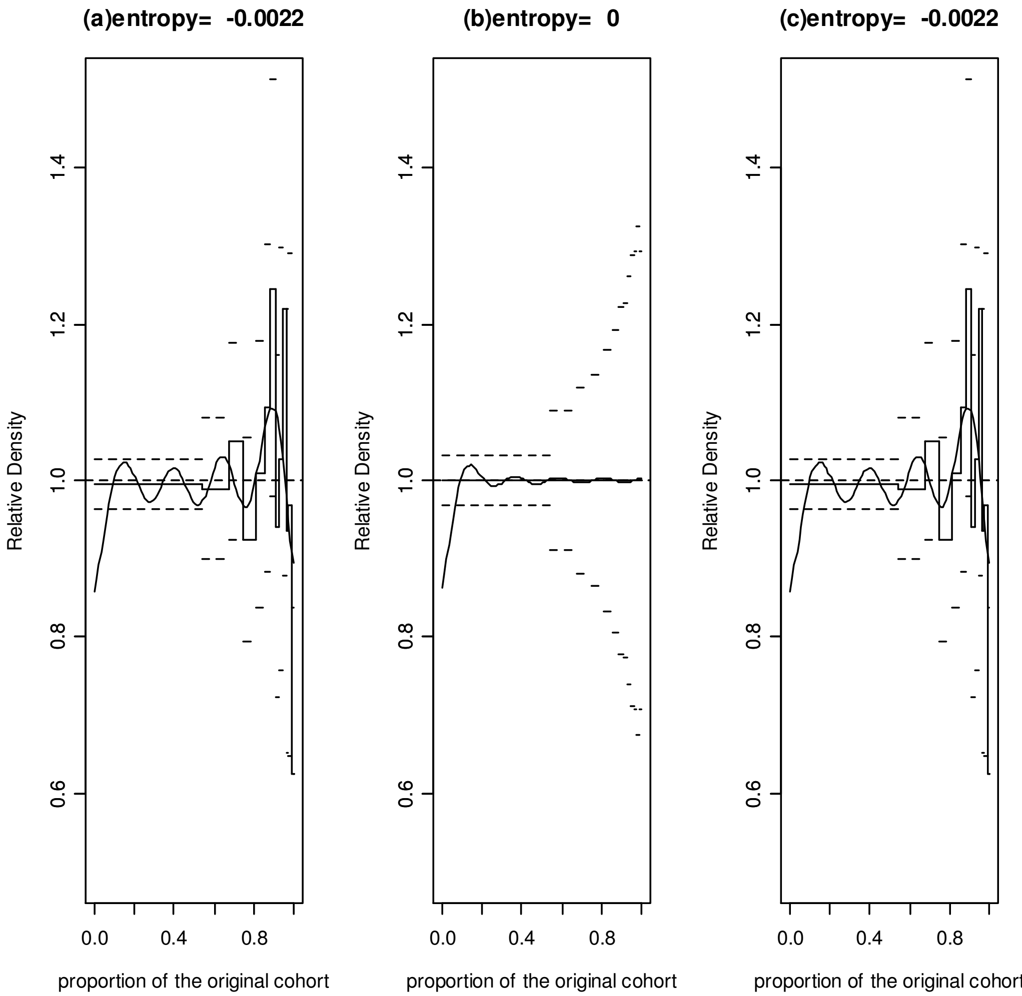
92-93 female



Entropy	Estimate
Overall change	-0.0056
Median effect	0
Shape effect	-0.0056

Polarization index	Estimate	95% CI	p-value
Median index	-0.399	-0.432 – -0.365	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.399	-0.465 – -0.332	0.000

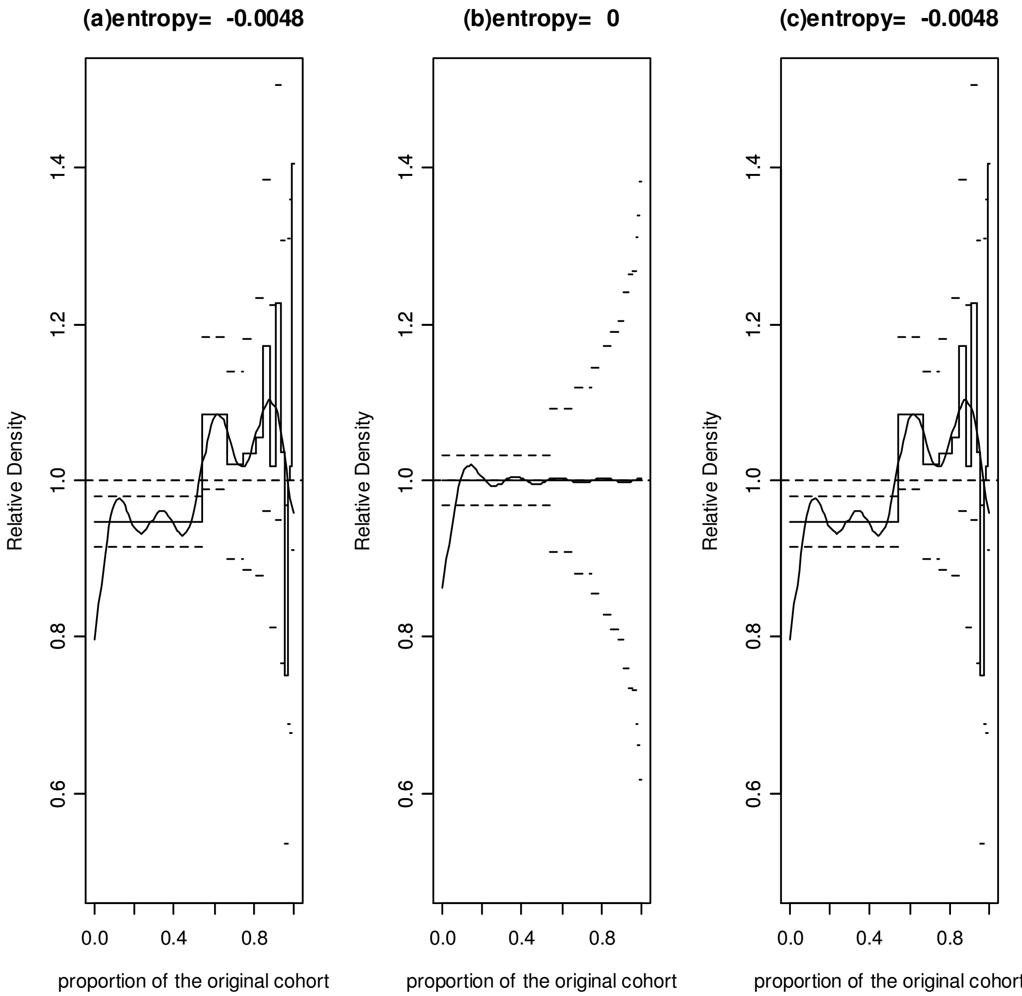
93-94 female



Entropy	Estimate
Overall change	-0.0022
Median effect	0
Shape effect	-0.0022

Polarization index	Estimate	95% CI	p-value
Median index	-0.343	-0.364 – -0.322	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.343	-0.385 – -0.301	0.000

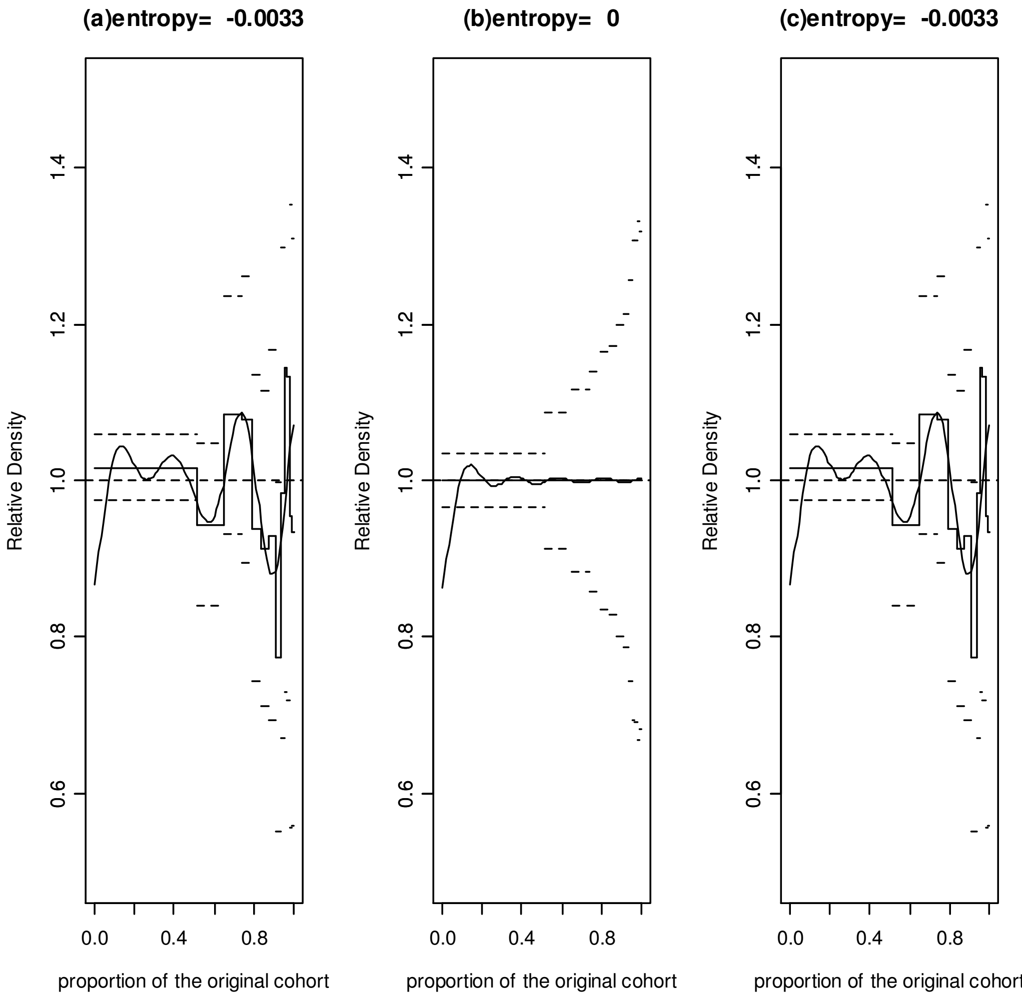
94-95 female



Entropy	Estimate
Overall change	-0.0048
Median effect	0
Shape effect	-0.0048

Polarization index	Estimate	95% CI	p-value
Median index	-0.322	-0.345 – -0.300	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.322	-0.367 – -0.278	0.000

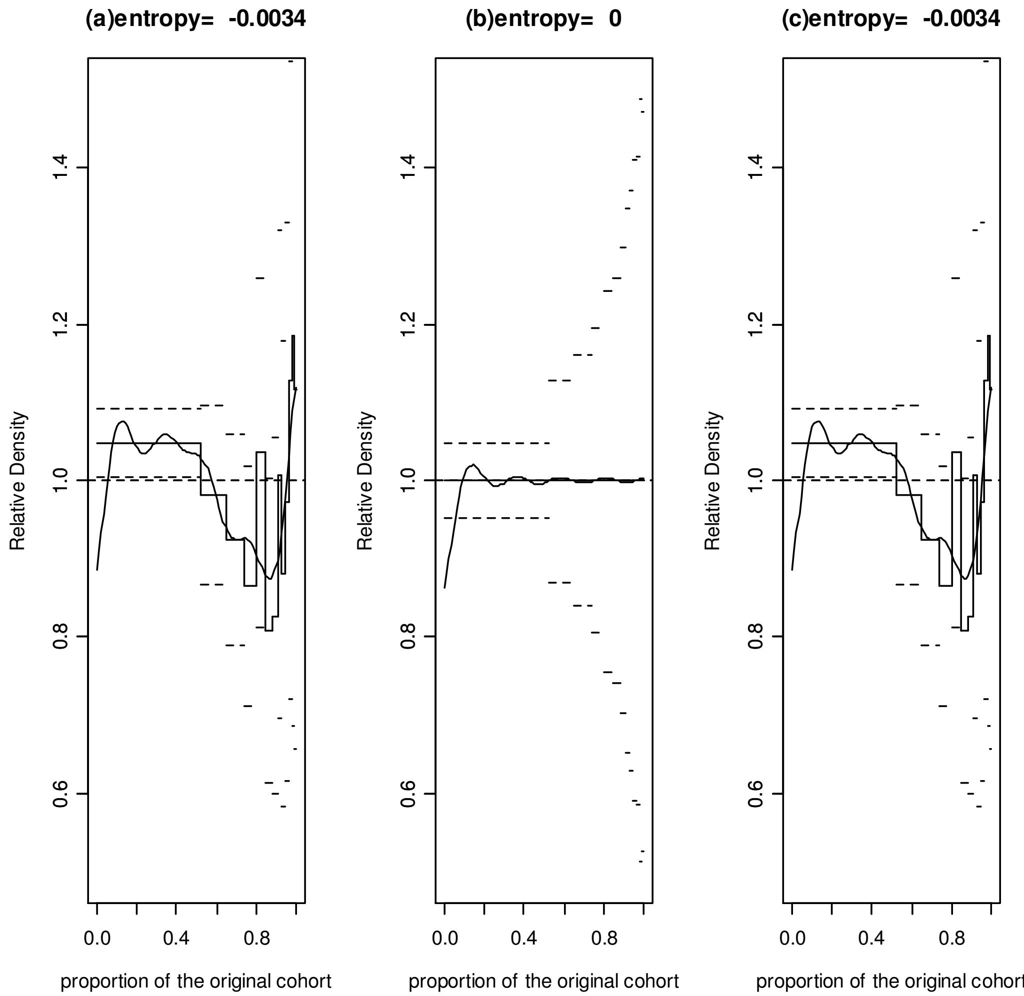
95-97 female



Entropy	Estimate
Overall change	-0.0033
Median effect	0
Shape effect	-0.0033

Polarization index	Estimate	95% CI	p-value
Median index	-0.413	-0.441 – -0.385	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.413	-0.469 – -0.358	0.000

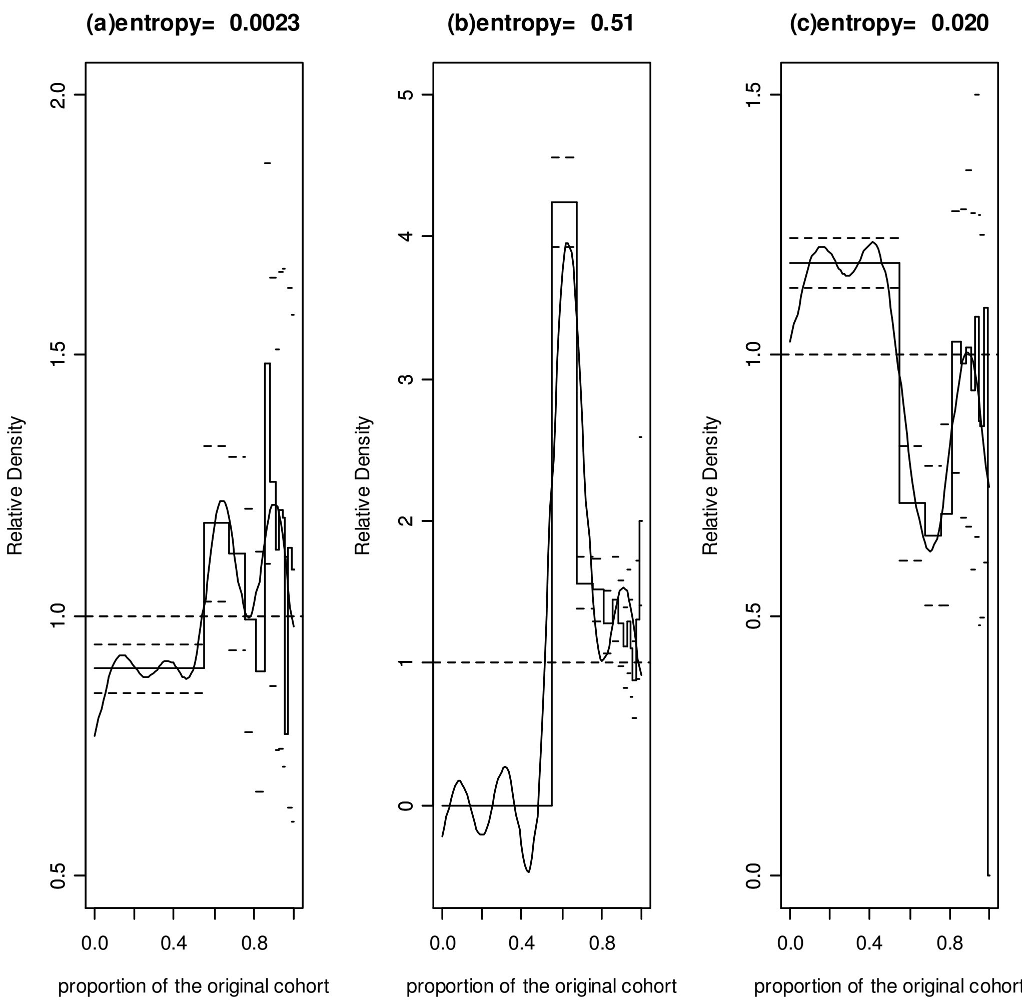
97-98 female



Entropy	Estimate
Overall change	-0.0034
Median effect	0
Shape effect	-0.0034

Polarization index	Estimate	95% CI	p-value
Median index	-0.414	-0.441 – -0.386	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.414	-0.468 – -0.359	0.000

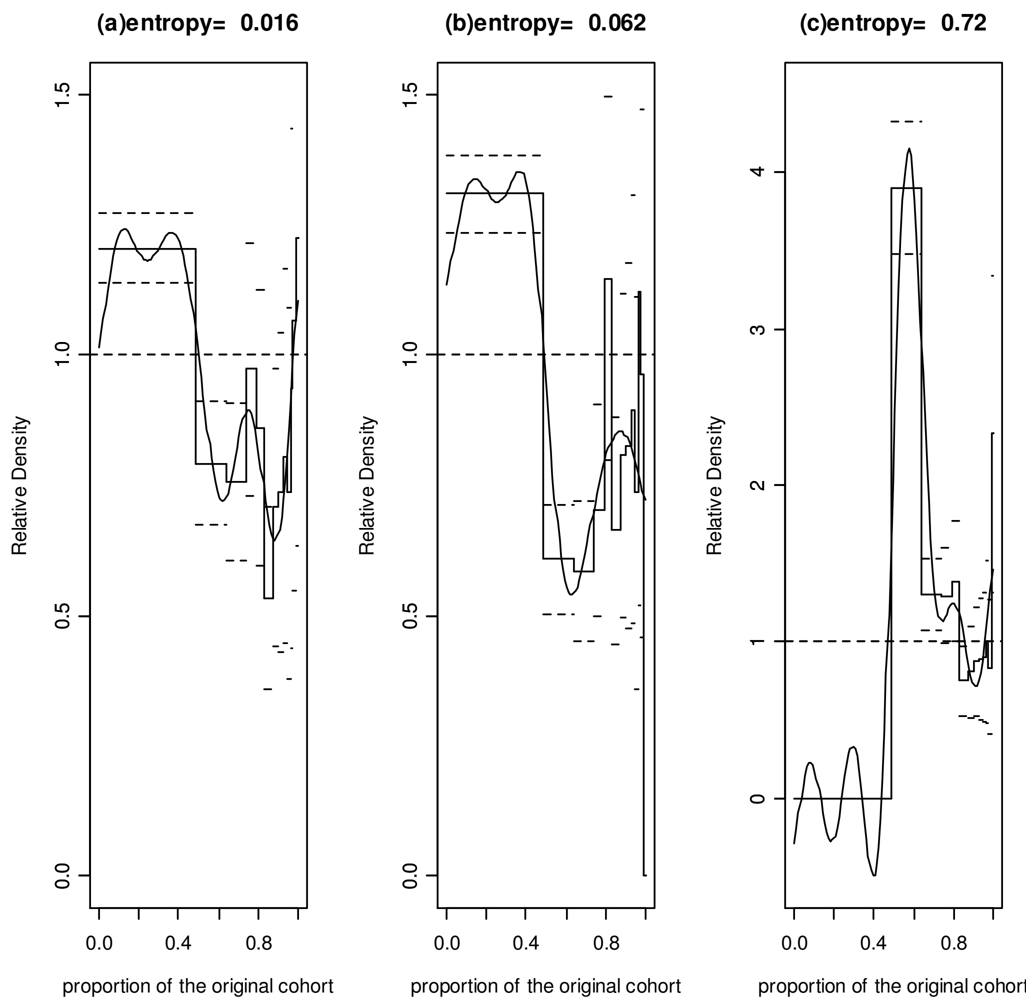
98-99 female



Entropy	Estimate		
Overall change	0.0023		
Median effect	0.51		
Shape effect	0.020		

Polarization index	Estimate	95% CI	p-value
Median index	0.465	0.432 – 0.497	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.05392	-0.11279 – 0.00495	0.03631

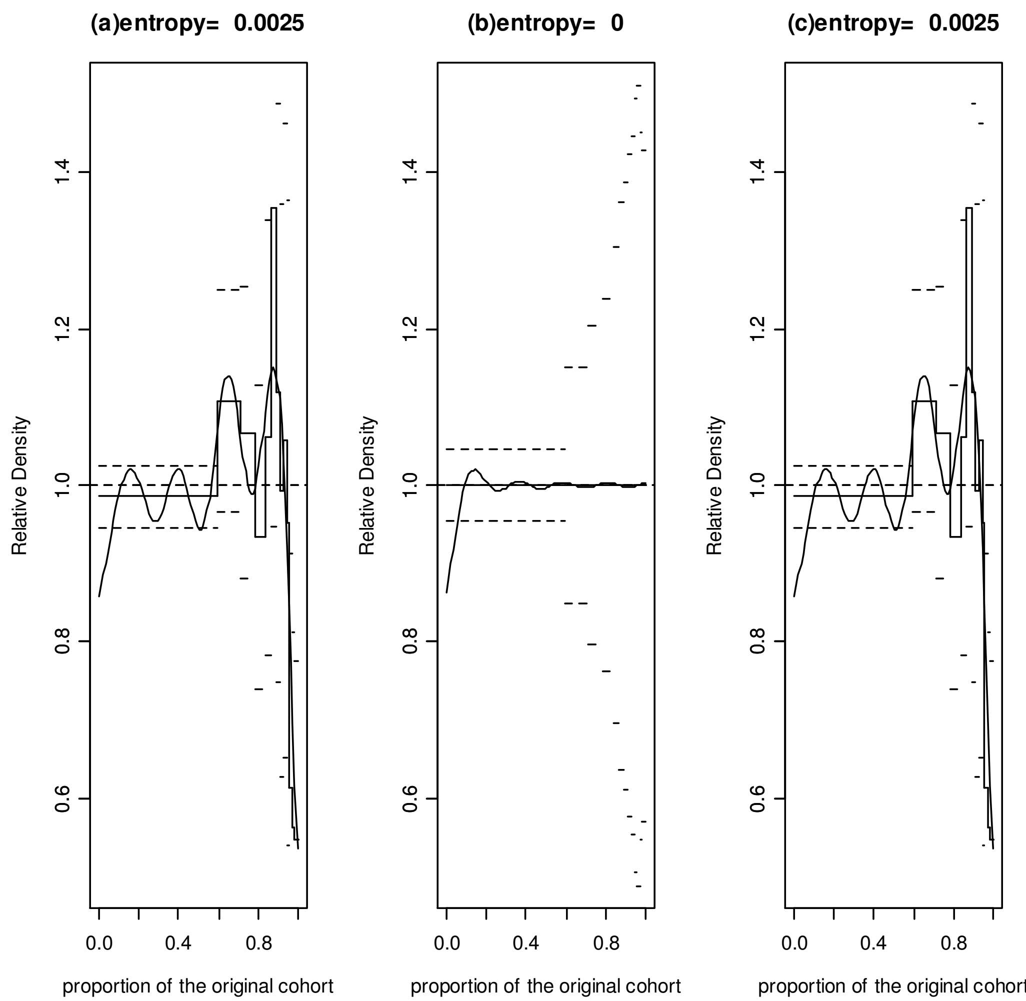
99-00 female



Entropy	Estimate
Overall change	0.016
Median effect	0.062
Shape effect	0.72

Polarization index	Estimate	95% CI	p-value
Median index	-1.07e-01	-1.39e-01 – -7.45e-02	4.25e-11
Lower index	NaN	NaN	NaN
Upper index	-0.106695	-0.165812 – -0.047578	0.000202

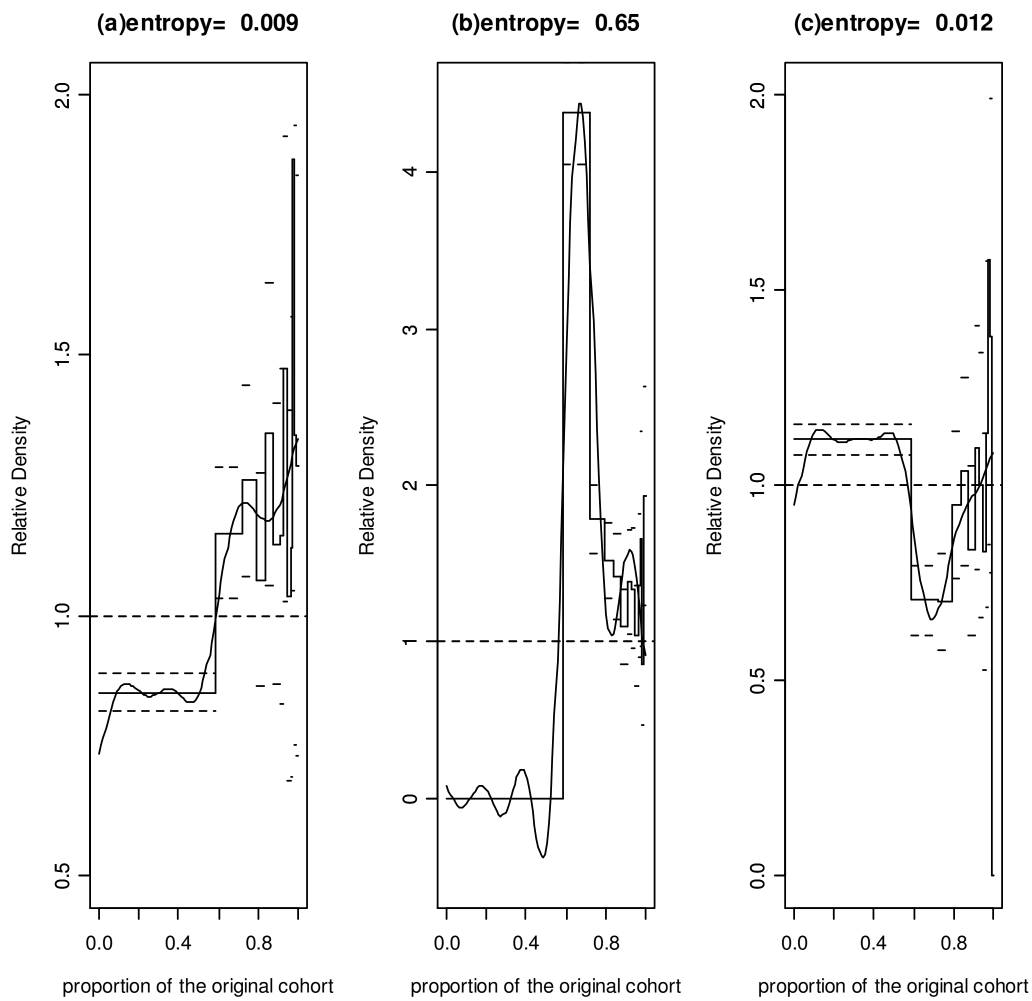
00-01 female



Entropy	Estimate
Overall change	0.0025
Median effect	0
Shape effect	0.0025

Polarization index	Estimate	95% CI	p-value
Median index	-0.255	-0.281 – -0.229	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.255	-0.307 – -0.203	0.000

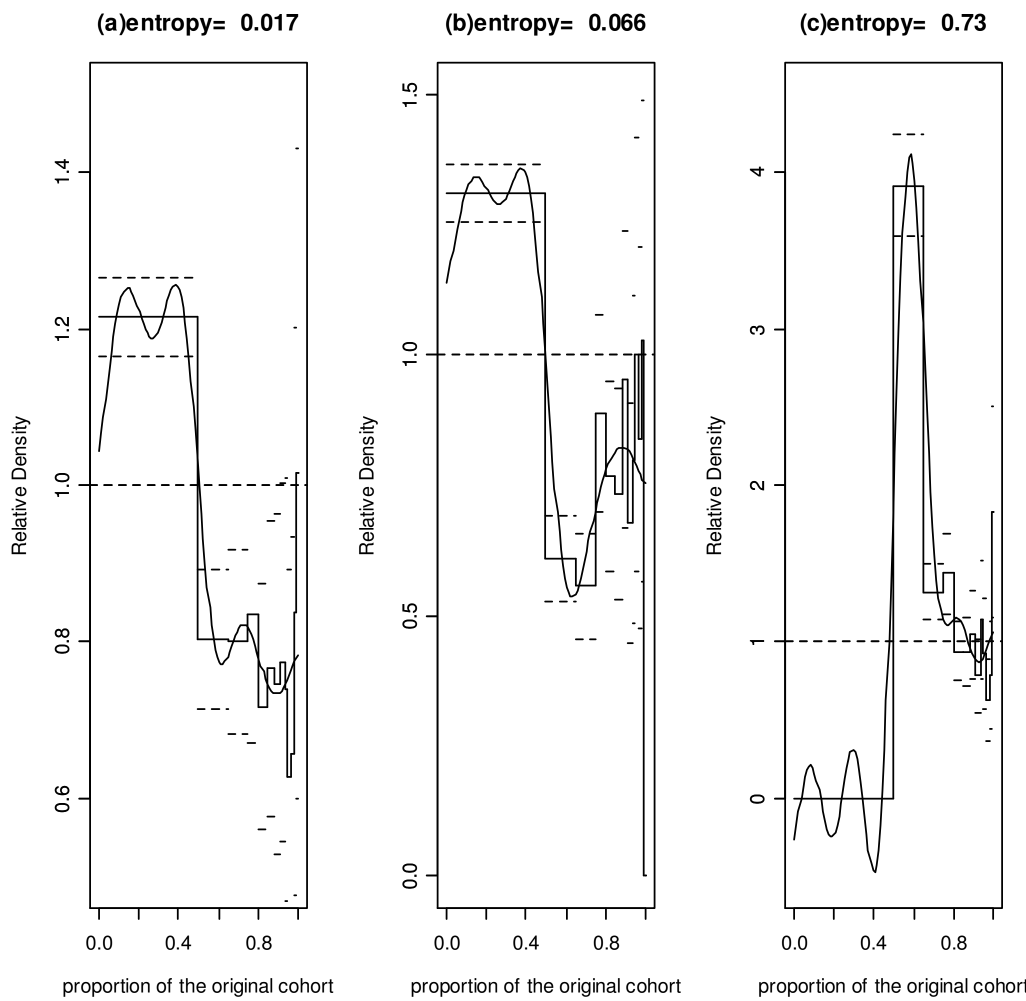
01-02 female



Entropy	Estimate
Overall change	0.009
Median effect	0.65
Shape effect	0.012

Polarization index	Estimate	95% CI	p-value
Median index	0.520	0.496 – 0.545	0.000
Lower index	NaN	NaN	NaN
Upper index	0.04469	-0.00118 – 0.09055	0.02809

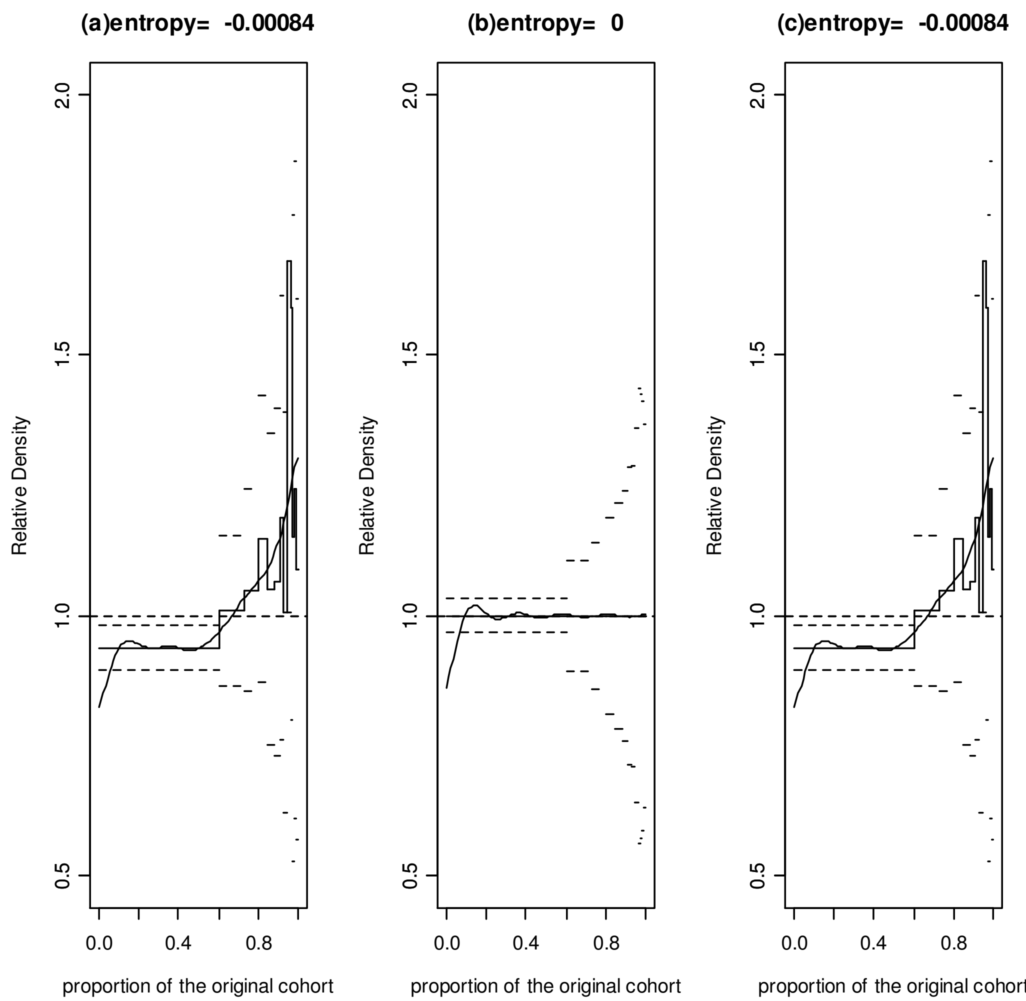
02-03 female



Entropy	Estimate
Overall change	0.017
Median effect	0.066
Shape effect	0.73

Polarization index	Estimate	95% CI	p-value
Median index	-9.30e-02	-1.17e-01 – -6.93e-02	7.44e-15
Lower index	NaN	NaN	NaN
Upper index	-9.30e-02	-1.37e-01 – -4.90e-02	1.73e-05

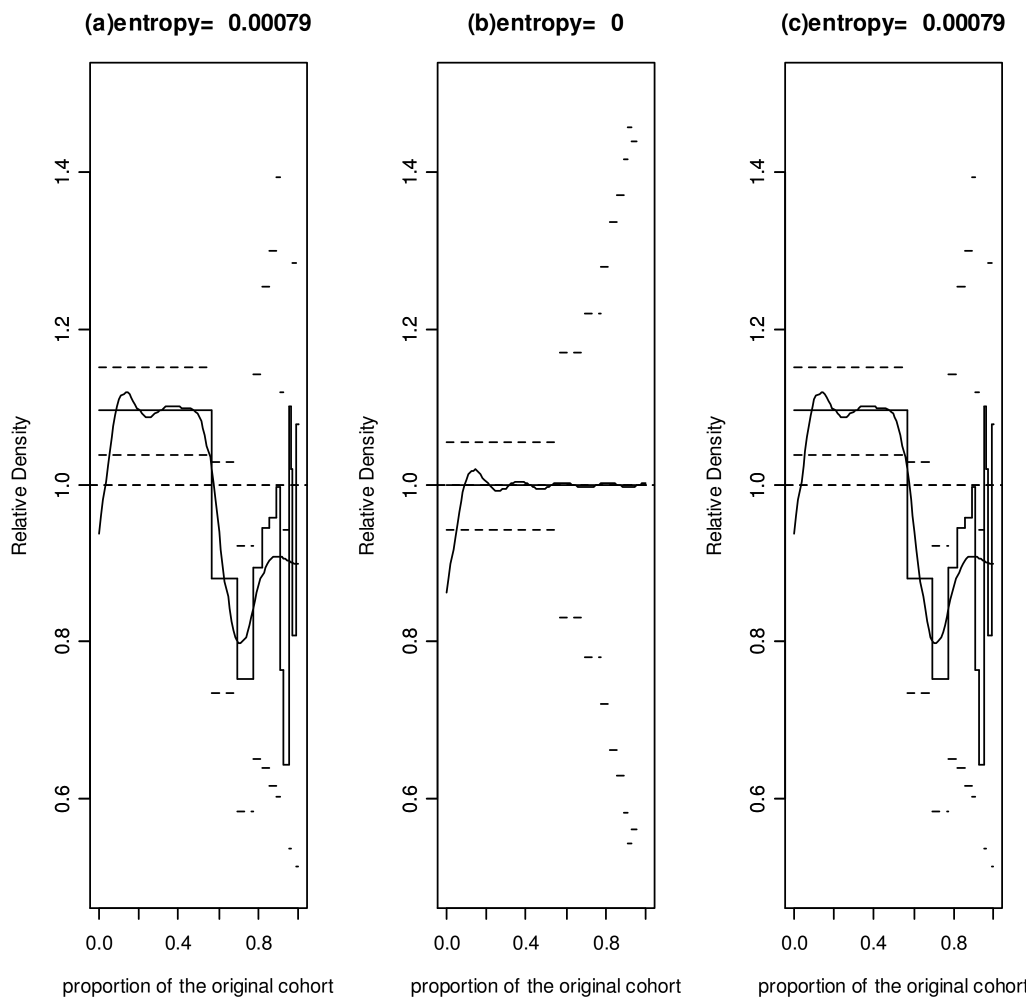
03-04 female



Entropy	Estimate
Overall change	-0.00084
Median effect	0
Shape effect	-0.00084

Polarization index	Estimate	95% CI	p-value
Median index	-0.169	-0.197 – -0.140	0.000
Lower index	NaN	NaN	NaN
Upper index	-1.69e-01	-2.26e-01 – -1.12e-01	3.07e-09

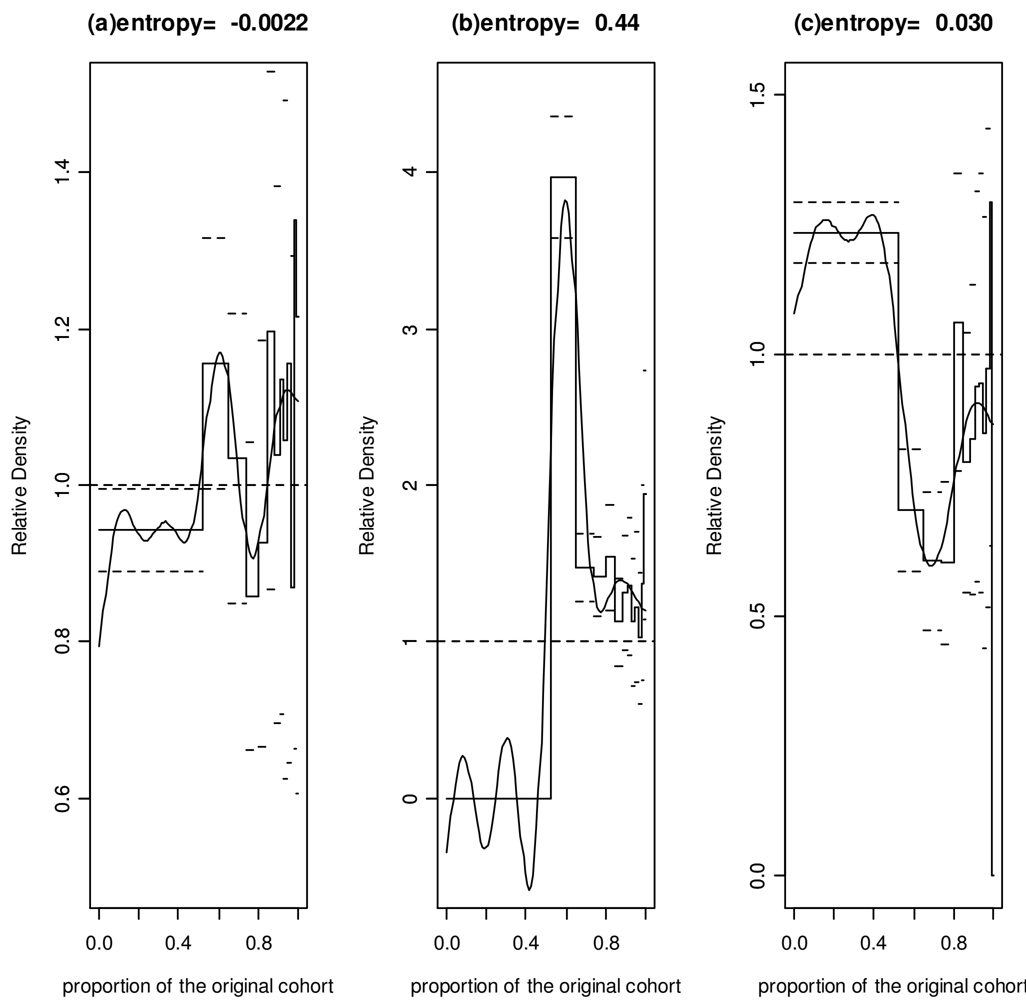
04-05 female



Entropy	Estimate		
Overall change	0.00079		
Median effect	0		
Shape effect	0.00079		

Polarization index	Estimate	95% CI	p-value
Median index	-0.346	-0.378 – -0.315	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.346	-0.409 – -0.283	0.000

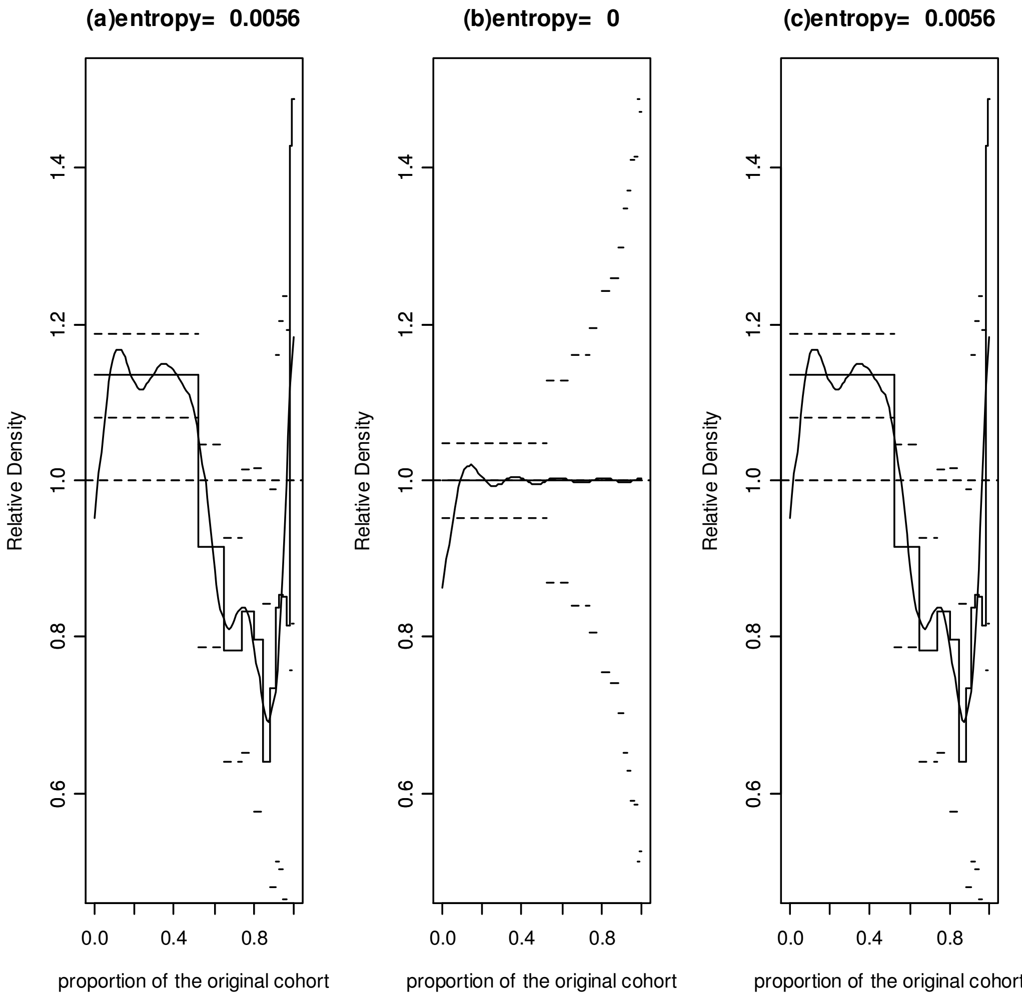
97-99 female



Entropy	Estimate
Overall change	-0.00022
Median effect	0.44
Shape effect	0.030

Polarization index	Estimate	95% CI	p-value
Median index	0.436	0.400 – 0.471	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.110814	-0.176540 – -0.045088	0.000476

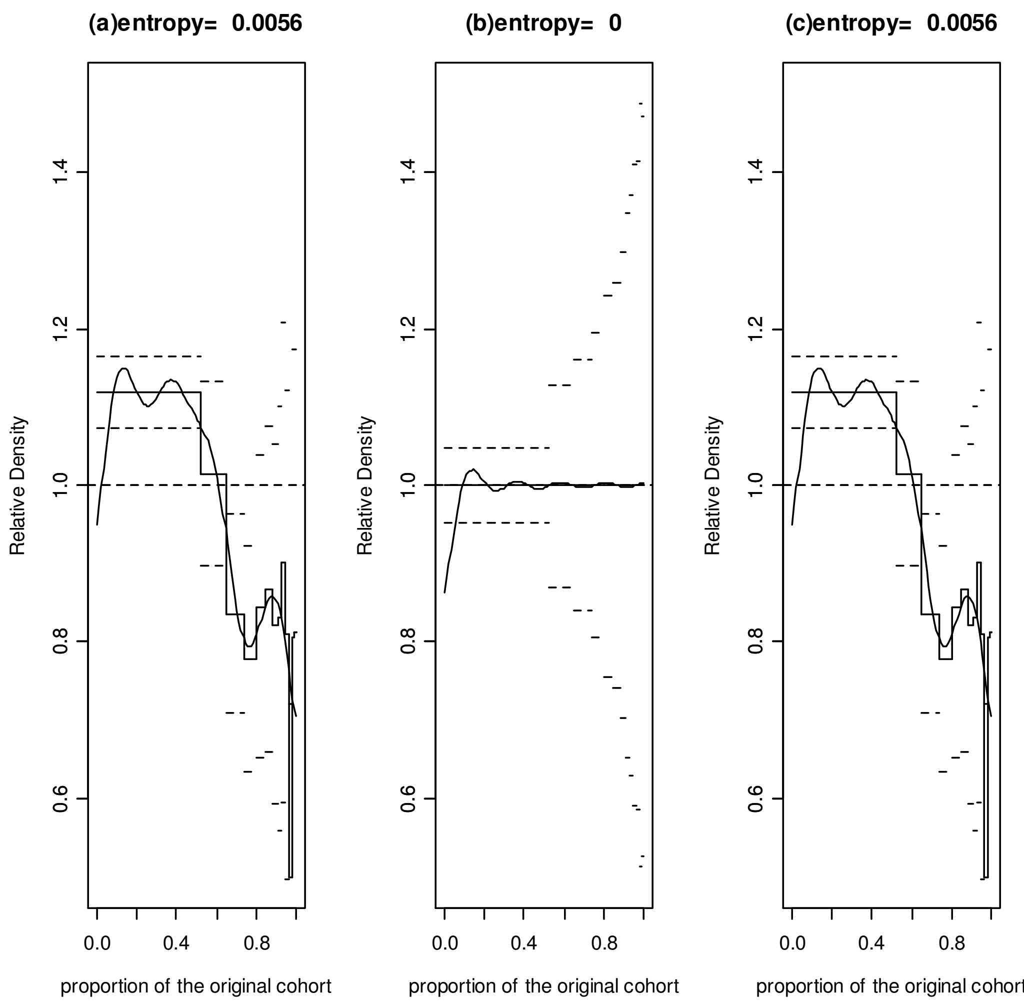
97-00 female



Entropy	Estimate
Overall change	0.0056
Median effect	0
Shape effect	0.0056

Polarization index	Estimate	95% CI	p-value
Median index	-0.462	-0.493 – -0.431	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.462	-0.524 – -0.400	0.000

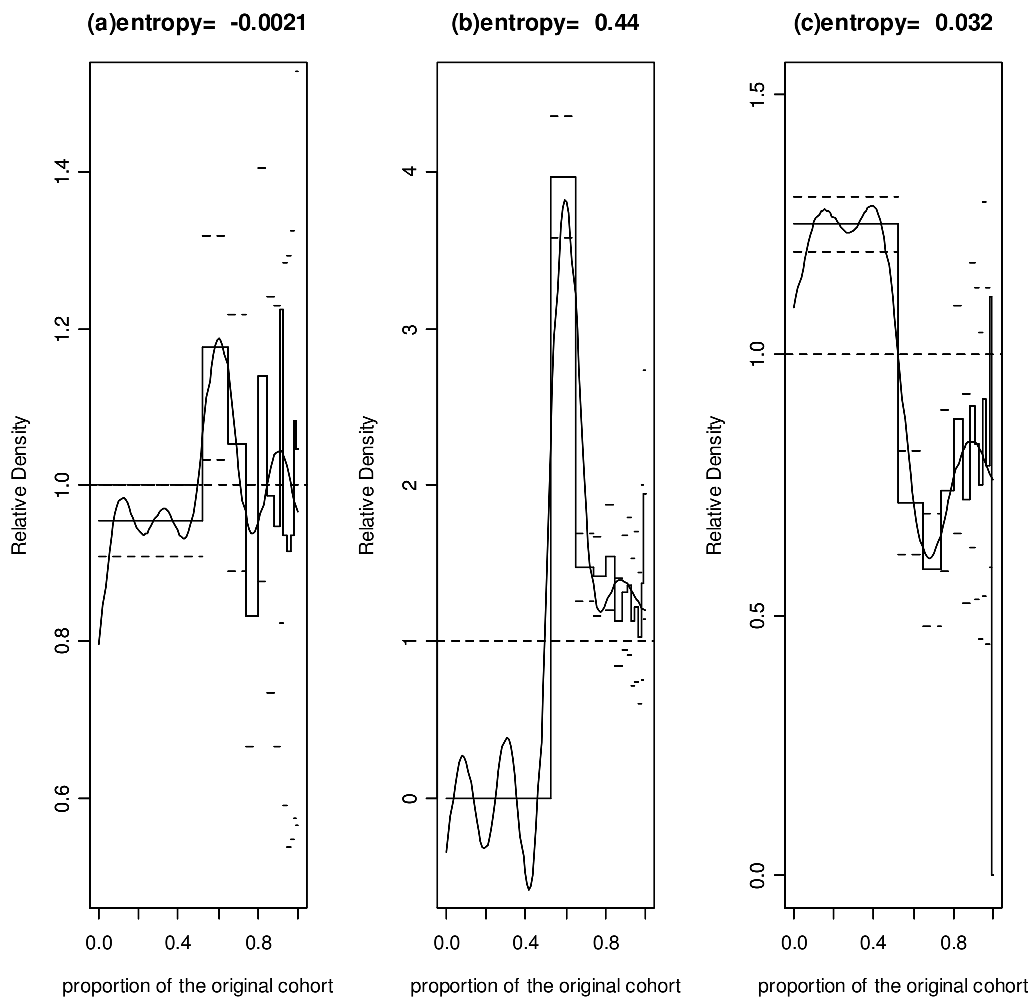
97-01 female



Entropy	Estimate
Overall change	0.0056
Median effect	0
Shape effect	0.0056

Polarization index	Estimate	95% CI	p-value
Median index	-0.472	-0.498 – -0.445	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.472	-0.524 – -0.419	0.000

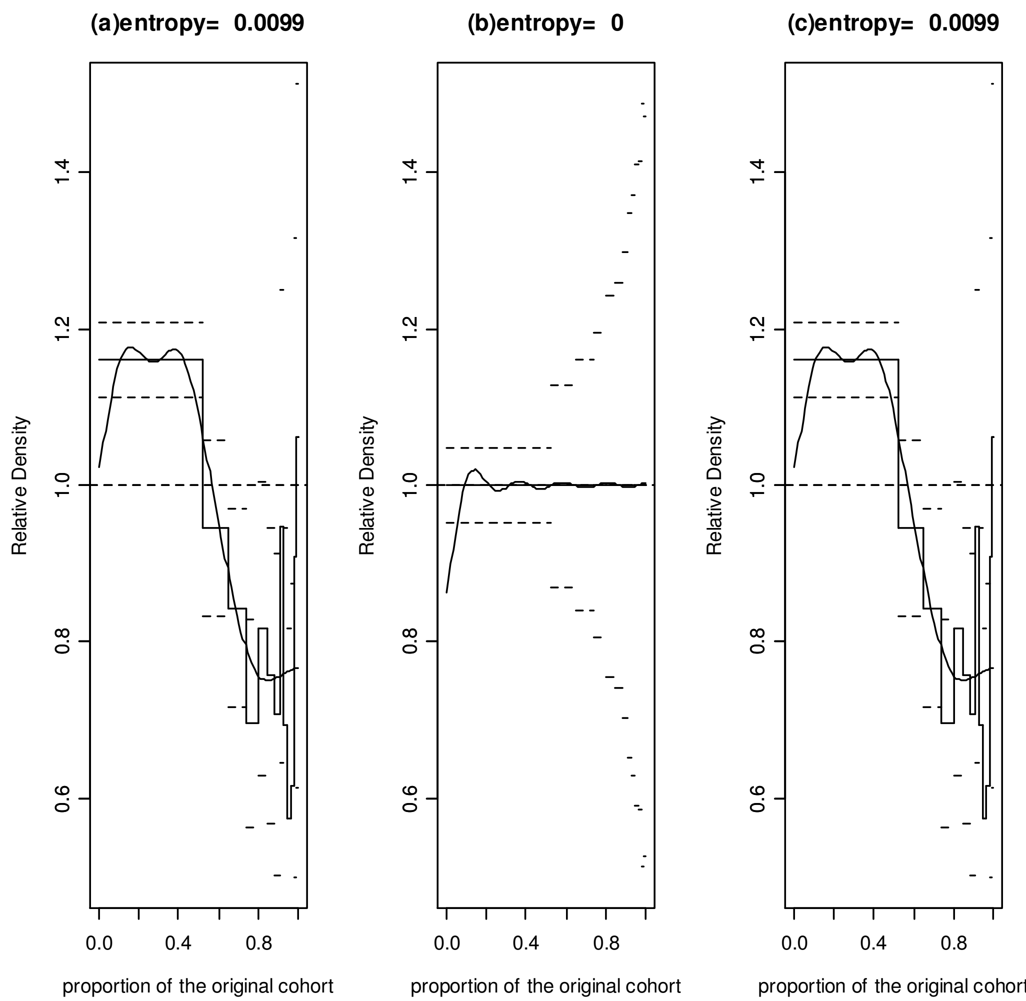
97-02 female



Entropy	Estimate
Overall change	-0.0021
Median effect	0.44
Shape effect	0.032

Polarization index	Estimate	95% CI	p-value
Median index	0.429	0.400 – 0.459	0.000
Lower index	NaN	NaN	NaN
Upper index	-1.36e-01	-1.91e-01 – -8.18e-02	4.98e-07

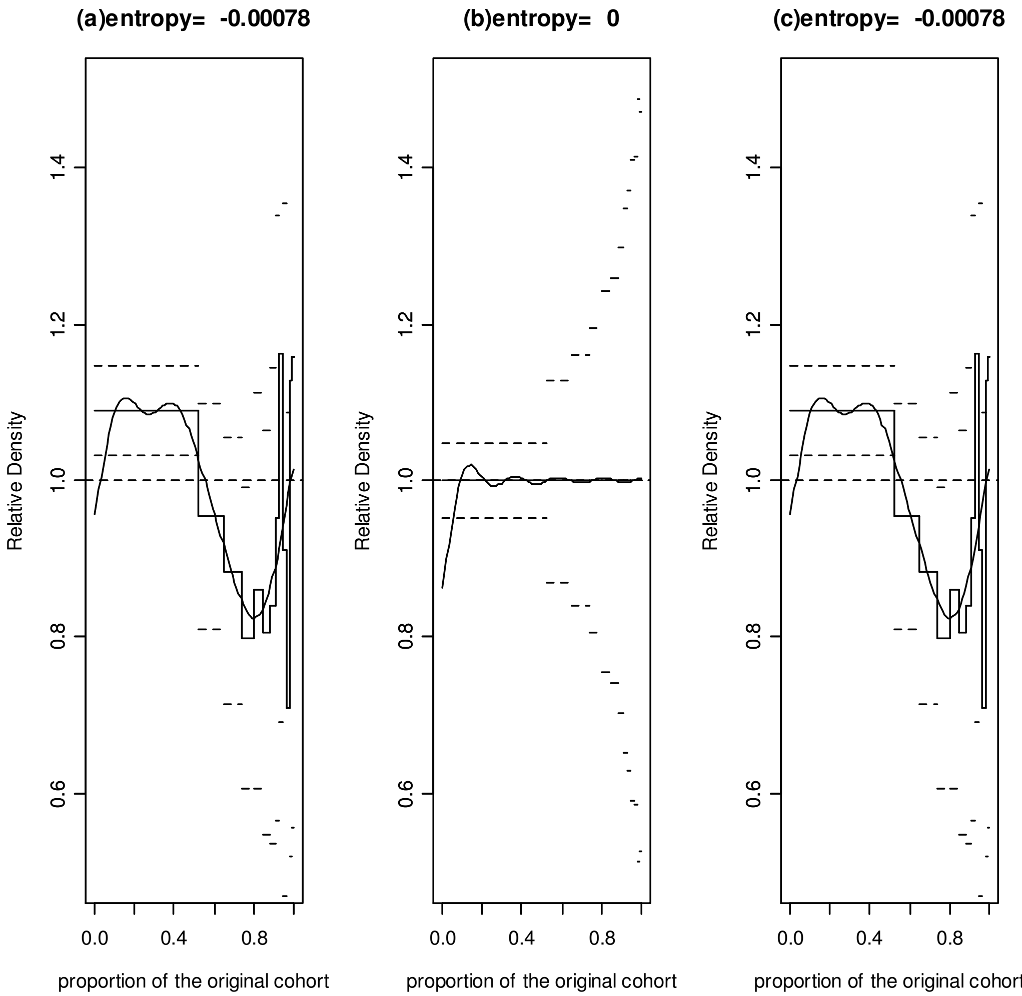
97-03 female



Entropy	Estimate
Overall change	0.0099
Median effect	0
Shape effect	0.0099

Polarization index	Estimate	95% CI	p-value
Median index	-0.493	-0.518 – -0.467	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.493	-0.544 – -0.442	0.000

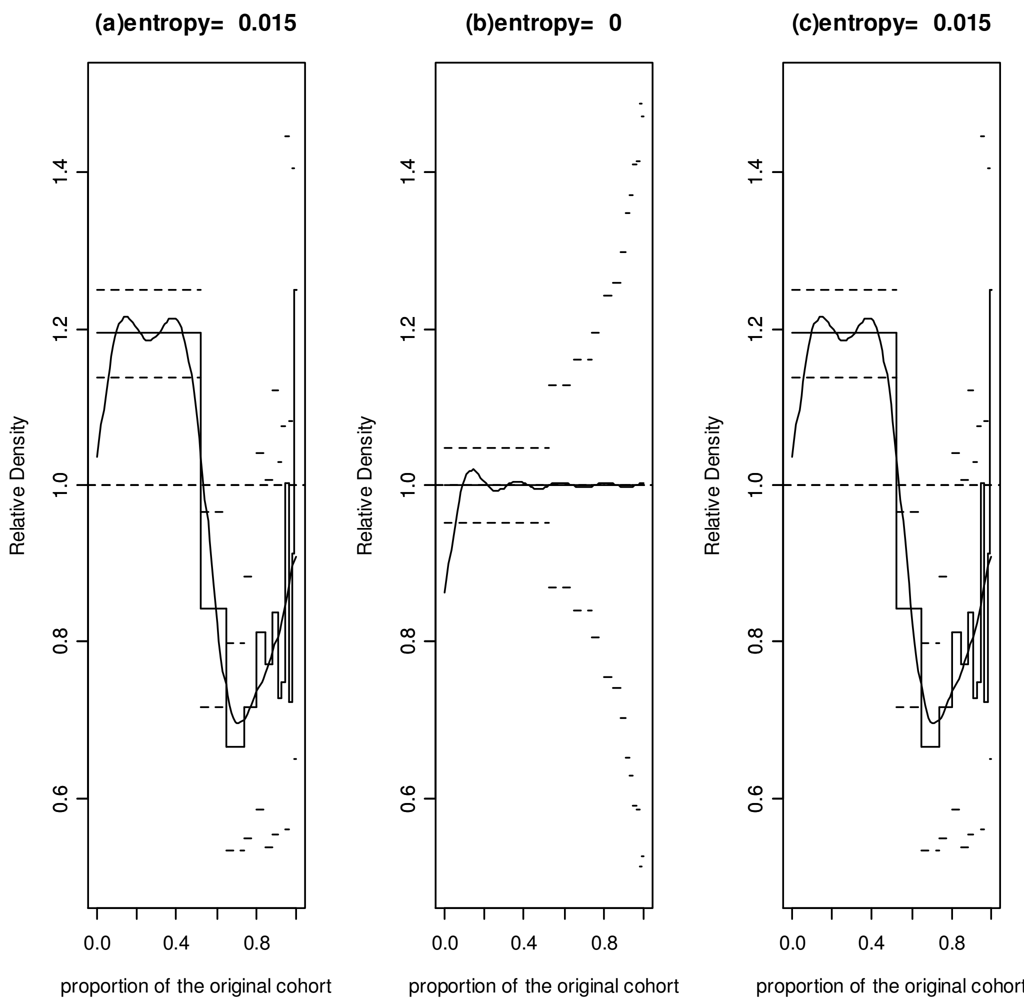
97-04 female



Entropy	Estimate
Overall change	-0.00078
Median effect	0
Shape effect	-0.00078

Polarization index	Estimate	95% CI	p-value
Median index	-0.438	-0.473 – -0.403	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.438	-0.508 – -0.369	0.000

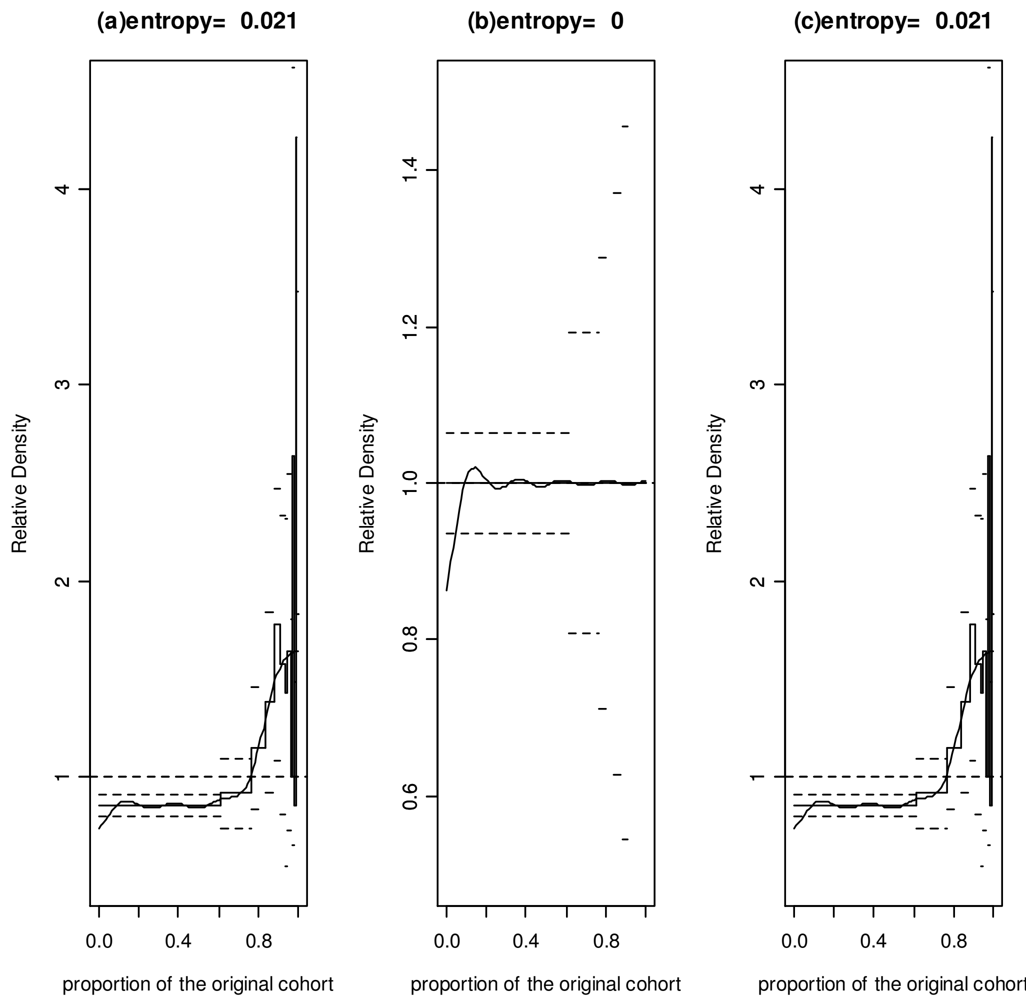
97-05 female



Entropy	Estimate
Overall change	0.015
Median effect	0
Shape effect	0.015

Polarization index	Estimate	95% CI	p-value
Median index	-0.493	-0.524 – -0.463	0.000
Lower index	NaN	NaN	NaN
Upper index	-0.493	-0.554 – -0.432	0.000

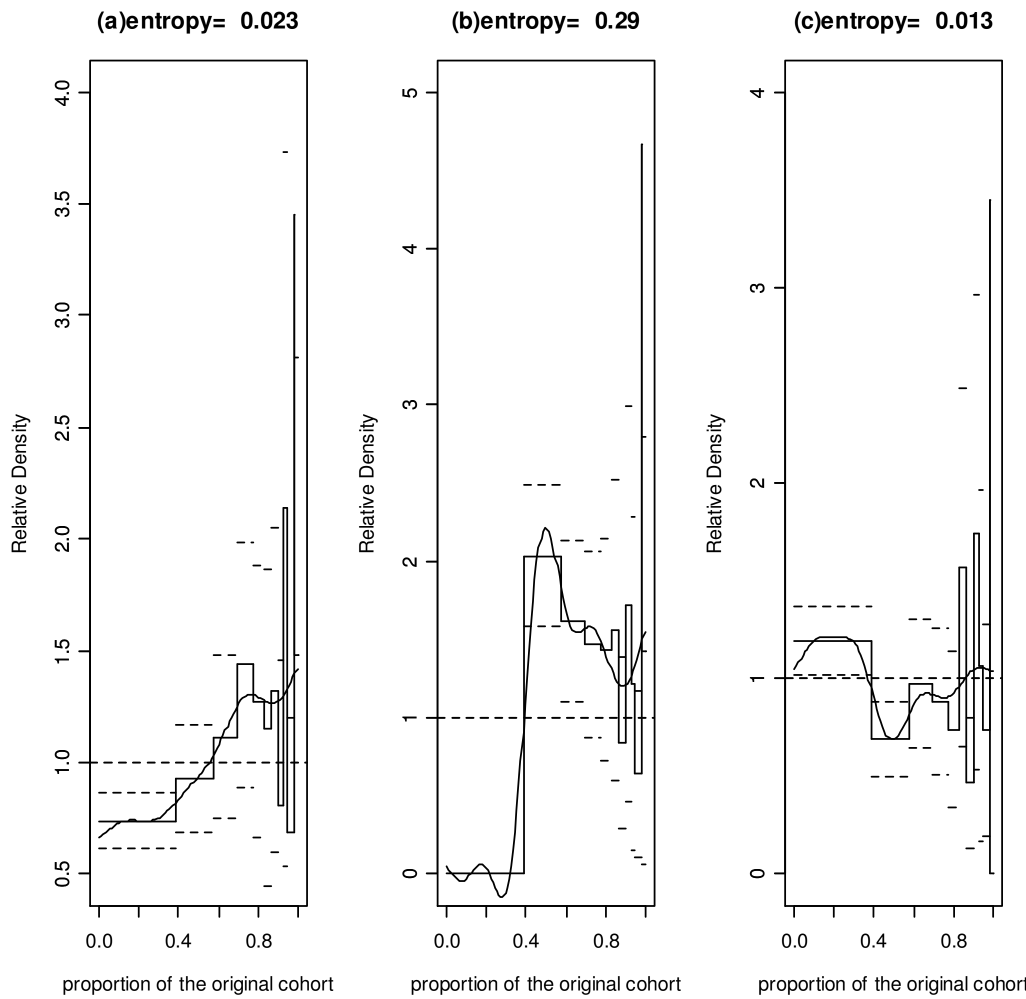
91 male female



Entropy	Estimate
Overall change	0.021
Median effect	0
Shape effect	0.021

Polarization index	Estimate	95% CI	p-value
Median index	-0.0609	-0.1048 – -0.0170	0.0033
Lower index	NaN	NaN	NaN
Upper index	-0.0609	-0.1487 – 0.0270	0.0872

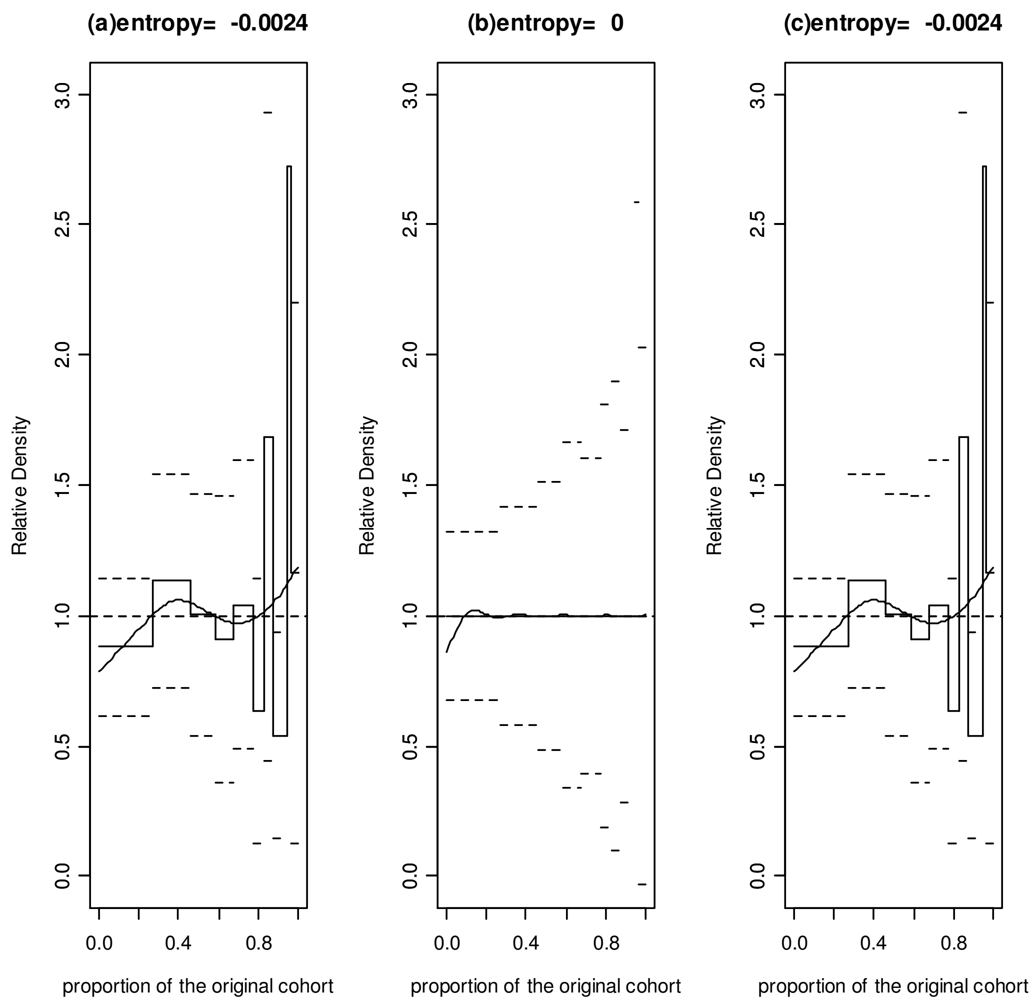
91 male female truncated at 0



Entropy	Estimate
Overall change	0.023
Median effect	0.29
Shape effect	0.013

Polarization index	Estimate	95% CI	p-value
Median index	2.16e-01	1.39e-01 – 2.92e-01	1.60e-08
Lower index	4.12e-01	2.93e-01 – 5.30e-01	4.94e-12
Upper index	0.0480	-0.0846 – 0.1806	0.2389

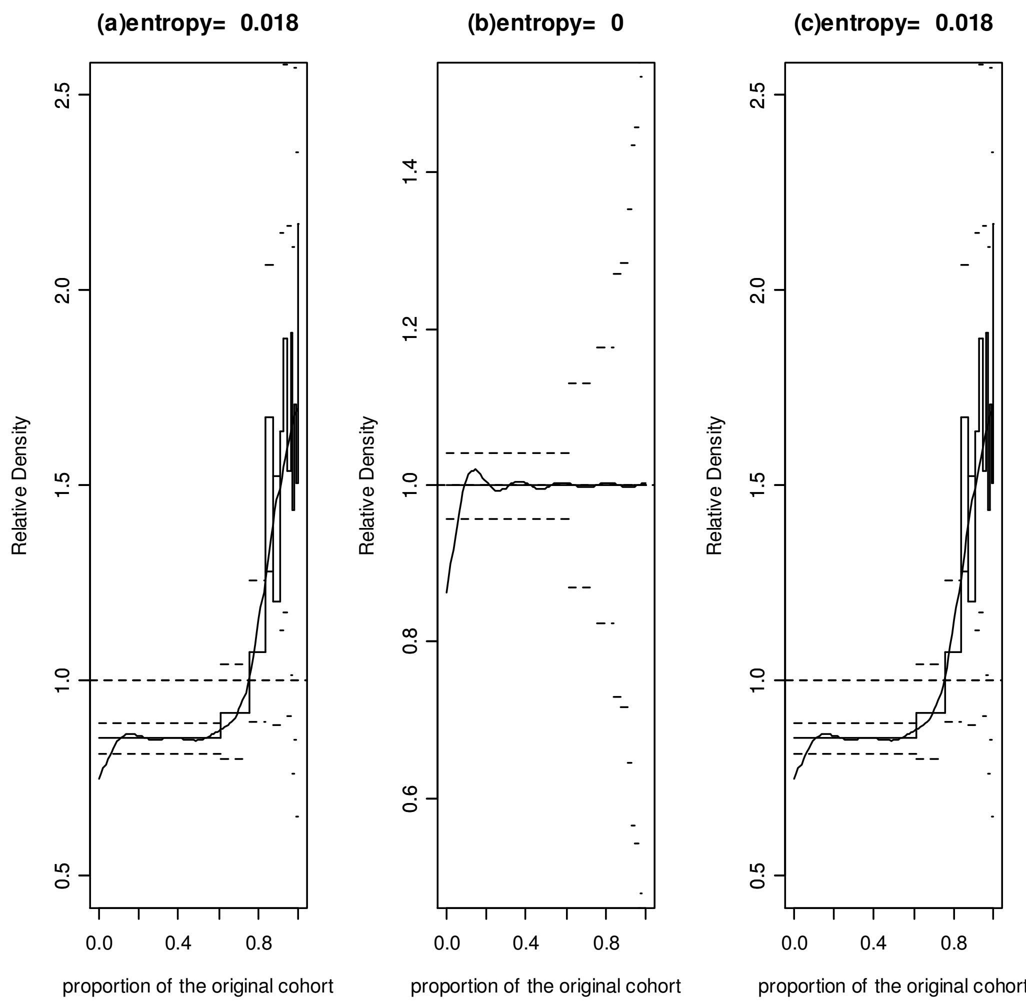
91 male female truncated at 2



Entropy	Estimate
Overall change	-0.0024
Median effect	0
Shape effect	-0.0024

Polarization index	Estimate	95% CI	p-value
Median index	-0.13871	-0.23379 – -0.04362	0.00212
Lower index	-4.47e-01	-5.89e-01 – -3.05e-01	3.50e-10
Upper index	0.116	-0.080 – 0.313	0.123

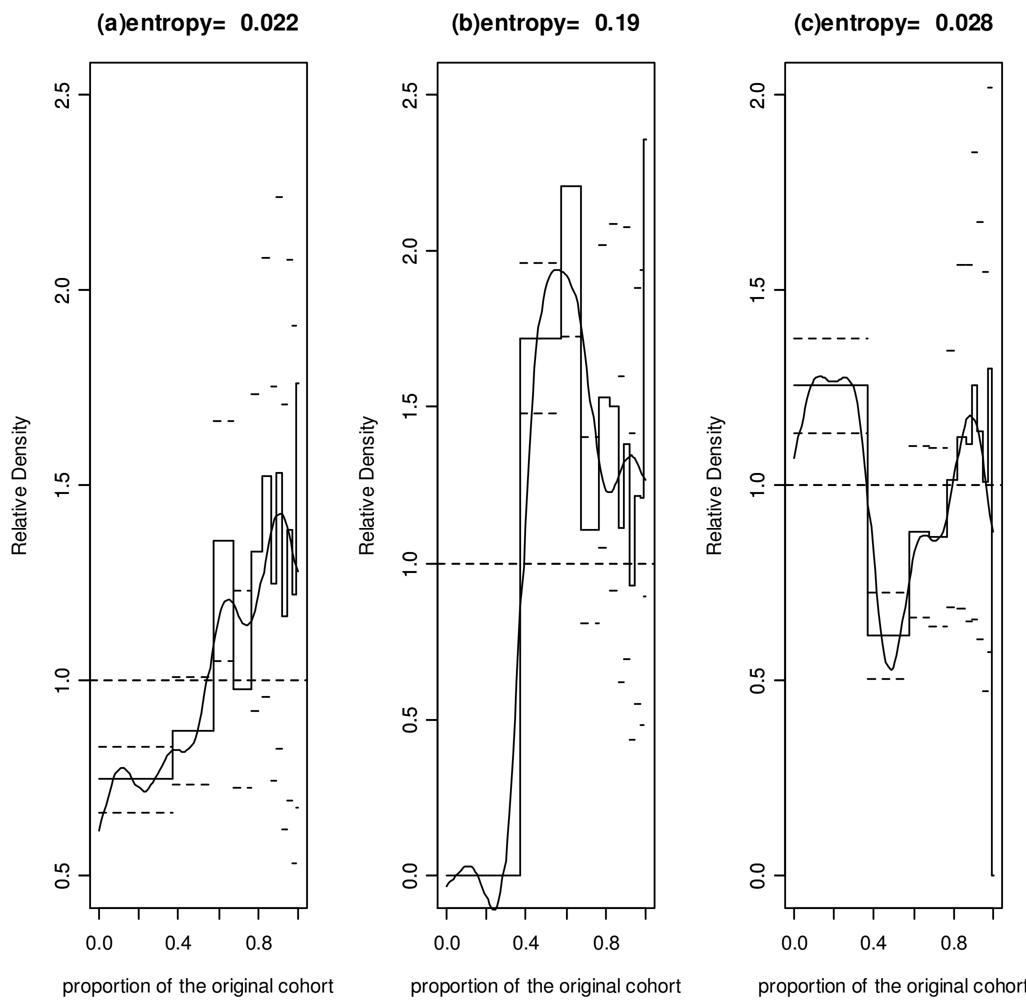
97 male female



Entropy	Estimate
Overall change	0.018
Median effect	0
Shape effect	0.018

Polarization index	Estimate	95% CI	p-value
Median index	-6.73e-02	-9.62e-02 – -3.84e-02	2.43e-06
Lower index	NaN	NaN	NaN
Upper index	-0.06730	-0.12501 – -0.00959	0.01114

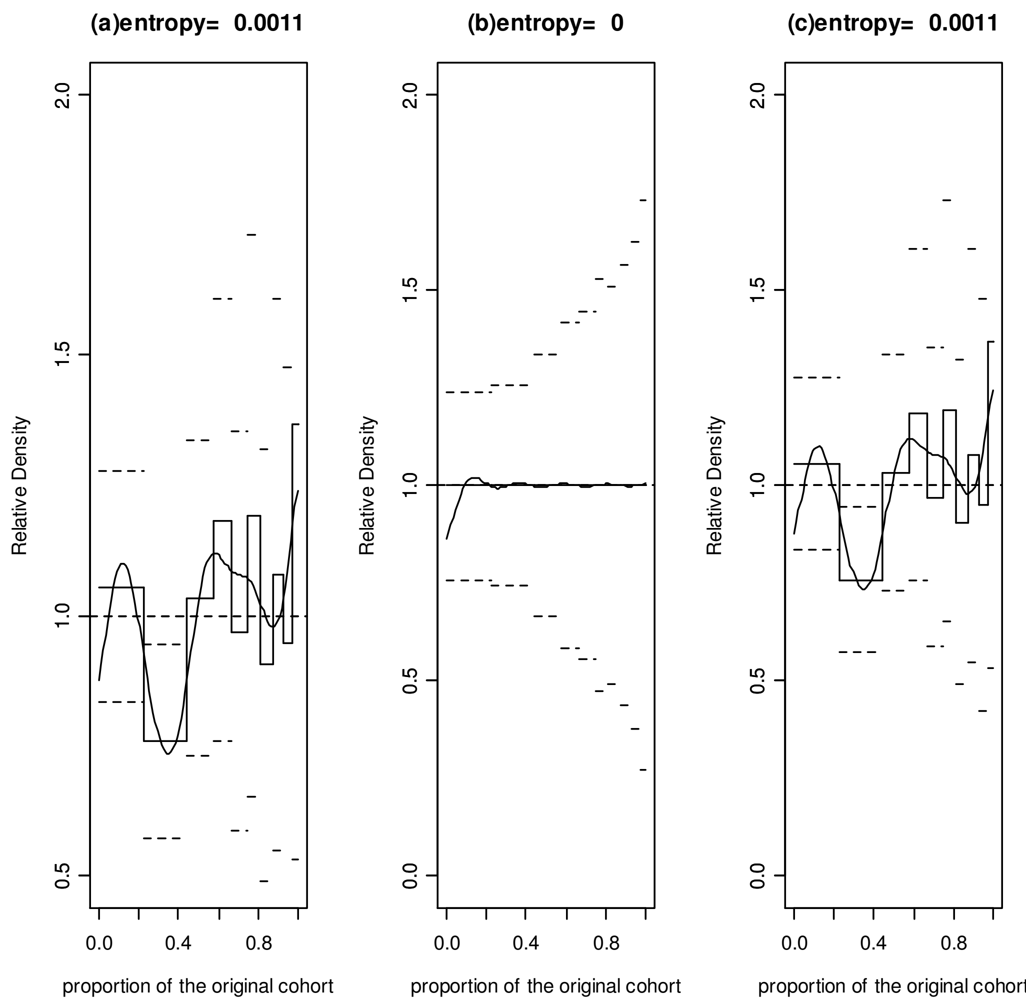
97 male female truncated at 0



Entropy	Estimate		
Overall change	0.022		
Median effect	0.19		
Shape effect	0.028		

Polarization index	Estimate	95% CI	p-value
Median index	0.223	0.174 – 0.272	0.000
Lower index	0.405	0.330 – 0.479	0.000
Upper index	0.0676	-0.0196– 0.1549	0.0644

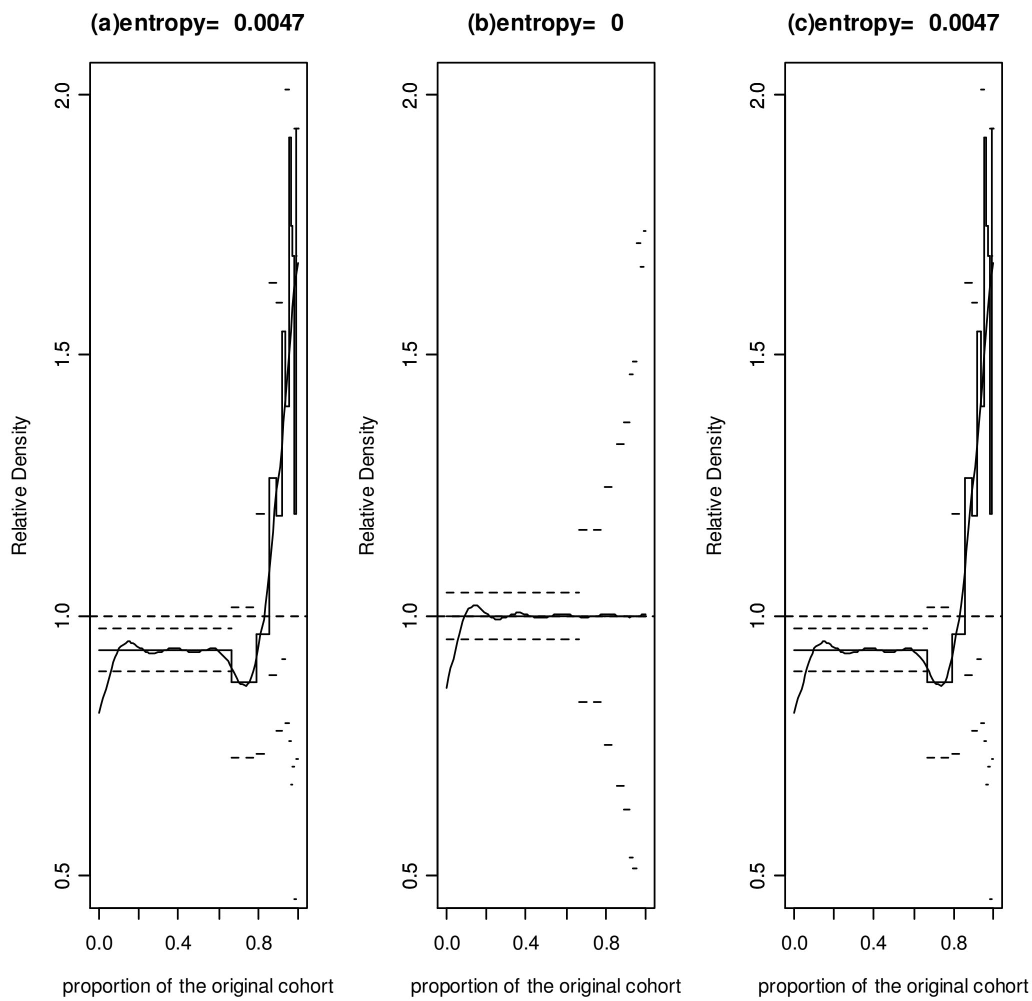
97 male female truncated at 2



Entropy	Estimate
Overall change	0.0011
Median effect	0
Shape effect	0.0011

Polarization index	Estimate	95% CI	p-value
Median index	-0.0723	-0.1335 – -0.0112	0.0102
Lower index	-2.57e-01	-3.39e-01 – -1.74e-01	5.37e-10
Upper index	0.0522	-0.0869 – 0.1913	0.2310

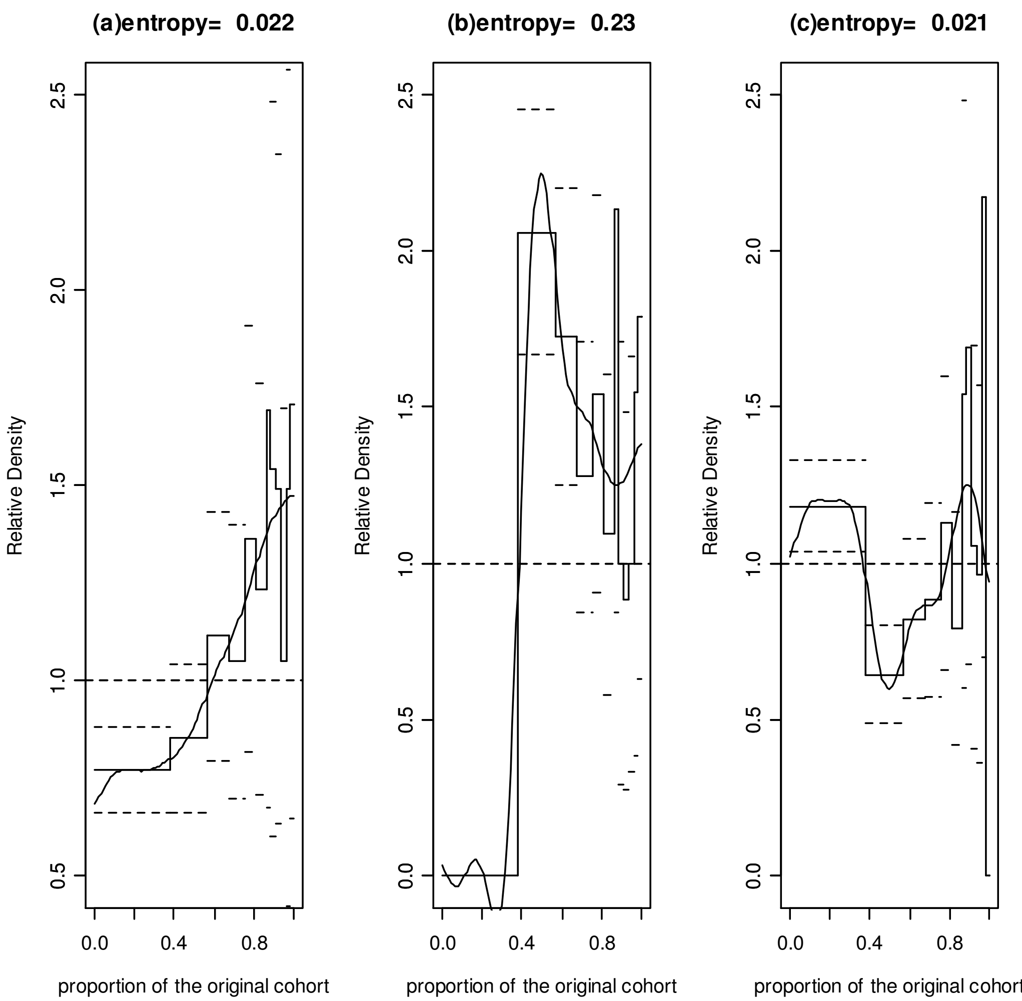
05 male female



Entropy	Estimate
Overall change	0.0047
Median effect	0
Shape effect	0.0047

Polarization index	Estimate	95% CI	p-value
Median index	-0.00161	-0.02798 – 0.02477	0.45249
Lower index	NaN	NaN	NaN
Upper index	-0.00161	-0.05436 – 0.05115	0.47620

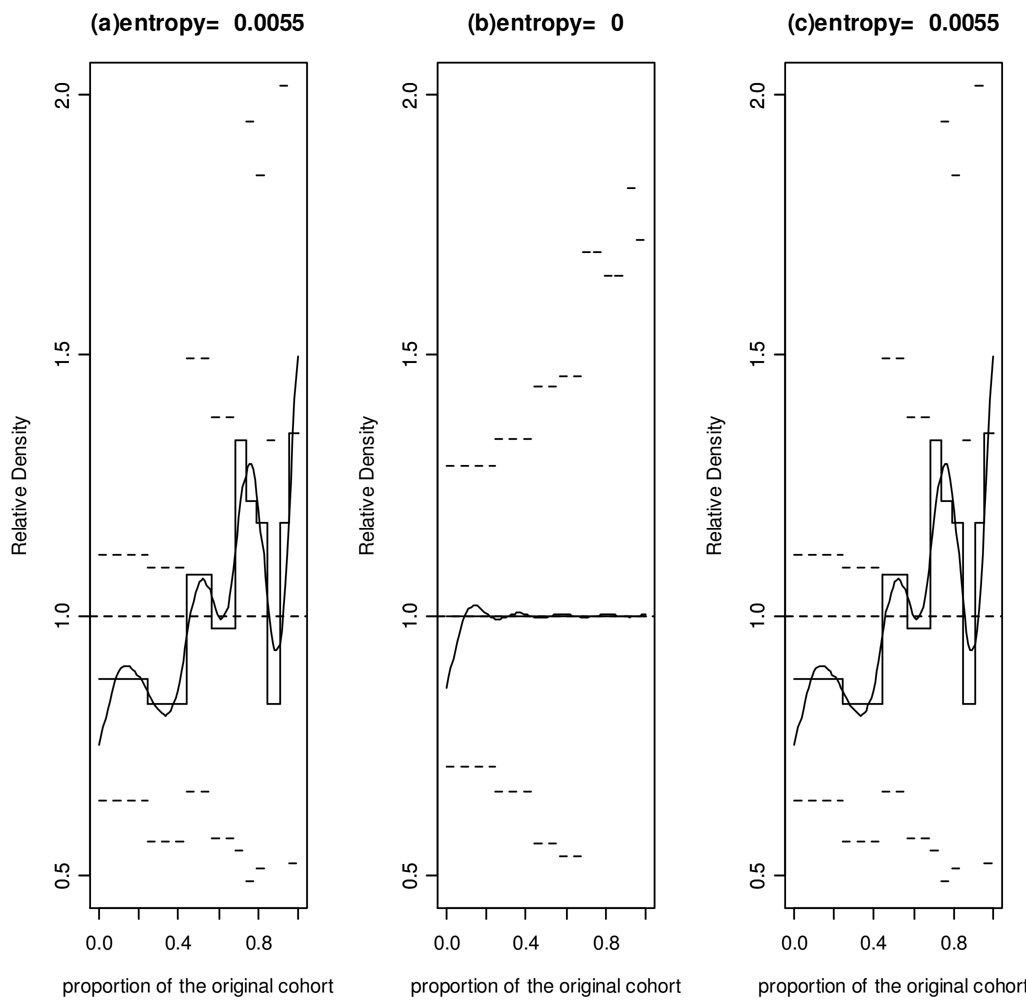
05 male female truncated at 0



Entropy	Estimate
Overall change	0.022
Median effect	0.23
Shape effect	0.021

Polarization index	Estimate	95% CI	p-value
Median index	2.51e-01	1.88e-01 – 3.14e-01	2.66e-15
Lower index	0.467	0.370 – 0.564	0.000
Upper index	0.0738	-0.0419 – 0.1895	0.1057

05 male female truncated at 2



Entropy	Estimate
Overall change	0.0055
Median effect	0
Shape effect	0.0055

Polarization index	Estimate	95% CI	p-value
Median index	-0.078967	-0.158327 – 0.000393	0.025571
Lower index	-3.18e-01	-4.20e-01 – -2.16e-01	4.60e-10
Upper index	0.0665	-0.1181 – 0.2511	0.2399