

---

## REPORT

---

# CAN IMPROVING UK SKILLS LEVELS REDUCE POVERTY AND INCOME INEQUALITY BY 2020?

Mark Taylor, Tina Haux, Steve Pudney

**This report** investigates how improving the level of skills in the UK economy will affect rates of poverty and income inequality.

Improving skills among the workforce is seen as fundamental to achieving a more competitive economy and maintaining productivity, with a world-class skills base considered a key driver of competitive advantage (BIS, 2010). This report uses data from the British Household Panel Survey to investigate how projected improvements in skills levels in the UK economy between now and 2020 will affect rates of poverty and income inequality.

The report:

- models the impact of skills on the probability of employment and on earnings derived from employment for working-age people;
- uses estimates from these models to predict the distribution of earnings, and simulate the distribution of net household incomes, likely to arise from the distribution of skills by 2020; and
- predicts the levels of poverty and income inequality likely to be engendered by the different distribution of skills.

# CONTENTS

Executive summary	05
1 Introduction	10
2 Data and methodology	13
3 Poverty and skills in 2020	18
4 Income inequality and skills in 2020	29
5 Summary and conclusions	35
Notes	39
References	41
Appendix	44
Acknowledgements and About the authors	59
<b>List of figures</b>	
1 Actual and predicted poverty rates under different skills distributions	21
2 Predicted poverty rates among men under different skills distributions	22
3 Predicted poverty rates among women under different skills distributions	22
4 Predicted poverty rates under different skills distributions among families with children	24
5 Predicted poverty rates under different skills distributions among childless people of working age	24
6 Predicted poverty rates under different skills distributions in England	25
7 Predicted poverty rates under different skills distributions in Wales	26
8 Predicted poverty rates under different skills distributions in Scotland	26
9 Actual and predicted poverty rates under different skills distributions in Northern Ireland	27
10 Average predicted household income by income percentile under different skills distributions	30
11 Income ratios with predicted distributions of household incomes under different skills distributions	30

12	Income ratios with predicted distributions of household incomes under different skills distributions in England	32
13	Income ratios with predicted distributions of household incomes under different skills distributions in Wales	32
14	Income ratios with predicted distributions of household incomes under different skills distributions in Scotland	32
15	Income ratios with predicted distributions of household incomes under different skills distributions in Northern Ireland	33
16	Gini coefficients based on incomes predicted under different skills distributions	34
<b>List of tables</b>		
1	Changing distribution of qualifications – UK	15
2	Summaries of actual and estimated net weekly equivalised household income	19



---

# EXECUTIVE SUMMARY

In this study we investigate how improving the level of skills in the UK economy will affect rates of poverty and income inequality.

---

Improving skills among the workforce is seen as fundamental to achieving a more competitive economy and maintaining productivity, and a world-class skills base is considered a key driver of competitive advantage (BIS, 2010). This research makes use of the ambition for 2020, set by the previous Labour administration as a result of the 2006 Leitch Review, to be one of the top eight OECD countries for jobs, productivity and skills. To achieve this, more than 90 per cent of adults must be qualified to at least Level 2 (equating to five or more GCSEs at grades A–C) and more than 40 per cent must be qualified to at least Level 4 (first or other degree). The Coalition Government's 2010 skills strategy, *Skills for Sustainable Growth*, retained a commitment to world-class skills but abolished these targets, moving beyond 'the machinery of central control' as a means to achieve this ambition (BIS, 2010, p. 13). However, BIS (and others, such as the OECD) still measure the UK's progress against international comparisons of qualification levels (see BIS, 2010, p. 58, for example). For the purposes of this study, these measures have been used as indicators of progress towards world-class skills to enable analysis of the potential impact of increasing skills levels on poverty and income inequality. Prior to the removal of the 2020 goals, the UK Commission for Employment and Skills (UK Commission) played a role in monitoring UK performance against the ambition. The most recently available projections indicate that the Level 4 measure will be met but that attainment at lower skills levels will not (UK Commission, 2010).

There are several ways in which skills may affect the risk of poverty and the distribution of household incomes. For example, better basic skills may equip people to manage their finances more efficiently and so avoid problems of over-indebtedness. They may also make it easier to understand the social security system and claim benefit entitlements. However, skills and educational attainment are likely to have the biggest impact on income and poverty through their relationship with employment and earnings. Earnings from work are the main part of most working-age adults' and families' incomes. Being out of work or in unstable low-paid employment therefore has a big effect on the experience of poverty and low income.

---

We model the impact of skills on the probability of employment and on earnings derived from employment for working-age people. We use the resulting estimates to predict the distribution of earnings likely to arise from the anticipated distribution of skills in 2020. The predicted earnings of individuals are then used to simulate the distribution of net household incomes that would emerge as a consequence of meeting the 2020 ambition for skill levels and from the most recent skills distribution projected for 2020 by the UK Commission. We then predict the levels of poverty and income inequality likely to arise under these different distributions of skills.

## Data and methods

We use survey data on individuals taken from the British Household Panel Survey (BHPS). Every year since 1991, the BHPS has followed and interviewed the same adults (aged 16 and above), collecting information about their education levels, incomes by source, labour market status, housing tenure and conditions, household composition, education, health and many other aspects of their lives. Crucially for this research, the BHPS contains detailed information for each individual on (i) qualification level; (ii) employment and earnings; and (iii) income by source. Since all adult members of sampled households are interviewed, it is possible to construct each household's total income. The distribution of skills and of household incomes in the BHPS both match closely those from other data sources, confirming the robustness of the evidence on which our analysis rests.

Our approach is to investigate how different current poverty and income inequality would be if the skills distribution today matched 2020 ambition levels and the UK Commission projections for 2020, while also allowing for projected changes in the structure of households. We model the impact of skills on individuals' employment and earnings, and use the results to simulate the distributions of household incomes associated with the different potential levels of skills in the economy in 2020. We make three key assumptions. Firstly, we assume that the estimated links between qualifications and employment status and earnings are causal – that is, that higher qualifications lead to higher employment rates and higher earnings. This is suggested by human capital theory, and the general consensus from the relevant literature is that at least part of the observed relationship between education levels, earnings and employment is causal. The second assumption is that estimated returns to education and skills will not be affected by the changes in the supply of skills. The validity of this assumption relies on the demand for skills keeping up with the increase in supply and, again, evidence suggests that this has largely been the case to date. However, evidence also suggests that the impacts of educational attainment on earnings are becoming increasingly dispersed and that the wage returns to a particular qualification vary more now than before. One explanation for this is that people with the same educational attainment are becoming employed in a wider variety of jobs with different wages or that they experience different employment trajectories. Furthermore, there is a large proportion of the UK working population in peripheral or unstable labour markets, faced with low pay and short-term contractual arrangements, indicating that gaining employment does not guarantee an escape from poverty. We return to the implications of this in the discussion of our findings, while Taylor *et al.* (2012) summarise these issues and the related evidence. The third assumption we make is that the tax/benefit system in 2020 has the same implications at each level of gross income as the current tax/benefit system. Similarly, we do not incorporate changes in the system that are already planned,

---

such as the means testing of Child Benefit. This approach seems sensible given the uncertainty about the tax/benefit regime in future years.

We explore three alternative scenarios for the 2020 skills distribution: the distribution of skills specified in the 2020 ambition; the most recent UK Commission projections of the actual skills distribution in 2020; and the 'status quo' scenario which leaves the skills distribution unchanged from 2008. We provide predictions of what would happen to poverty and income inequality if the distribution of skills in the economy matched the 2020 ambition levels and the UK Commission projections for 2020, and compare them to income inequality and poverty generated by the distribution of skills in 2008.

## **The impact of changing skills on poverty and inequality**

We calculate poverty rates using two measures. The first is a fixed poverty line ('absolute' poverty), set at 60 per cent of median income in 2006. This is essentially a measure of spending power. People are brought above the fixed poverty line if incomes rise across all parts of the income distribution, regardless of whether those towards the bottom are catching up with or slipping further behind those higher up. The second measure is the relative poverty line. This is also set at 60 per cent of median income but reflects changes in the median caused by skill changes. This measure shows whether the gap between those in the lower and higher parts of the income distribution is widening or narrowing.

This research suggests that, using a fixed poverty line, achieving the 2020 ambition distribution of skills or the UK Commission projected distribution for 2020 will reduce poverty rates in the UK by almost exactly the same amount – 2.2 percentage points. This equates to lifting about 1.5 million people out of poverty compared with the pattern of skills in 2008. However, changing the skill distribution has a smaller effect when measuring poverty using relative poverty rates. Achieving the 2020 ambition distribution is predicted to reduce relative poverty by one percentage point, while achieving the UK Commission projected skills distribution is predicted to reduce it by 0.8 percentage points. These are equivalent to lifting between 500,000 and 700,000 people out of poverty.

What explains these different impacts of changes in the skills distribution on poverty when using a fixed measure rather than a relative one? Both the 2020 ambition measure and UK Commission projected distribution of skills imply that skills will increase across the whole distribution – the changes in skills affect both those at the bottom and those at the top. This raises incomes across the entire income distribution (and so reduces poverty if measured using a fixed threshold), rather than raising the incomes of those at the bottom of the income distribution relative to those higher up (and so reducing relative poverty).

As a consequence of affecting the entire income distribution, the changes to the distribution of skills are predicted to have only a small impact on income inequality. At 2008 skill levels, households at the 90th percentile of the income distribution in 2020 are predicted to have incomes that are more than four times larger than those of households at the 10th percentile of the distribution. This ratio is predicted to fall to 3.9 under both the 2020 ambition and UK Commission projected distribution of skills.

We also estimate the impact of the changing distribution of skills on poverty rates among various population subgroups. The effects on men and women are very similar in relation to the fixed poverty line, but vary more in terms of relative poverty. Poverty rates defined in terms of a fixed poverty threshold are

---

estimated to fall by 1.8 percentage points among both men and women if the 2020 ambition level of skills is met, and by 1.7 percentage points if the 2020 projected level of skills is met, compared with maintaining 2008 skill levels. This is equivalent to lifting almost 600,000 men and more than 600,000 women out of poverty. Relative poverty will fall by 0.8 percentage points among men (lifting 260,000 men out of poverty) and 0.5 percentage points among women (lifting 170,000 women out of poverty) if the 2020 ambition skill distribution is met (and slightly less if the projected distribution is met). These small gender differences probably reflect the fact that a larger proportion of the employment gains associated with up-skilling among women will be in part-time jobs. The research also indicates that the changing distribution of skills will have larger effects on poverty rates among families with children than on childless working-age adults. Using a fixed poverty line, poverty among families with children is estimated to fall by 4 and 4.1 percentage points, relative to the status quo, on meeting the 2020 ambition and projected skills distributions respectively. This is estimated to lift about 500,000 children out of poverty. Relative poverty is predicted to fall by 2.4 percentage points if the 2020 ambition skills distribution is met (lifting about 300,000 children out of poverty), and by 1.8 percentage points if the 2020 projected skills distribution is met (lifting 250,000 children out of poverty). We find that falls in poverty would occur in England, Scotland, Wales and Northern Ireland, with slightly larger effects in Wales and, especially, Northern Ireland. The larger effects in Wales and Northern Ireland are because the current skills base in these countries is low relative to England and Scotland, and so the projected up-skilling of the workforce is larger.

## Conclusions

Our results suggest that achieving either the 2020 ambition distribution or the UK Commission projected distribution of skills will reduce poverty among both men and women, across the UK, with poverty reductions being particularly large among families with children. The falls in poverty are larger if the 2020 ambition level of skills rather than the UK Commission projected distribution are met. This is primarily because, according to the UK Commission's estimates, slower progress is being made in raising skills at the lower end of the distribution than is necessary to meet the 2020 ambition levels. Thus, our predictions indicate that policies aimed at maintaining productivity and economic competitiveness through achieving world-class skills for the UK by 2020 could indeed be expected to improve considerably the absolute quality of life of large groups of people where there is clear income deprivation at present. Child poverty, in particular, is strongly associated with a range of adverse life-course outcomes, including employment, health and family stability. Our results therefore suggest the possibility of very long-run benefits to society as well as economic competitiveness flowing from achieving the ambition of world-class skills.

However, the picture is less clear when we think of income inequality and poverty in relative terms. Achieving the 2020 ambition measures or UK Commission projected distribution of skills will reduce relative poverty by about one percentage point, which is equivalent to lifting about 660,000 people out of poverty. The main reason for the smaller impact on relative poverty and inequality is that the changing distribution of skills results in an increase in incomes across the entire income distribution. This has the effect of raising the relative poverty line without significantly changing the differences in incomes between those higher and lower in the distribution. Consequently, there may



---

be some people whose incomes increase but who nevertheless either slip into or remain in relative poverty as a result of the skills change. In order to reduce relative poverty and income inequality more substantially, it is necessary to focus efforts on raising the skill levels of those at the bottom of the skills distribution relative to those at the top. The Coalition Government's skills policy recognises the need to improve basic literacy and numeracy skills, and to support people who lack the basic skills they need to access employment (BIS, 2010). A general increase in skills across the distribution has to be part of a wider strategy to reduce income inequality and poverty as it will not reduce relative poverty or income inequality substantially by itself.

The projected large reductions in 'absolute' poverty are a worthwhile outcome. Maintaining progress towards the improved skill levels currently predicted for 2020 is therefore very important. To make progress in reducing relative poverty as well, approaches are needed that improve the skills and incomes of those at the bottom of the income distribution compared with those higher up. This is particularly true given the evidence that an increasing proportion of high-skilled people are not employed in high-skilled jobs – which displaces lower-skilled workers in the labour market and, at the same time, increases the dispersion in returns to skills. Unless particular attention is paid to raising the skills at the bottom of the skill distribution, the result is likely to be an increasingly segmented labour market in which the unskilled are confined to unstable low-paid work, which may in fact exacerbate poverty and income inequality. In addition to addressing skills directly, the wider literature also suggests that it is necessary to address the insecurity and poor conditions of low-level work, and to help people move from the peripheral to the core labour market (see Taylor *et al.*, 2012). Raising skill levels may not be sufficient to match low-skilled workers with stable, high-wage employment and to bring them out of poverty and low income. Other mechanisms may be necessary to encourage firms to employ workers with a history of unemployment or of employment in unstable, unskilled jobs, and to raise awareness of the labour market among low-skilled people in poor households – for example, by improving more generic skills associated with job search and by developing social networks.

---

# 1 INTRODUCTION

This report explores the effects of the changing distribution of skills between 2008 and 2020 on poverty and income inequality in the UK.

---

Improving skills among the working-age population is seen as fundamental to achieving a more competitive economy, raising employment levels and maintaining productivity (BIS, 2010). Furthermore, a world-class skills base is considered a key driver of competitive advantage and of improving social mobility, both of which are stated aims of the current Coalition Government (BIS, 2010). The research makes use of the ambition for 2020, set by the previous Labour administration as a result of the 2006 Leitch Review, to be one of the top eight OECD countries for jobs, productivity and skills. To achieve this, more than 90 per cent of adults must be qualified to at least Level 2 (equating to five or more GCSEs at grades A–C) and more than 40 per cent must be qualified to at least Level 4 (first or other degree). The Coalition Government's 2010 skills strategy, *Skills for Sustainable Growth*, retained a commitment to world-class skills but abolished these targets, moving beyond 'the machinery of central control' as a means to achieve this ambition (BIS, 2010, p. 13). However, BIS (and others, such as the OECD) still measure the UK's progress against international comparisons of qualification levels (see BIS, 2010, p. 58, for example). For the purposes of this study, these measures have been used as indicators of progress towards world-class skills to enable analysis of the potential impact of increasing skills levels on poverty and income inequality. Prior to the removal of the 2020 goals, the UK Commission for Employment and Skills (UK Commission) played a role in monitoring UK performance against the ambition. The most recently available projections indicate that the Level 4 measure will be met but that attainment at lower skills levels will not (UK Commission, 2010).

## **The impact of changing skills on inequality and poverty**

Our research investigates how achieving the distribution of skills associated with the 2020 ambition, and how meeting the most recent UK Commission projections of the skills distribution in 2020, will affect rates of income inequality and poverty. There are several ways in which skills may affect the

---

risk of poverty and the distribution of household incomes. For example, better basic skills may equip people to manage their finances more efficiently and so avoid problems of over-indebtedness. They may also make it easier to understand the social security system and claim benefit entitlements. However, skills and educational attainment are likely to have the biggest impact on income and poverty through their relationship with employment and earnings. Labour-market earnings are the main component of personal and household incomes and so being out of work or in unstable low-paid employment has implications for the experience of poverty and low income.

Links between skills, employment, earnings and poverty are well established. Those with low educational attainment are disproportionately represented in low-wage jobs and are less likely than those with high educational attainment to be active in the labour market (DWP and DIUS, 2007; Tomlinson and Walker, 2009; Garrett *et al.*, 2010; HM Government, 2010). There are strong relationships between educational attainment and unemployment, with unemployment rates some four times greater among those with no qualifications than those with a university degree (HM Government, 2010). Unemployment, job loss and a history of unstable employment have been shown to be major factors in triggering the onset of poverty (Jenkins and Rigg, 2001; Tomlinson and Walker, 2009), while wage inequality plays a major role in determining income inequality and poverty (Jenkins, 1995; HM Government, 2010).

There are several underlying processes that drive these observed links, which are discussed in detail in Taylor *et al.* (2012). Human capital theory (Becker, 1964), which relates people's skills to their productivity in the workplace, is a central concept. The assumption is that more educated workers are more productive, earn higher wages and therefore enjoy higher incomes. Increasing people's skills raises their attractiveness to potential employers, their likelihood of employment and also their earnings when employed. Therefore, focusing on those at the bottom of the skills distribution will increase their earnings and incomes relative to the high skilled and will reduce income inequality and poverty. Macroeconomic growth theories suggest that the presence of large numbers of skilled people increases employment in research and development activities, which generates more innovation and raises long-term growth (Temple, 2001). Again this suggests that raising skill levels among the least skilled will raise income and therefore reduce poverty.

At the same time, however, improving skills among the population will increase competition for high-skilled jobs which, if the supply of such jobs is limited, induces a fall in relative wages. Increasing skills in an economy with limited demand for skilled workers may also lead to highly skilled workers seeking low-skilled jobs, potentially pushing less-skilled workers out of employment. Consequently income inequality and poverty may actually increase. This may also explain rising income inequality within educational groups as people with the same educational attainment become employed in a wider variety of jobs with different wages or experience different employment trajectories (Martins and Pereira, 2004). Dual labour market and job polarisation theories divide the labour market into two sectors: a primary sector which is characterised by secure, high-paying jobs; and a secondary sector characterised by unstable, low-paying jobs. Poverty is concentrated among people in the secondary sector, and escaping the secondary sector is difficult because of the nature of the jobs in each sector rather than the characteristics (such as skills and qualifications) of the workers in those jobs. Thus raising the skill levels of those in the secondary sector may have little impact on their employment and earnings. Recent evidence suggests that the numbers of people in good (high-wage) jobs and bad (low-wage) jobs are growing, while

---

the number in mid-wage jobs is falling (Goos and Manning, 2007; Goos, Manning and Salomons, 2009), which may increase the chances of workers becoming trapped in low-wage jobs.

## Key findings

Our research suggests that ... the changing distribution of skills by 2020 is likely to reduce poverty using both a fixed and relative poverty measure.

Our research suggests that, other things remaining the same (including, for example, the level of benefits and the structure of the benefit system), the changing distribution of skills by 2020 is likely to reduce poverty using both a fixed and relative poverty measure. However, the effects of skills changes on fixed or 'absolute' poverty are much greater than on relative poverty. This is because the current skills trajectory (both the 2020 ambition and the UK Commission projections) improves skills across the whole of the skills distribution. Therefore incomes are affected across the whole distribution rather than there being a substantial narrowing of the gap in incomes between the bottom and the rest of the income distribution. Predicted changes in the skills distribution will reduce poverty by 2.2 percentage points when using a fixed threshold and by about one percentage point when using a relative threshold. These falls equate to lifting 1.5 million and 660,000 people out of poverty respectively, relative to the skills distribution remaining at the 2008 level, and are a direct consequence of predicted changes in employment and earnings resulting from the changes in skills. Reductions in poverty are predicted among both men and women, among families with children and in each of England, Scotland, Wales and Northern Ireland. Of course, these predicted impacts are likely to change as the nature and structure of the tax and benefit system change.

The finding that projected changes in skills will have small impacts on relative poverty gives rise to several policy implications. Primarily, it highlights that, in seeking to reduce relative poverty, there is a need to focus efforts on raising the skill levels of those at the bottom of the skills distribution relative to those at the top (although it must also be considered that skills increases are used as a driver of productivity). The need to improve basic literacy and numeracy skills, and to support people who lack the basic skills they need to access employment, has been identified by the current Coalition Government in its skills policy (BIS, 2010). Furthermore, for these impacts on poverty to materialise, employers will need to create sufficient numbers of skilled jobs to absorb the increase in the number of highly skilled workers, and policy-makers will need to provide appropriate incentives to create high-skilled jobs. Policy-makers and employers need to work closely with education providers to ensure that the increase in skills is (at least partly) demand led and focuses on the skills that employers are seeking. We discuss some of the policy implications of our findings in the concluding chapter.

## Structure of the report

The remainder of the report is structured as follows. In Chapter 2 we describe the British Household Panel Survey (BHPS) data, illustrate its advantages for tackling this research, and summarise the steps taken in modelling the implications of the changing distribution of skills for household incomes in the UK. In Chapters 3 and 4 we discuss the results of this modelling and the predicted impact of changing skills on poverty and on inequality. Finally, Chapter 5 outlines our conclusions and draws some policy implications.

---

## 2 DATA AND METHODOLOGY

In this chapter we briefly introduce the data set used in the analysis and summarise the key steps and assumptions that underlie our modelling procedure.

---

We estimate a series of empirical models of the impact of skills on people's probability of employment and their earnings in employment, based on survey data taken from the BHPS for 2000 to 2008. We use these models to predict earnings based on the 2020 skills distributions, and then simulate distributions of household incomes under each skills distribution. Following tax/benefit modelling, and in conjunction with household projections from the Department of Communities and Local Government, we use these distributions to predict both income inequality and the proportions of individuals in the UK that will be in poverty under the 2020 ambition distribution and UK Commission projected skills distributions. We compare these with the predictions resulting from the skills distribution in 2008. Throughout, we measure skills using highest qualification level attained. This is for two reasons. Firstly, both the 2020 ambition and the skills projections produced by the UK Commission are based on qualification levels. Secondly, the majority of data sets that collect information on skills do so through the highest level of qualification attained.

### Data

Our research draws on data from the BHPS.<sup>1</sup> From 1991 to 2008, the BHPS followed and interviewed annually the same adults (aged 16 and above), collecting information about their education levels, incomes by source, labour-market status, housing tenure and conditions, household composition, education, health and many other aspects of their lives. The original sample consisted of some 5,500 households and 10,300 individuals drawn from 250 areas of Great Britain. Additional samples of 1,500 households in each of Scotland and Wales were added to the main sample in 1999, and in 2001 a sample of 2,000 households was added in Northern Ireland, making the panel suitable for UK-wide research. We use BHPS data for 2000–08, both to ensure that our estimate of the relationships between education, skills,

---

employment, earnings, poverty and income inequality uses the most recent data (2008 is the most recent year available), and to maintain a sufficient time dimension for robust estimation of the econometric models.

This data has key advantages for this research. Firstly, it is a panel data set which follows the same individuals over time. This is important in assessing the impact of education and skills on employment and earnings because of potential biases caused by, for example, unobserved ability. These biases may arise because people with particular personality characteristics (such as ability, commitment, ambition or persistence) may choose to acquire more education. If people with these personality traits are also more likely to be employed or to have higher earnings, then this distorts the estimated effects of education and skills on employment and/or earnings (Belzil, 2007; Blundell *et al.*, 1999; Carneiro *et al.*, 2010; Harmon *et al.*, 2000; Willis and Rosen, 1979). With panel data we can estimate statistical models which allow unobserved traits that tend to vary little over time (such as motivation, ability and commitment) to be taken into account, resulting in more accurate estimates of the impacts of skills on employment and earnings. Secondly, the BHPS contains a wide range of contextual information, including personality traits and parental background. Such information is very important in obtaining accurate estimates of the impacts of skills on employment and earnings. Thirdly, as well as detailed information on educational attainment and labour-market earnings, the BHPS contains information on the amount of income received from other sources, and from all household members. This allows the aggregation of personal income to the household level, which is critical in obtaining an accurate measure of total household income.

Finally, from waves 1 to 16 (covering 1991 to 2006), data on both net (post-government) household incomes and gross (pre-government) household incomes is available. This allows the construction of standard poverty and income inequality indices of the sort typically presented in the Households Below Average Income (HBAI) series. Appendix Table 1 presents estimates of poverty and income inequality in the UK from the 2006 BHPS data and compares them with corresponding estimates from the 2006/7 Family Resources Survey. (This is the primary data source used to compile the Department for Work and Pensions' annual HBAI reports, but is not suitable for use in this research because it lacks the necessary detailed information on skills and qualifications.) This suggests that the BHPS gives a reasonably accurate picture of the household income distribution, particularly for lower-income families which are of greater concern.

### Skills and education data in the BHPS

The UK government's ambition is for the UK to achieve world-class skills levels. Although the Coalition Government has moved away from the specific 2020 goals adopted by the previous government, we have used the 2020 ambition levels to quantify 'world class', by which the UK would be in the top quartile of OECD countries at each skills level. Skills are measured in terms of basic skills (functional numeracy and literacy) and educational attainment defined by the relevant National Qualifications Framework (NQF) qualification level. The BHPS data contains detailed information on qualifications held, allowing a comparable measure of skills to be derived.

**Table 1 – Changing distribution of qualifications – UK**

UK	LFS 2008 (%)	BHPS 2008 (%)	Ambition 2020 (%)	UK Commission projections (%)
No qualifications	12	11	5	5
Below Level 2	17	16	6	14
Level 2	20	20	22	20
Level 3	20	20	28	19
Level 4+	31	32	40	42

Notes: Percentages relate to columns. Working-age people, 19–64. BHPS percentages weighted using appropriate cross-sectional weights.

Sources: Figures from LFS 2008, Ambition 2020 and UK Commission projections from UK Commission (2010).

Table 1 summarises the distribution of skills among working-age individuals in the UK according to the 2008 Labour Force Survey (LFS) and the corresponding year of the BHPS, together with the distribution required to achieve the 2020 ambition and the UK Commission projections. We present the country-specific distribution of education in Appendix Table 2. This table indicates that the distribution of skills in the BHPS closely matches that in the larger LFS sample.

## Modelling approach and assumptions

The aim of this research is to investigate how changes in skill levels would affect poverty rates and income inequality in 2020 compared with the situation if there were no changes in skill level from the current distribution. This is complicated by a number of factors. For example, to obtain accurate predictions, strong assumptions would need to be made about trends in earnings between now and 2020, as well as in investment and pensions incomes. It would also require some assumptions about the tax/benefit regime in 2020.<sup>2</sup> Rather than making assumptions about these fundamental issues, we instead investigate how current poverty and income inequality would differ if the skills distribution today matched the 2020 ambition and the UK Commission’s projections for 2020, while also allowing for predicted changes in the structure of households.

Our modelling approach is based on human capital theory, which assumes that the skills acquired through participating in education make people more productive in employment and hence raise both their employability and their earnings conditional on employment (Becker, 1962, 1964; Mincer, 1974). Therefore higher employment rates and earnings among more highly educated people compared with less educated people are caused by the greater productivity their education imparts. There is much debate in the theoretical and empirical literature about whether this is valid. For example, in contrast to human capital theory, signalling theory argues that education instead allows employers to identify people who would be more productive workers (even in the absence of education), and hence that investing in skills and education has no direct effect on a worker’s productivity. The general consensus from the empirical literature is that acquiring education, qualifications and skills has productivity-enhancing effects and hence raises employability and earnings (see Taylor *et al.*, 2012 for a summary).

---

## Estimation procedure

There are a number of steps in the procedure we adopt to simulate the impact of the changing distribution of skills and qualifications on poverty and income inequality. We first model the impact of skills on the probability of people of working age being in employment, and their weekly earnings conditional on employment.<sup>3</sup> It is through the relationships between education, skills, employment and earnings that we expect the changing distribution of skills to affect poverty and income inequality. Details of these modelling procedures are provided in Appendix Sections 1 and 2, and the estimated impacts of qualification level on the probability of employment and on earnings conditional on employment are presented in Appendix Tables 3 and 4. The estimates indicate that more highly educated individuals are more attractive to potential employers (and hence are more likely to be in work at any point in time), and are more productive when employed (and hence have higher earnings).<sup>4</sup>

We then replicate the 2020 ambition distribution and the UK Commission projected distribution of skills in the BHPS sample from 2008 (the most recent available year), and use these new distributions to predict employment and earnings based on other observed individual characteristics in 2008. (Details of how we simulate the changing distribution of skills using BHPS data are in Appendix Section 3 and Appendix Tables 5 and 6.) The predictions from the employment and earnings models are then combined to generate forecasts of gross weekly earnings for each individual, given these new skills distributions. (Details of these procedures are provided in Appendix Sections 1 and 2, and actual and predicted employment and earnings are summarised in Appendix Tables 7 and 8, and Appendix Figure 1).

In doing this, we assume that the estimated returns to education and skills will not be affected by the changes in the supply of skills. The validity of this assumption relies on the demand for skills keeping up with the increase in supply. Since the late 1970s, the wages of highly educated workers have increased relative to those of the less educated, suggesting that demand for skills has increased as fast as supply (Machin, 2008). There is also much evidence that the earnings benefits to education have remained stable (Harkness and Machin, 1999; Harmon *et al.*, 2000; Gosling *et al.*, 2000; Machin, 1996, 2003; McIntosh, 2006; Schmitt, 1995; Walker and Zhu, 2003, 2008). This is consistent with the policy perspective that the supply of high-skill jobs will match demand (DWP and DIUS, 2008). However, there is also evidence that the impacts of educational attainment on earnings are becoming increasingly dispersed – some individuals benefit more from acquiring skills than others (Green and Zhu, 2010). We allow for some dispersion in these returns by introducing random error in our employment and earnings predictions (see Appendix Sections 1 and 2 for details).

Our procedure yields a simulated distribution of gross weekly earnings, at 2008 prices, for each individual under different skills distributions. These earnings are then added to any non-means-tested income the individual receives in 2008 (such as from rents, investments and pensions) to generate an estimate of total non-means-tested gross personal income.<sup>5</sup>

As the BHPS collects information from all adults in sampled households, these predicted gross personal incomes can be aggregated within households to give an estimated gross household non-means-tested income.<sup>6</sup> As is standard in income inequality and poverty studies, we allocate this gross household income to each adult within the household. This process is necessary to generate estimates of income inequality and poverty, which are typically based on household incomes.



---

The final stage in our modelling process is to subject these gross household incomes to tax/benefit modelling in order to retrieve an estimate of net household income, and hence the distribution of net household incomes. This allows for the redistributive effects of income taxation and means-tested benefits, and involves assumptions about the future nature of taxes and benefits. This is complicated by the current process of welfare reform and the consequent uncertainty about the tax/benefit regime in future years. We construct an estimate for net income through a simple empirical approximation to the gross–net transformation produced by the current tax/benefit system and provision, within each of a number of relatively homogeneous population groups – for example, single-earner families with children, two-earner couples with children. We have used BHPS data, for which the most recently available data on gross and net household incomes relate to 2006. We do not incorporate changes in the system that are already planned, such as the means testing of Child Benefit. In practice this involves estimating separate gross-to-net models for individuals in a range of different household types. While simple, this approach will allow for non-linearities in the relationship between gross and net income, and for the fact that net income depends on household structure and composition.<sup>7</sup> The estimates from the models of the gross-to-net transformations are presented in Appendix Table 9. In the following chapters we use these simulated income distributions to estimate poverty and income inequality under each skills profile.

---

## 3 POVERTY AND SKILLS IN 2020

In this research we simulate the distribution of household incomes likely to be associated with patterns of skills in 2020 as compared with those in 2008. Firstly, we examine the implications of this for rates of poverty and then, in Chapter 4, for inequality. A number of measures of poverty are included, which are discussed below.

---

### Simulated net income distributions

In Table 2 we summarise the resulting distributions of predicted net household incomes together with the actual distribution observed in 2006.<sup>8</sup> (Country-specific summaries are in Appendix Table 10). All incomes are given at 2008 prices to remove the effects of inflation and trends in earnings. Presenting the simulated incomes distributions at current price levels seems sensible, given that we cannot accurately forecast future trends in prices and earnings. In addition, all incomes have been equivalised using the modified OECD equivalence scales to adjust for household size and structure, as is standard in the poverty and income inequality literature.

The table reveals that our gross-to-net transformations, although only approximations, are accurate in reproducing the true distribution of net household incomes for 2006 at various points in the income distribution. Furthermore, the means and medians of the predicted distribution of household incomes based on the 2008 distribution of skills are generally similar to the actual and estimated numbers in 2006 – which suggests that our modelling of employment and earnings have reproduced the actual distribution of net household incomes quite accurately. We plot the actual and simulated income distributions in Appendix Figure 2, and this too reveals that our models accurately reproduce the true income distribution.<sup>9</sup>

**Table 2 – Summaries of actual and estimated net weekly equivalised household income**

Position in the income distribution	Actual income	Estimated income (£ per week) based on:			
		Skills in 2006	Skills in 2008	2020 ambition skills	UK Commission projections
10th percentile	133	142	137	143	144
25th percentile	182	185	197	207	206
Median	263	260	278	288	290
75th percentile	370	370	389	399	400
90th percentile	502	500	524	537	539
Mean	300	302	314	324	324

Notes: £s per week are deflated to January 2008 prices. Net weekly equivalised household income is weekly income minus taxes, plus any benefits received, adjusted to account for household composition and size.

Means of the predicted household net income distributions at the 2020 ambition skills and at the projected skills distribution in 2020 are about 3–5 per cent higher than the predictions based on the 2008 distribution of skills (which is the appropriate comparison). The predicted mean net household incomes in the UK based on the 2020 ambition and UK Commission projected distributions of skills are £324 per week, compared with £314 per week based on the current distribution of skills. Therefore, on average, the targeted and projected changes to the distribution of skills in 2020 will increase average net household incomes (measured in 2008 prices) by a small amount across the whole of the income distribution (although the impact of increasing skills for the individual may, of course, be significant). The relative increases are slightly larger at the bottom of the distribution than at the top (4–5 per cent at the 10th and 25th percentiles compared with 3–4 per cent at the 75th and 90th percentiles). Therefore we might expect poverty and income inequality to fall as a consequence of changes to the skills distribution.

## Poverty measures

The most commonly used measure of poverty is the proportion of individuals living in households with less than 60 per cent of median equivalised net household income before housing costs (BHC). We present results based on this relative measure, which is specified in the Child Poverty Act 2010. (We present estimates of poverty rates using 50 per cent and 70 per cent of median equivalised net household income in Appendix Tables 11–14). Relative poverty allows us to identify whether changes in the distribution of skills improve the income of people at the bottom of the income distribution relative to those in the middle and at the top. Under this measure, if everyone's incomes increase but the distribution of income remains unchanged, then the relative poverty rate will remain the same.

The second measure of poverty is the fixed or 'absolute' poverty line and identifies the proportion of individuals living in households with less than 60 per cent of median income in 2006. This gives an indication of the proportion of the population under the various skills distributions that would be defined as being in poverty if the poverty line is fixed at the 2006 level. It allows us to assess the impact on absolute poverty rates of the changing distribution of skills. (An absolute poverty measure is also specified in the Child Poverty Act

2010.) Under this measure, if everyone's incomes increase then the poverty rate will fall, even if the increases in incomes of those with the lowest incomes are smaller than those with the highest incomes.

Using a fixed poverty threshold, we would expect improving skills in the population to reduce poverty, as people's incomes and spending power are raised regardless of whether those towards the bottom of the distribution are catching up with or slipping further behind those higher up. However, it is less clear whether improving skills would reduce poverty based on the relative measure. The population who are not up-skilled may become more disadvantaged relative to those who have their skills improved, thus widening the earnings and incomes distribution and resulting in an increase in poverty and income inequality. If changing skills are to address relative poverty, significant improvements would be needed in the skills of those at the bottom of the income distribution compared with those higher up, rather than simply improving skills across the whole distribution.

We have estimated poverty rates for the UK as a whole and for particular population subgroups (men, women, families with children, and childless people of working age). We have also estimated rates specific to England, Scotland, Northern Ireland and Wales.<sup>10</sup> Our results for the population subgroups are indicative and some caution is needed in interpreting these predictions because sample sizes and representativeness may affect measurement.

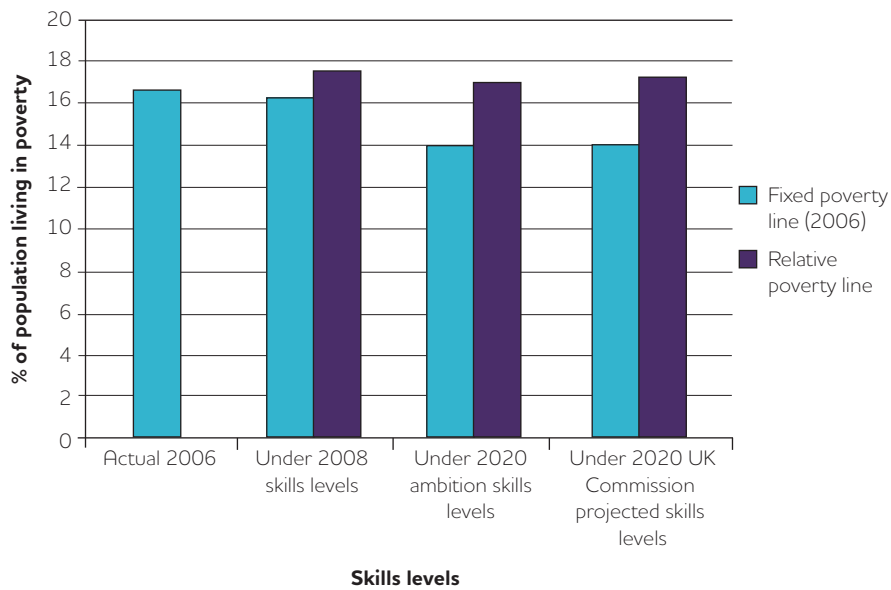
## The overall picture

Figure 1 shows estimated poverty rates for the UK population and illustrates the expected changes in poverty associated with the 2020 ambition and UK Commission projected skills distributions.<sup>11</sup> The first column presents a poverty estimate for 2006 based on BHPS data and shows that 16.7 per cent of people lived in households with incomes below 60 per cent of the median. The second set of columns presents estimates of poverty rates assuming that the skills distribution remains at 2008 levels (that is, the results from our modelling procedure using the current distribution of skills). This is the appropriate group with which to compare the poverty predictions using the 2020 distributions of skills, as it will also be subject to any biases or anomalies that our modelling procedure has produced. The third set of columns presents estimates of poverty rates assuming that the 2020 ambition levels of skills are achieved. The fourth set assumes that the most recent UK Commission projections for the skills distribution in 2020 are met.

We focus initially on the estimates from using a poverty line fixed at the 2006 threshold. Our models predict that with the 2008 distribution of skills, 16.2 per cent of people would live in households with incomes that are less than 60 per cent of the 2006 median, which is 0.5 percentage points lower than in 2006. However, achieving either the 2020 ambition levels or the UK Commission projected skills distributions reduces the poverty rate by 2.2 percentage points from 16.2 per cent under the 2008 distribution of skills to 14 per cent. Given current population projections, this is equivalent to reducing the numbers of people in poverty by about 1.5 million, from 10.8 million to 9.3 million. These predicted falls in poverty rates are driven by the expected changes in employment and the earnings distribution associated with the new distribution of skills in the workforce. More detailed analysis (not shown) suggests that about two-thirds of this fall in poverty is associated with the expected changes in earnings as those already in work earn more through higher pay or by working more hours. The remainder is associated with the expected changes in employment – that is, more people entering work.

Achieving either the 2020 ambition levels or the projected skills distributions reduces the poverty rate by 2.2 percentage points from 16.2 per cent to 14 per cent.

**Figure 1: Actual and predicted poverty rates under different skills distributions**



These effects on poverty are estimated using a fixed poverty line and therefore illustrate the absolute reduction in poverty associated with the changes in the skills distribution. Figure 1 also presents estimates of relative poverty rates: that is, poverty rates defined using a poverty line based on the distribution of incomes associated with each skill distribution. It shows that the changes in relative poverty resulting from the changing skills distribution are likely to be smaller than the changes using a fixed poverty line. In particular, achieving the 2020 ambition levels of skills will reduce poverty rates by one percentage point relative to the 2008 skills distribution (from 17.8 per cent to 16.8 per cent), which is the equivalent of lifting 700,000 people out of relative poverty (reducing the number in poverty from almost 11.9 million to 11.2 million). Meeting the UK Commission projected distribution will reduce poverty by 0.8 percentage points (to 17 per cent), which is the equivalent of lifting 500,000 people out of relative poverty (reducing the number in poverty from almost 11.9 million to 11.4 million). More detailed analysis (not shown) suggests that the impact on employment rates of the changing skills distribution is critical for reducing relative poverty rates. If the changes in the skills distribution had no impact on employment, then relative poverty rates would actually increase. This is because the changes in earnings associated with raising skill levels increases median income, but the incomes of non-working households are unchanged unless employment rates are affected.

What explains these differences in results when using fixed and relative poverty thresholds? Both the 2020 ambition levels and UK Commission projected distributions of skills imply that skills will increase across the whole skills distribution and affect those with low or no skills as well as the more highly skilled. As Table 2 showed, this has the effect of raising incomes across the entire income distribution (so reducing poverty, measured using a fixed threshold), rather than raising the incomes of those at the bottom of the income distribution relative to those higher up the distribution (which would reduce relative poverty).

Overall, there is little difference in the impact of achieving the 2020 ambition skills levels as opposed to the UK Commission's projections for 2020. Reaching ambition levels would generally deliver slightly larger reductions in poverty rates than the UK Commission projections, because the projected

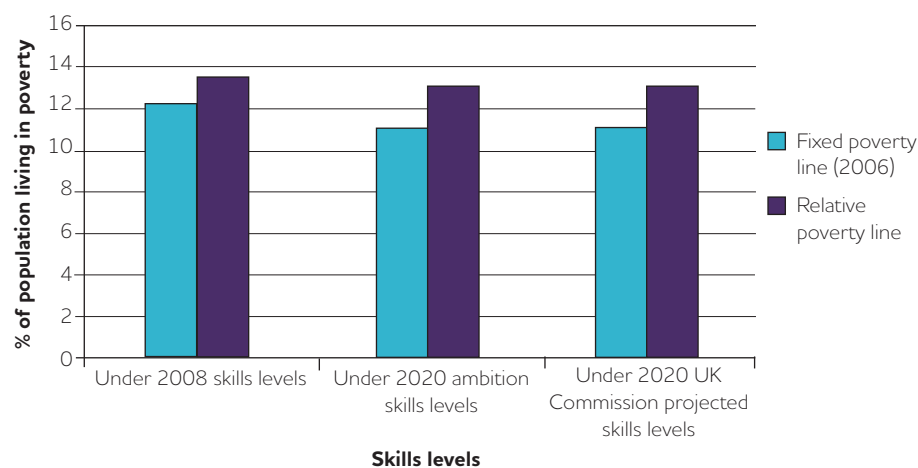
skills patterns indicate less improvement in skills at the bottom end of the distribution than implied by the ambition levels.

There are currently big differences in poverty rates among different groups in the population, particularly between men and women, different family types and between different parts of the UK. Below, we examine the impact of changes in skills on these groups.

## Men and women

Figures 2 and 3 present the estimated impact on poverty, broken down by gender, of changing the distribution of skills. The estimated poverty rates for women in particular should be treated with some caution. This is because a relatively large proportion of women are employed on a part-time basis and so have relatively low earnings, while others work full-time and so have relatively high earnings. Our modelling procedure does not accurately reproduce this earnings distribution, and is likely to overestimate the earnings of part-time workers while underestimating those of full-time workers (Appendix Figure 1 illustrates this). There is also some uncertainty about the impact of skills on the decision to work part-time rather than full-time. While these limitations affect the magnitude of the predicted poverty rates, they do not necessarily invalidate the comparison of the predicted rates between skills distributions.

**Figure 2 – Predicted poverty rates among men under different skills distributions**



**Figure 3 – Predicted poverty rates among women under different skills distributions**

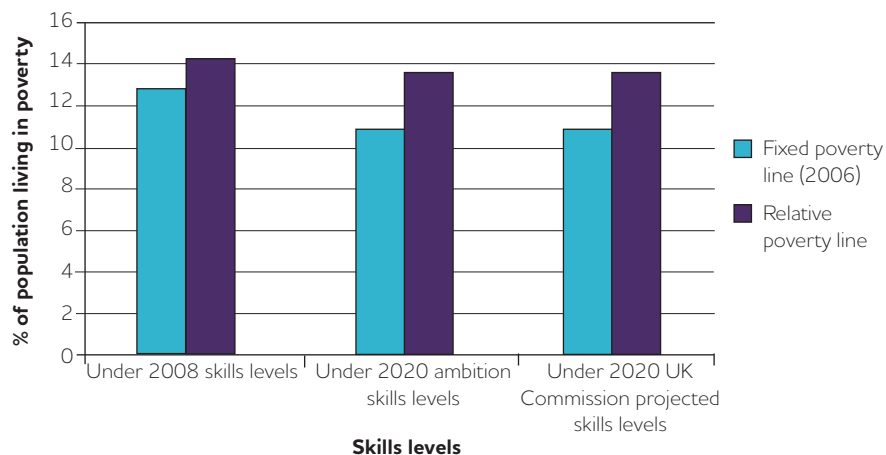


Figure 2 indicates that, using a fixed poverty line, poverty rates among men are predicted to fall from 12.3 per cent under the 2008 distribution of skills to 10.5 per cent under 2020 ambition levels and 10.6 per cent under the UK Commission skills projections. These falls are equivalent to lifting almost 600,000 men out of poverty (reducing the number in poverty from about 4.1 million to 3.5 million). For relative poverty, the impact of changing the skills distribution is smaller – we predict relative poverty rates to fall from 13.6 per cent under the 2008 skills distribution to 12.8 per cent under the 2020 ambition levels and 13 per cent under the UK Commission projected distribution of skills. This is equivalent to lifting 300,000 and 200,000 men out of relative poverty (reducing the number in poverty from about 4.5 million to 4.2 and 4.3 million respectively).

Figure 3 shows that, using the fixed poverty line, similar-sized reductions in poverty rates are predicted among women, from 12.8 per cent with the 2008 skills distribution to 11 per cent and 11.2 per cent with the 2020 ambition levels and UK Commission skills projections respectively. This is equivalent to lifting 650,000 and 550,000 women out of poverty (reducing the number in poverty from about 4.6 million to about 3.9 million). For relative poverty, the impact of changing the skills distribution is again smaller – from 14.1 per cent with the 2008 skills distribution to 13.6 per cent under the 2020 distributions, equivalent to lifting between 100,000 and 200,000 women out of relative poverty (reducing the number in poverty from about 5 million to less than 4.9 million). Hence the predicted fall in relative poverty among women is marginally smaller than among men. This is because a larger proportion of the employment gains associated with up-skilling among women will be in part-time employment and therefore associated with relatively lower income gains than among men.

## Families with and without children

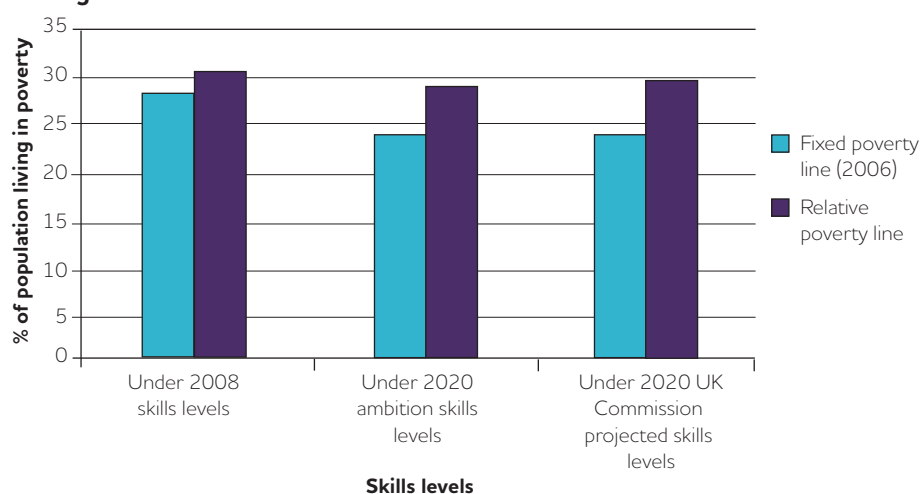
We next examine the estimated impacts of changing the distribution of skills on poverty rates among families with children and childless people of working age. The eradication of child poverty has been a stated aim of government policy, most recently encapsulated in the Child Poverty Act 2010. The purpose of this Act was to define markers of success in eradicating child poverty and create a framework to monitor progress. Of the four poverty targets specified in the Child Poverty Act, one is relative (reducing the proportion of children living in households with incomes of less than 60 per cent of the median to below 10 per cent in 2020). Another is associated with reducing to less than 5 per cent the proportion of children living in households with incomes below 60 per cent of the 2010/11 median.

Rather than focusing on child poverty explicitly, we examine the predicted impact of changing the distribution of skills on families with children. Figure 4 indicates that the likely impact is quite large. In particular, our estimates suggest that changes in the distribution of skills will reduce poverty (defined in terms of a fixed poverty line) by four percentage points (from 28 per cent under the 2008 distribution of skills to 24 per cent under the 2020 ambition levels and to 23.9 per cent under the UK Commission projected skills distribution).<sup>12</sup> With current household structure projections for 2020, this equates to about 500,000 children lifted above the poverty line. The changes in the skills distribution also reduce relative poverty among families with children, by 2.4 percentage points if the 2020 ambition levels are achieved and by 1.8 percentage points on meeting the UK Commission projections. This is equivalent to between 200,000 and 300,000 children lifted out of relative

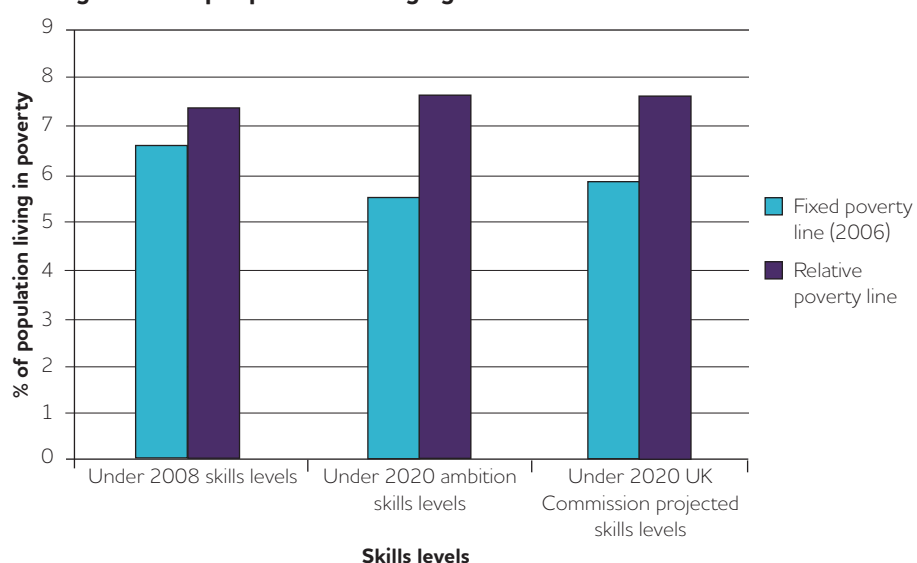
poverty. Our estimated impacts on poverty of changes in the skills distribution are consistent with those generated by Dickerson and Lindley (2008), who estimated that changes in the patterns of employment resulting from the changing distribution of skills would reduce child poverty rates in the UK by between two and five percentage points.

The changing distribution of skills is also predicted to have an impact on poverty rates among people of working age who have no children (Figure 5). Our research suggests that, when using a fixed poverty line, poverty rates among this group will fall from 6.6 per cent with the 2008 distribution of skills to 5.7 per cent with the 2020 ambition levels, and 5.9 per cent with the UK Commission projected skills distributions. However, changes in the skills distribution will not reduce relative poverty rates among childless people of working age. On average, low-skilled people have more children than people with higher skills, and have them at a younger age, so that the changing distribution of skills has a greater impact on families with children than childless people of working age. Hence families with children will be more affected than childless people by the projected improvement in skills, and therefore will benefit to a greater extent from projected gains in earnings and employment.

**Figure 4 – Predicted poverty rates under different skills distributions among families with children**



**Figure 5 – Predicted poverty rates under different skills distributions among childless people of working age**





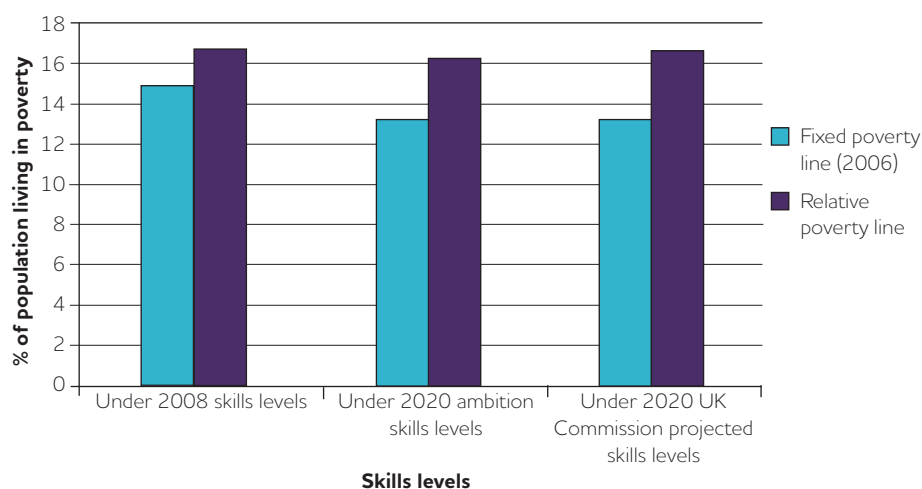
## England, Scotland, Wales and Northern Ireland

We have also examined the effects of changes in skills on poverty in England, Scotland, Wales and Northern Ireland. These should be interpreted with caution because the relatively small sample sizes in each country may potentially distort some of our estimates and predictions. There are also other issues that complicate country-specific estimation, such as skill- or employment-related migration. If opportunities for suitable employment among particular skill groups are limited in one country relative to another, this may prompt skill-specific migration between countries which will affect poverty rates (and income inequality) within countries. For example, a growth in high-skilled employment opportunities in London may prompt highly skilled people in Wales, Scotland and Northern Ireland to move to England in order to take advantage of them – and this will affect poverty and income inequality in both the origin and destination country. Our approach does not allow for this potential employment or skill-related migration. Also, the same poverty line has been used across the whole of the UK rather than calculating separate poverty lines for each of the countries. Figures 6, 7, 8 and 9 show the effects of changing skills on fixed and relative poverty in each of these parts of the UK.

Although levels of poverty are very different across the four jurisdictions of the UK, our research suggests that, when using a fixed poverty line, changes in the skills distribution will result in falls in poverty rates in all four countries. In England (Figure 6) poverty rates are predicted to fall from 14.9 per cent under the 2008 distribution of skills to 13.6 per cent under the 2020 ambition levels and UK Commission projected distributions. This 1.3 percentage point reduction is equivalent to lifting about 700,000 people above the poverty threshold (reducing the number in poverty from about 8 million people to 7.3 million).

The impact on poverty of changes in the skills distribution is larger in Wales (Figure 7) than in England, reducing it from 19.6 per cent with the 2008 distribution of skills to 15.9 per cent under 2020 ambition levels and 17.1 per cent under the UK Commission projections. These 3.7 percentage point and 2.5 percentage point falls in poverty are equivalent to lifting between 80,000 and 120,000 people out of poverty in Wales (reducing the number in poverty from over 600,000 people to between 500,000 and 550,000). The difference in the sizes of the effect between England and Wales is caused by differences

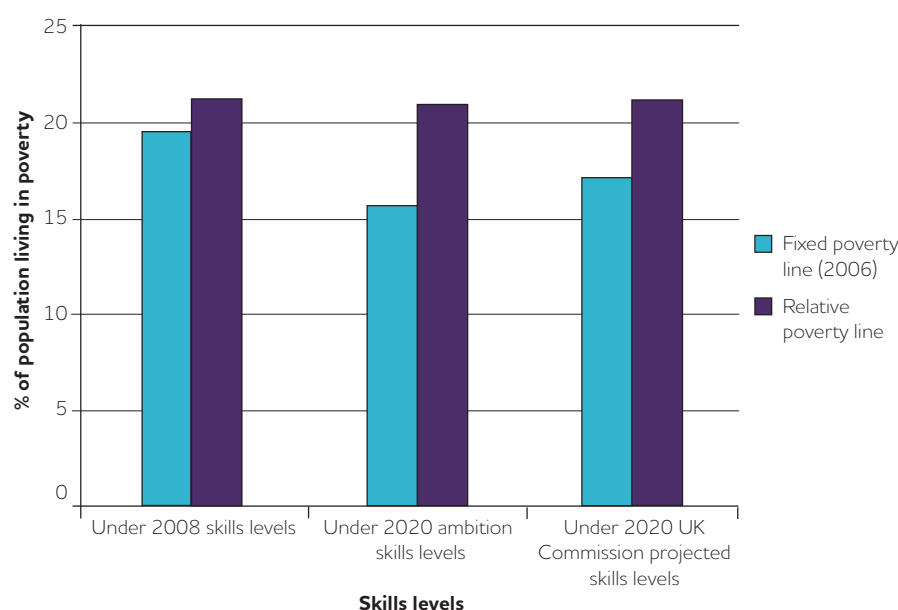
**Figure 6 – Predicted poverty rates under different skills distributions in England**



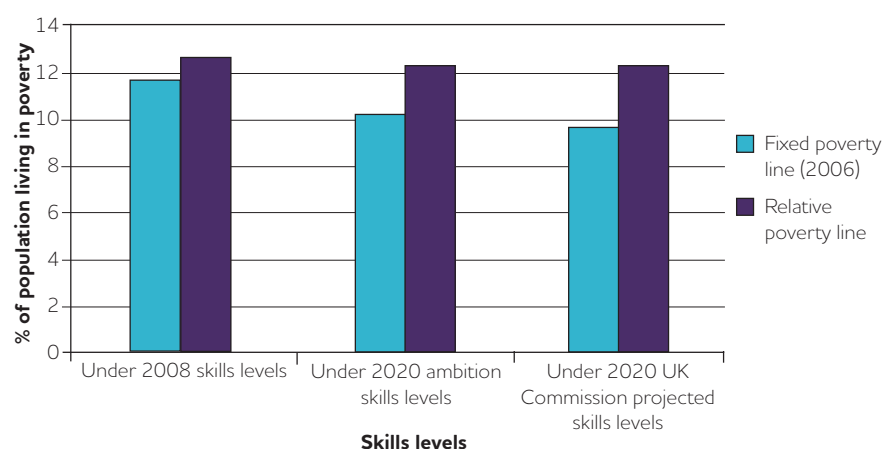
in projected up-skilling between the two countries, particularly among those with no qualifications (see Appendix Table 2 for details). The current skills base in Wales is low relative to that in England, and the projected increase in skills is greater. For example, the proportion of people in Wales with no qualifications is projected to fall from 15 per cent to 7 per cent, while in England it is projected to fall from 11 per cent to 5 per cent. Hence the associated employment and earnings gains from up-skilling will be relatively larger in Wales than England, particularly towards the bottom of the income distribution.

In Scotland, changes to the skills distribution will reduce poverty by between 1.5 percentage points under 2020 ambition levels and 1.9 percentage points under the UK Commission projections, using a fixed poverty line (Figure 8).<sup>13</sup> At current population projections, this is equivalent to between 80,000 and 100,000 people lifted out of poverty in Scotland (with the number of people in poverty falling from more than 600,000 to less than 540,000). In terms of a fixed poverty line, changes to the skills distribution will have the largest impacts on poverty in Northern Ireland (Figure 9). This is because the current skills base

**Figure 7 – Predicted poverty rates under different skills distributions in Wales**



**Figure 8 – Predicted poverty rates under different skills distributions in Scotland**



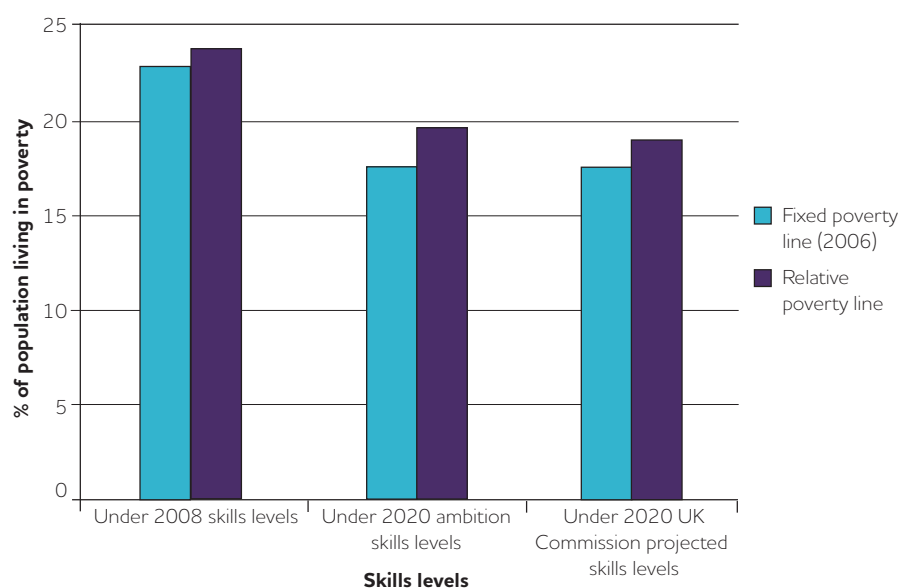
in Northern Ireland is low relative to the other countries and the projected up-skilling of the workforce is largest (see Appendix Table 2 for details). Therefore the predicted employment and earnings gains from the changing distribution of skills are larger in Northern Ireland than elsewhere in the UK. Our models predict that poverty rates in Northern Ireland defined using a fixed threshold will fall by 4.9 percentage points under the 2020 ambition levels and UK Commission projected skills distribution relative to the 2008 distribution. This is equivalent to lifting about 100,000 people out of poverty (with the number of people in poverty falling from about 450,000 to 350,000).

The impacts of the changes in skills distribution on relative poverty are considerably smaller than on absolute poverty across England, Scotland, Wales and Northern Ireland. Skills changes are predicted to have almost no impact on relative poverty rates in England (Figure 6) or Scotland (Figure 8), particularly with the UK Commission projected distribution. This indicates that household incomes in these countries will increase by similar proportions across the whole income distribution. In Wales, achieving the 2020 ambition distribution of skills is predicted to reduce relative poverty by 1.4 percentage points (lifting 50,000 people out of poverty), but meeting the UK Commission projections will have no effect (Figure 7). Only in Northern Ireland does the research suggest that both the 2020 ambition levels and UK Commission projected distributions of skills will reduce relative poverty rates compared with the 2008 distribution (Figure 9). Skills changes are estimated to reduce relative poverty in Northern Ireland by 3.7 percentage points (with 2020 ambition levels) and 4.5 percentage points (with UK Commission projections). These reductions are equivalent to 70,000 to 90,000 people lifted out of poverty. These large impacts on relative poverty are primarily due to the considerable up-skilling of the working age population in Northern Ireland, which is greater than in the other three countries.

## Summary

This research suggests that achieving the 2020 ambition distribution of skills or the UK Commission projected skills distribution for 2020 will reduce poverty

**Figure 9 – Actual and predicted poverty rates under different skills distributions in Northern Ireland**



---

rates in the UK by 2.2 percentage points, using a fixed poverty line, removing about 1.5 million people from poverty relative to skill levels in 2008. However, changing the skills distribution has smaller effects on poverty that is measured using relative poverty rates. Achieving the 2020 ambition levels is likely to reduce relative poverty by about one percentage point, while achieving the UK Commission's projected skills distributions is predicted to reduce relative poverty by 0.8 percentage points. These are equivalent to lifting between 500,000 and 700,000 people out of poverty. The different impacts on poverty when using a fixed measure rather than a relative measure result from the 2020 ambition levels and UK Commission projected changes raising skills across the whole distribution – the changes in skills affect those at the bottom and those at the top of the skills distribution. This has the effect of raising incomes across the entire income distribution. It therefore reduces poverty that is measured using a fixed threshold, rather than raising the incomes of those at the bottom of the income distribution relative to those higher up the distribution and so reducing relative poverty.

The impacts of changing skills are fairly similar among men and women. Poverty rates defined in terms of a fixed poverty threshold are estimated to fall among both men and women by 1.8 percentage points if the 2020 ambition level of skills is met, and by 1.7 percentage points if the 2020 projected level of skills is met (equivalent to lifting almost 600,000 men and more than 600,000 women out of poverty) compared with maintaining 2008 skill levels. Relative poverty will fall by 0.8 percentage points among men (lifting 260,000 men out of poverty) and 0.5 percentage points among women (lifting 170,000 women out of poverty) if the 2020 ambition skill distribution is met (and slightly less if the projected distribution is met). Our projections also indicate that the changing distribution of skills will have particularly large effects on poverty rates among families with children. Using a fixed poverty line, poverty among families with children is predicted to fall by 4 and 4.1 percentage points relative to the status quo on meeting the 2020 ambition and projected skills distributions respectively, estimated to lift about 500,000 children out of poverty. Relative poverty is predicted to fall by 2.4 percentage points if the 2020 ambition skills distribution is met (lifting about 300,000 children out of poverty), and by 1.8 percentage points if the 2020 projected skills distribution is met (lifting 250,000 children out of poverty). The research also suggests that falls in poverty would occur in England, Scotland, Wales and Northern Ireland, with slightly larger effects in Wales and, especially, in Northern Ireland. The larger effects in Wales and Northern Ireland are because the current skills base in these countries is low relative to England and Scotland, and so the projected up-skilling of the workforce is larger.

Our projections also indicate that the changing distribution of skills will have particularly large effects on poverty rates among families with children.

---

## 4 INCOME INEQUALITY AND SKILLS IN 2020

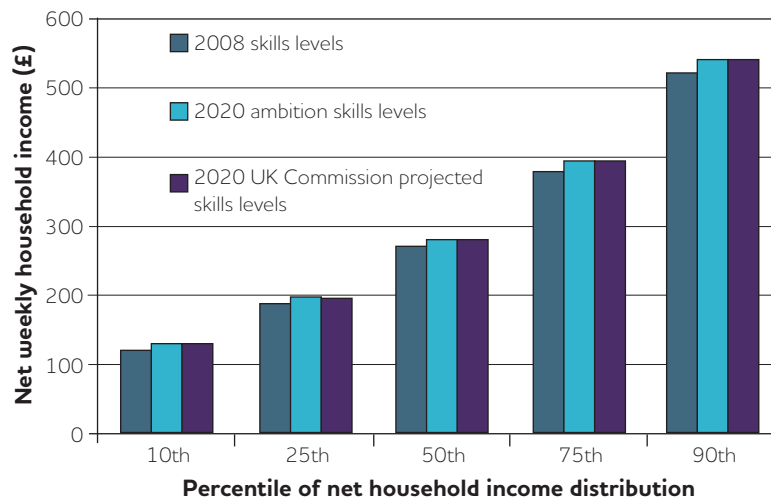
Having investigated the impact of changes in the skills distribution on poverty, we now examine their impact on income inequality.

---

We use a number of different indicators of income inequality: the ratio of incomes at the 90th and the 10th percentile of the income distribution (90:10 ratio), at the 50th and the 10th percentile (50:10 ratio), and the 90th to the 50th percentile (90:50 ratio). These ratios capture the difference in incomes between high- and low-income households, between average- and low-income households and between high- and average-income households respectively. These measures are commonly used in the income inequality literature (see, for example, National Equality Panel, 2010). However, such extremes of the income distribution will be subject to potential measurement error problems, particularly when focusing on country-specific estimates. We also therefore report estimated Gini coefficients for the household incomes projected under each skills distribution. This is the most commonly used measure of inequality, which varies between 0 (when there is complete equality and all households have the same incomes) and 1 (which indicates complete inequality, and one household has all the income).

Figure 10 shows average estimated household incomes at the 10th, 25th, 50th, 75th and 90th percentiles of the predicted incomes distributions, based on the 2008 pattern of skills, the 2020 ambition levels and those projected for 2020 by the UK Commission. An important caveat is that it is the comparison of incomes generated by each distribution of skills that is important, rather than the absolute amount of household income. This indicates that predicted incomes with the 2020 ambition levels and UK Commission projection of the skills distributions are higher at each point of the income distribution than those predicted at current skills levels. This might suggest little overall impact on income inequality and helps explain why the changes in skills have little impact on relative poverty rates. If incomes rise by similar proportions across the distribution, then income inequality and relative poverty remain unchanged. The increase in incomes ranges from about £7 per week at the 10th percentile of the distribution to £15 per week at the 90th percentile and £12 per week at the median. However, differences in predicted household incomes using the

**Figure 10 – Average predicted household income by income percentile under different skills distributions**



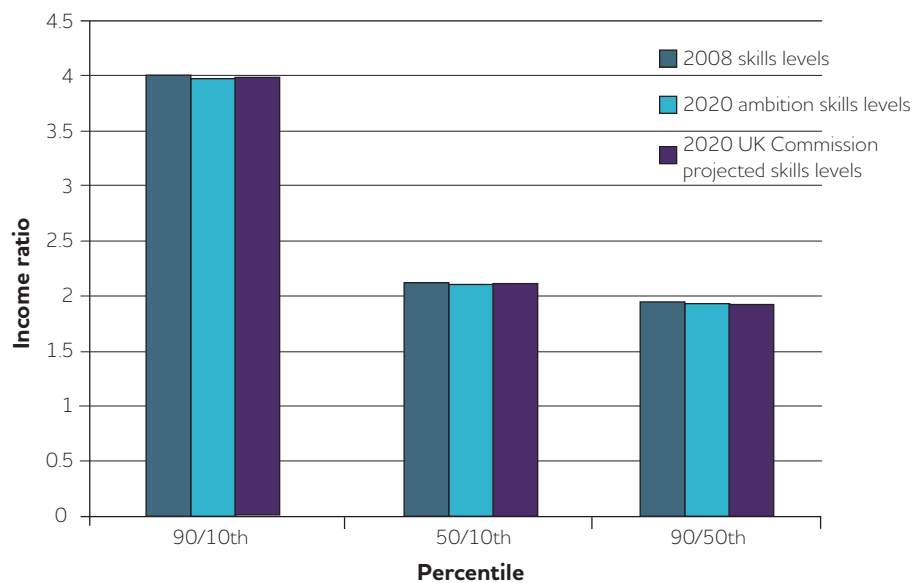
2020 ambition distribution of skills and the UK Commission projections are small at each point in the distribution.

## Income inequality in the UK

The implications of these predicted shifts in the distributions of incomes for income inequality, as measured by the ratios of incomes at various points in the distributions, are summarised in Figure 11.

Figure 11 suggests that income inequality is reduced very slightly (the ratios fall) across the income distribution with the 2020 ambition and UK Commission projected distributions of skills relative to the 2008 skills distribution. At 2008 skill levels, for example, high-income households (at the 90th percentile of the distribution) are predicted to have incomes that are

**Figure 11 – Income ratios with predicted distributions of household incomes under different skills distributions**



just over four times larger than those of households with low incomes (at the 10th percentile of the distribution). This falls to 3.9 with the 2020 ambition and UK Commission skills projections. The ratios of incomes at the 50th to 10th percentile and the 90th to the 50th percentile are lower with the 2020 distributions of skills than with the 2008 distribution. However, the differences are very small. Therefore, on average the changes in the distribution of skills in the UK will compress the income distribution marginally and slightly reduce income inequality.

This rather small impact of changes in the skills distribution on income inequality is mainly attributable to two factors. Firstly, our modelling procedure focuses on the impact of the changing distribution of skills on employment and earnings of working-age people. We have assumed that the income of pensioners and income from savings and investments remain unchanged. Of course, in the short term this is a reasonable assumption but in the medium to long term the up-skilling of the workforce is likely to affect wealth, savings and pension rights. This could increase the income of pensioners (who tend to be concentrated towards the bottom of the household income distribution) and thus result in a larger impact on income inequality. Secondly, the anticipated and targeted distributions of skills imply that the average level of skills in the economy will increase and this is predicted to raise incomes across the income distribution. As a result, the change in skills shifts the entire income distribution with little change in its shape.

On average the changes in the distribution of skills in the UK will compress the income distribution marginally and slightly reduce income inequality.

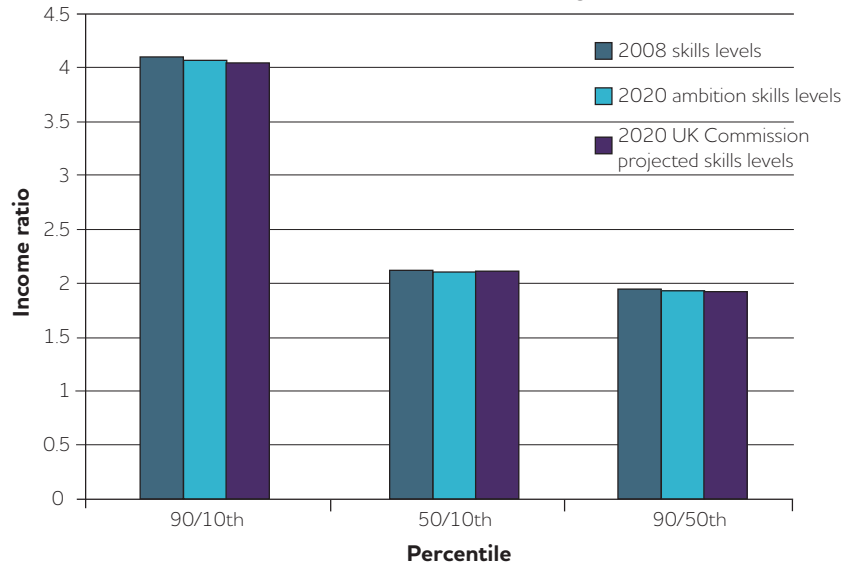
## England, Scotland, Wales and Northern Ireland

Income inequality across England, Scotland, Wales and Northern Ireland is currently quite similar. England has the highest inequality (those in the 90th percentile of income have 4.1 times the income of those in the 10th percentile). Northern Ireland has the next highest inequality (with a ratio of 3.8 between the 90th and 10th percentiles). Scotland and Wales have less inequality with ratios of 3.7 and 3.5 respectively. The impact of skills changes on income inequality also varies across the four jurisdictions. As with the poverty estimates, these should be interpreted with some caution because of issues relating to the size and representativeness of the sample, and the potential measurement error they may introduce.

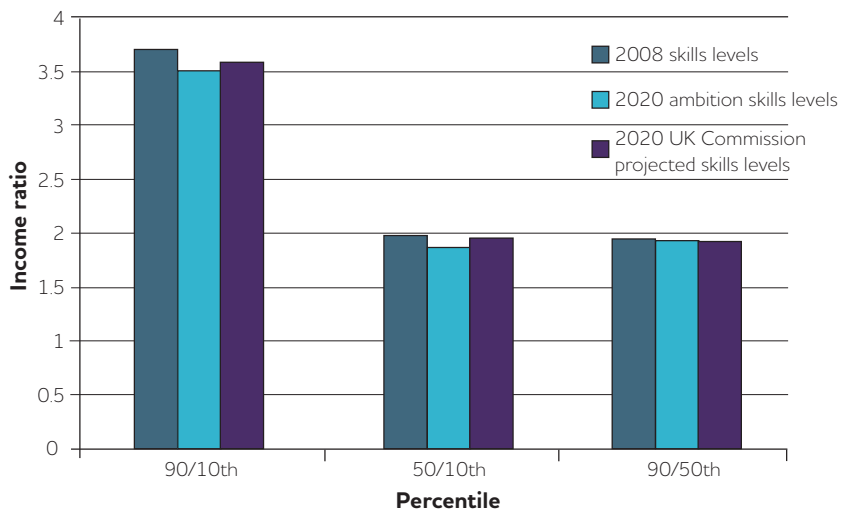
Figure 12 focuses on the predicted incomes ratios for England and indicates that the changes to the skills distribution implied by 2020 ambition levels and the UK Commission projections again have only small impacts on income inequality. The income ratios related to the predicted household income distributions under the new distributions of skills are marginally lower than under the 2008 distribution, but the differences are very small.

In contrast, Figure 13 suggests that the changes in skills distributions will have a larger impact on income inequality in Wales. In particular, the 90:10 ratio is predicted to fall from 3.7 under the 2008 distribution of skills to 3.5 under the 2020 ambition levels and 3.6 under the UK Commission projections. Achieving the increases in skills that these distributions imply would therefore condense the income distribution in Wales and hence reduce income inequality. Furthermore, the predicted changes in the 50:10 and 90:50 ratios suggest that most of this reduction in income inequality is due to a fall in the 50:10 ratio. Therefore the changes in the skills distribution reduce income inequality in Wales by raising the incomes of households at the bottom of the distribution (the 10th percentile) relative to the median. This is caused by the relatively low current skills base in Wales compared with England, and by the

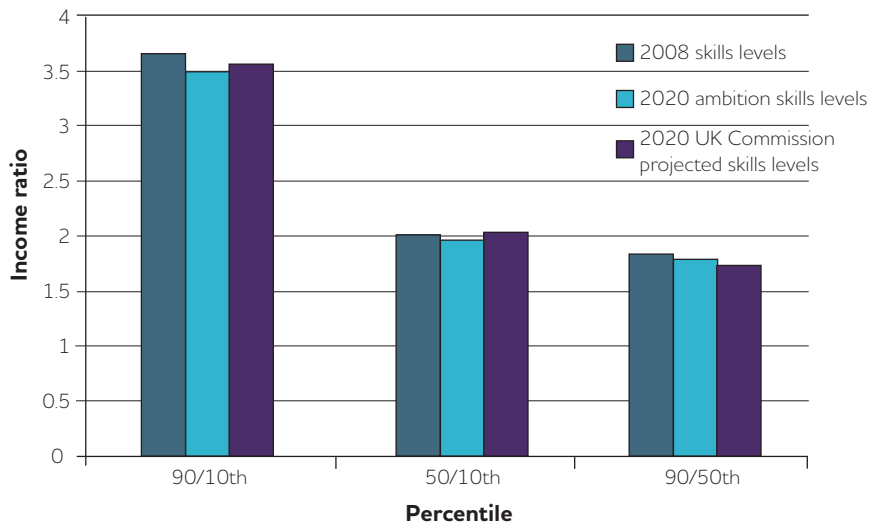
**Figure 12 – Income ratios with predicted distributions of household incomes under different skills distributions in England**



**Figure 13 – Income ratios with predicted distributions of household incomes under different skills distributions in Wales**



**Figure 14 – Income ratios with predicted distributions of household incomes under different skills distributions in Scotland**



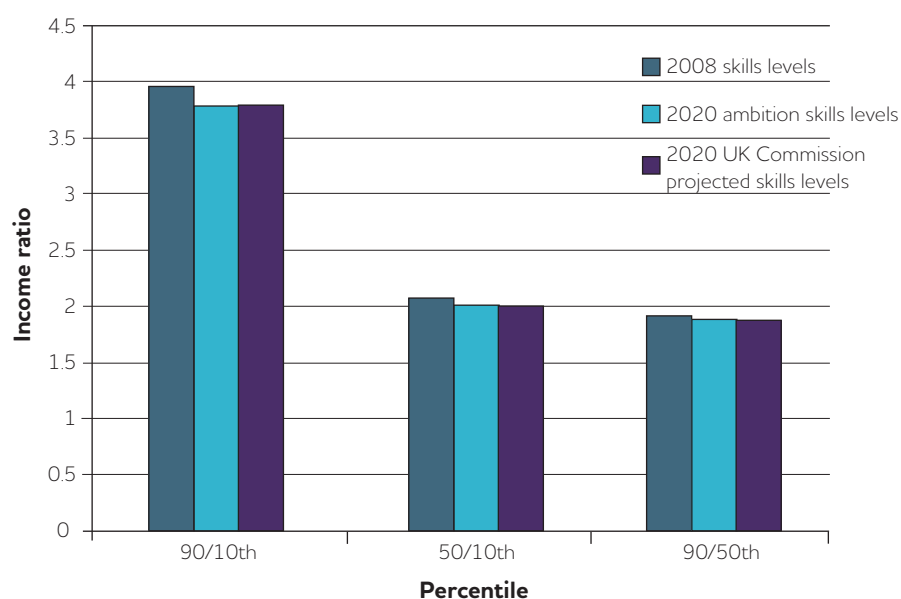


2020 ambition levels and UK Commission projections implying greater up-skilling, particularly among those with no qualifications.

Figure 14 plots the income ratios for Scotland. This also suggests that achieving the 2020 ambition distribution would especially raise incomes at the bottom of the distribution relative to the top. In particular, the ratio of incomes at the 90th percentile to the 10th percentile of the distribution falls under the 2020 ambition skill levels (to 3.5) and UK Commission projected skills distribution (to 3.6) relative to the 2008 distribution (3.7). Meeting the 2020 ambition projections would also raise incomes at the bottom of the distribution relative to the middle (the 50:10 ratio falls), and incomes at the middle of the distribution relative to those at the top (the 90:50 ratio also falls). Meeting the UK Commission projections increases incomes at the middle of the distribution relative to the top (the 90:50 ratio falls), but does little to change incomes at the bottom of the distribution relative to the middle (the 50:10 ratio remains almost unchanged). The 2020 ambition skill levels and the UK Commission projections are quite different for Scotland, particularly at higher skill levels, and this may explain the differential impacts on income inequality.

Figure 15 presents the predicted income ratios for Northern Ireland, and this indicates that the changes to the skills distribution will reduce income inequality. Meeting the 2020 ambition levels and UK Commission projected skill levels is associated with incomes at the top of the income distribution being about 3.7 times larger than those at the bottom of the income distribution (the 90:10 ratio), compared with 3.9 times larger with the 2008 distribution of skills. Predicted changes to the 50:10 and 90:50 ratios suggest that this reduction in income inequality is a result both of incomes at the bottom of the distribution rising faster than those at the middle of the distribution, and those at the middle of the distribution rising faster than those at the top. (Both the 50:10 and the 90:50 ratios are smaller under the 2020 ambition levels and UK Commission projected skills levels than with 2008 skills levels.) Again, this results from the relatively low current skills base in Northern Ireland and from the fact that meeting the 2020 ambition levels and UK Commission projections implies greater up-skilling in Northern Ireland than in other countries, particularly at the bottom of the skills distribution.

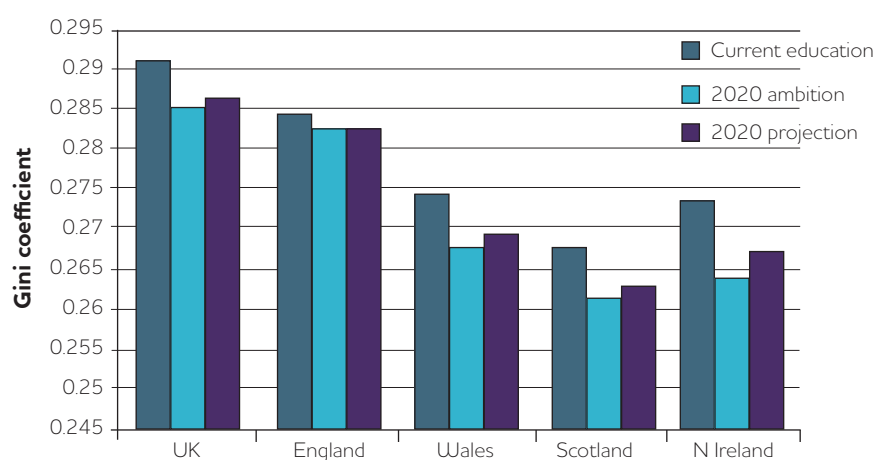
**Figure 15 – Income ratios with predicted distributions of household incomes under different skills distributions in Northern Ireland**



## Gini coefficients

The findings based on income ratios are supported by estimates of the Gini coefficients, presented in Figure 16. These indicate small falls in income inequality resulting from changes in the skills distribution, which are evident in all four countries. Across the UK as a whole, our predictions indicate that the Gini coefficient will fall from 0.291 under the 2008 skills distribution to 0.285 under 2020 ambition levels and 0.286 under the UK Commission projected distribution of skills. A similar pattern emerges in all four countries, and generally we find that the greater up-skilling associated with 2020 ambition levels, especially at the lower end of the distribution, reduces the estimated Gini coefficients more than for the UK Commission projections. The largest impacts on income inequality again emerge for Wales and Northern Ireland. This is because current skill levels are relatively low in these countries, and meeting the 2020 ambition and UK Commission projected skill levels are associated with greater improvements in skills than in England and Scotland.

**Figure 16 – Gini coefficients based on incomes predicted under different skills distributions**



Source: Authors' calculations based on simulated incomes constructed using BHPS 2000–08.

---

## 5 SUMMARY AND CONCLUSIONS

Our research suggests that the changing distribution of skills by 2020 is likely to reduce poverty using both a fixed and relative poverty measure.

---

Meeting the 2020 ambition skills distribution would have slightly greater effects than current UK Commission projections for skills distributions in 2020. This is because, according to the UK Commission's estimates, slower progress is being made in raising skills at the lower end of the distribution than is necessary to meet the 2020 ambition levels.

The effects of skills changes on fixed or 'absolute' poverty are much greater than on relative poverty because the current skills trajectory (both 2020 ambition and the UK Commission projections for 2020) improves skills across the whole of the skills distribution. They therefore affect incomes across the whole distribution rather than greatly narrowing the gap in incomes between the bottom and the rest of the income distribution. This has the effect of raising the relative poverty line. Consequently, there may be some people whose incomes increase, but who nevertheless either slip into or remain in relative poverty as a result of the skills change. Predicted changes in the skills distribution will reduce poverty by 2.2 percentage points when using a fixed threshold and by one percentage point when using a relative threshold. These falls equate to lifting 1.5 million and 660,000 people out of poverty, relative to the skills distribution remaining at the 2008 level, and are a direct consequence of predicted changes in employment and earnings resulting from the changes in skills. The impacts on absolute poverty are driven largely by the associated changes in earnings, while those on relative poverty are due to the associated changes in employment rates.

When using a fixed poverty threshold, anticipated changes to the skills distribution are predicted to reduce poverty among both men and women, among families with children and childless people of working age, and in England, Scotland, Wales and Northern Ireland. Thus, policies aimed at maintaining productivity and economic competitiveness through achieving world-class skills for the UK in 2020 could indeed be expected to improve considerably the absolute quality of life of large groups of people where there is clear income deprivation at present. Child poverty in particular is strongly associated with a range of adverse life-course outcomes, including

---

employment, health and family stability. Hence the research suggests the possibility of very long-run benefits to society as well as economic competitiveness flowing from achieving the ambition of being world class in terms of skills. Falls in relative poverty emerge less consistently among population subgroups although they are predicted to be particularly large among families with children, and in Northern Ireland.

## Assumptions used in our modelling approach

There are a number of assumptions made in our modelling approach that need to be kept in mind in interpreting these results. The first is that accumulating skills and qualifications leads to a greater likelihood of being in work and of having higher earnings. This is consistent with human capital theory, which hypothesises that more educated workers are more productive, earn higher wages and therefore enjoy higher incomes. Empirical evidence generally supports this theory – acquiring education and skills is rewarded through more stable employment, a smaller risk of unemployment and higher earnings when employed (see Taylor *et al.*, 2012 for a summary of the relevant literature). However, evidence also suggests that employment and earnings benefits to skills are not equal for all individuals, and some gain more from additional skills than others. In particular, less able workers (who are likely to be most disadvantaged) receive smaller gains than more able workers from acquiring skills and qualifications, although they still receive positive returns.

The second assumption arises from the fact that we have estimated the labour-market effects of qualifications and skills using data covering the period from 2000 to 2008. Our predictions therefore assume that the value of skills in the labour market will not be affected by the increase in supply. Thus the increase in skills implied by the changing skills distribution does not affect the employment and wage gains associated with acquiring particular skills. For this assumption to hold, it requires the demand for skills to keep pace with the increase in supply. Current evidence suggests that the returns to skills are on average little changed by the increasing supply but are becoming more dispersed. Also, larger proportions of graduates are seeking employment in jobs that do not require a university degree. This raises the possibility that expanding education may reduce employment opportunities for mid- and low-skilled workers as skilled workers will displace less-skilled workers in the labour market. Therefore income inequality and poverty may persist.

The third assumption stems from the fact that we have measured skills using educational attainment. This is not an issue if educational attainment is also a good measure of other skills that individuals hold and that are valued by employers, such as communication, team-working and other interpersonal skills. Similarly, educational attainment is a valid measure if it is also a signal of subsequent receipt of unaccredited or uncertified training. Although evidence suggests that the latter is at least partially true (the more highly educated tend to receive more formal and informal training), our estimates may still be biased and it is difficult to assess the direction of this bias.

Our estimates have also assumed that the nature of the tax/benefit regime remains unchanged from its level in 2006. While this is naïve, it is impossible to forecast the nature of future changes in the tax/benefit system. We have also not taken into account any proposed changes, such as the means testing of Child Benefit or the implementation of Universal Credit. Such changes will potentially affect both absolute and relative poverty rates and rates of income inequality in future years. The means testing of Child Benefit will, for example,

---

increase household incomes of families with children at the bottom of the distribution relative to those higher up.

A final issue relates to the process by which the general increase in skills in the population will arise. UK Commission projections are based on three effects: (i) a qualification effect whereby people in the workforce increase their qualifications level; (ii) a demographic effect whereby older workers (who tend to have lower levels of qualifications) withdraw from the labour market and are replaced by younger, more highly educated cohorts; and (iii) a migration effect which reflects the relative skill levels of immigrants and emigrants. The scope of this research necessitates a static rather than dynamic approach and we have therefore simulated the new distribution of skills on the BHPS sample, based on the characteristics of working-age individuals today. It is possible that patterns of ageing and migration will imply that skills will be distributed differently from the distribution suggested by our modelling procedure. Again, it is difficult to predict how this may affect our conclusions.

## Implications for policy

What are the lessons for policy from our research? Our estimates suggest that the projected changes in skills have small impacts on relative poverty. This finding gives rise to several policy implications. Primarily, it highlights the necessity to focus efforts on raising skill levels of those at the bottom of the skills distribution relative to those at the top. The Coalition Government's skills policy recognises the need to improve basic literacy and numeracy skills, and to support people who lack the basic skills they need to access employment (BIS, 2010). A general increase in skills across the distribution has to be part of a wider strategy to reduce income inequality and poverty, as it will not reduce relative poverty or income inequality substantially by itself.

Also, as discussed above, the estimates are based on key assumptions. For example, we assume that an increase in skills will lead to increases in employment (and, hence, that the skills being accumulated are in demand by employers and needed in a globally competitive economy). We also assume that the returns to these skills do not change as a result of the changes in the skills profile. For these assumptions to hold, it is important that employers create sufficient numbers of skilled jobs to absorb the increase in the number of highly skilled workers and that policy-makers provide appropriate incentives to create high-skilled jobs. For example, by adopting the latest production technologies, employers will demand higher-skilled workers and absorb the increase in supply. However, policy-makers and employers need to work closely with education providers to ensure that the increase in skills is demand led and focuses on the skills that employers are seeking. The fact that employers invest large sums in training their employees suggests that there is unmet demand for skilled workers (Shury *et al.*, 2010).

There is growing evidence of job polarisation in the UK labour market – with growing numbers of people in 'good' and 'bad' jobs in the economy, and fewer in jobs in the middle (Goos and Manning, 2007; Goos, Manning and Salomons, 2009). Furthermore, evidence suggests that these changing patterns are demand led as employers seek to maintain competitiveness in a global economy (Van Reenen, 2011). This polarisation in the labour market raises the possibility of less-skilled workers becoming trapped in low-wage jobs and being unable to progress into 'good' jobs unless firms provide career ladders or suitable training opportunities to make such jobs accessible to those in 'bad' jobs.

A general increase in skills across the distribution has to be part of a wider strategy to reduce income inequality and poverty, as it will not reduce relative poverty or income inequality substantially by itself.

---

The policy focus should also remain on improving the skills of the least-educated and least-skilled individuals in the population so that they are able to compete for available jobs and do not get displaced by more qualified workers. The impact on employment rates of the changing skills distribution is critical for reducing relative poverty rates. If the changes in the skills distribution had no impact on employment, then relative poverty rates would actually increase. This is because the changes in earnings associated with raising skill levels increases median income but the incomes of non-working households are unchanged unless employment rates are affected. Furthermore, if the increase in the supply of skills reduces the gains from acquiring a particular set of skills, then the predicted impacts on poverty presented here will be overestimated. A fall in the return to investments in skills will also discourage individuals from investing in education (and discourage firms from offering training courses), which will slow the up-skilling process and inhibit progress towards achieving world-class skills and productivity growth in the economy.

It is also important to improve more generic skills – for example, those associated with labour-market awareness or with developing social and business networks – that may be lacking among the most disadvantaged as a result of prolonged unemployment or economic inactivity. Evidence suggests such skills are important in facilitating successful job search, although there may also be barriers preventing labour market progression, such as glass ceilings and discrimination, that cannot be overcome by improving skill and qualification levels. The implication of extending this pattern across the whole qualification distribution is that improving skills through qualification levels alone may not reduce income inequality or poverty, and may in fact increase both. Unless particular attention is paid to raising skills at the bottom of the skill distribution, and to improving the security of the jobs that lower-skilled workers enter, the result is likely to be an increasingly segmented labour market in which the unskilled are confined to unstable low-paid work. This will not only exacerbate poverty and income inequality, but also hinder social mobility and productivity growth.

---

# NOTES

## Chapter 2

- 1 See <http://www.iser.essex.ac.uk/survey/bhps/> for more information about the BHPS.
- 2 At the time of conducting the modelling, there was very little detail available about Universal Credit, arguably the most ambitious benefit reform since Beveridge. It was not therefore possible to anticipate the benefit system in 2013 (the date earmarked for the introduction of Universal Credit), let alone 2020.
- 3 Our modelling procedure focuses on those of working age (defined as aged 19–64) as this age group is the focus of the 2020 ambition and the UK Commission's projected distributions of skills. For those outside this age range, we assume that any non means-tested income (either from the labour market or from other sources) remains at current levels. This seems sensible given that the impact of skills and education on household income mainly operates through the labour market.
- 4 The sizes of these returns to skills are similar in magnitude to those in previous research (e.g. Blundell *et al.*, 1999, 2000, 2005; Dearden, 1999; Dearden *et al.*, 2002; Dickerson, 2008; Walker and Zhu, 2001, 2003).

One factor that we have not allowed for is the impact of the supply of skills in a region on employment and wages. For example, we might expect the returns to high-level skills to be lower if a larger proportion of the local population have high skill levels. We experimented with models that also incorporated a measure of the supply of skills but the coefficients of interest were large and imprecisely estimated, suggesting that the model was therefore over-specified. The resulting predictions of employment and earnings were very sensitive to the regional distribution of skills, which is most likely to be caused by a lack of variability in the distribution of skills over the sample period.

Estimating country-specific returns to qualifications and skills is also problematic because it is possible that more highly skilled and able workers migrate out of their home country to pursue education or work. For example, evidence suggests that rates of migration from Scotland to England are highest among 16–44 year olds with high levels of education (General Register Office, 2004). Highly educated people may move to where earnings are highest.

- 5 This implicitly assumes that incomes such as those from investments and rents are unaffected by changes in the skills distribution. While this is a strong assumption, the largest projected changes in the skills distribution occur at the bottom of the skills distribution (from having no or few skills to having low- or middle-level skills). Changes in investments and savings associated with these skill changes are therefore likely to be negligible and so to have only limited impacts on unearned income.
- 6 We implicitly assume that partnering patterns remain unchanged from those observed in 2008. This seems sensible given that patterns of family formation are typically based on people's skills levels relative to others in the population (i.e. whether they are more or less skilled than average), rather than the level of skill itself (i.e. whether they hold Level 2 or Level 3 skills).
- 7 An alternative would be to use existing microsimulation software such as EUROMOD. However, EUROMOD is based on the Financial Resources Survey, which lacks detailed information on skills and qualifications as well as other important contextual information. Constructing an alternative microsimulation routine which can incorporate either panel data or richer cross-sectional data was not feasible within the timescale or budget of the current project.

---

## Chapter 3

- 8 These means and medians do not match those published in the comparable HBAI publications because of differences in the implementation of the equivalising scale (the Modified OECD scale). HBAI statistics rescale this to take the value '1' for couples without children while in the BHPS it is left at 1 for a childless single-person household.
- 9 Appendix Figure 2 indicates that the fit for net household incomes is not as good as for earnings (Appendix Figure 1), which suggests that the gross-to-net calculation loses some accuracy. Given that the poverty line typically falls on the very steep part of the net income distribution (where the fit is arguably least good), this could have a considerable impact on our poverty predictions. However, we have approximated the gross-to-net transformation as accurately as possible given the limitations imposed by the data and the scope of this project.
- 10 Sample size limitations prevent us from providing estimates for other disadvantaged groups (e.g. by ethnicity) or by region.
- 11 In order to allow for changes in household size and structure, we weight these proportions using projections of household size and structure in 2020 from the Department of Communities and Local Government (for England), the General Register Office (for Scotland), the Welsh Assembly Government, and the Northern Ireland Statistics and Research Agency. (Details of this weighting procedure are available in Appendix Section 4.) These predicted poverty rates are therefore adjusted to reflect household structure projections for 2020. Hence we make predictions about poverty rates under the 2020 ambition and UK Commission's projected distributions of skills, and compare them with poverty rates under the 2008 distribution of skills, allowing for anticipated changes in household structure.
- 12 Our estimates cannot be directly compared with the 2020 targets specified in the Child Poverty Act 2010 because (i) we include parents and other adult household members in calculating our poverty rates; and (ii) we have not allowed for general trends in earnings over time (which will raise expected incomes and therefore further reduce absolute poverty in particular).
- 13 Our predicted poverty rates for Scotland are clearly underestimated. This may result from the nature of the BHPS Scottish sample relative to the projected Scottish population, or from our employment and earnings models overestimating incomes relative to those in other countries. Appendix Table 2 shows that the BHPS over-represents highly qualified people in Scotland, which may inflate our estimated household incomes in Scotland relative to the other nations. Further investigations also suggest that the BHPS Scottish sample under-represents both single-person households and single-parent households, and over-represents couples with children. This is likely to introduce measurement error in accurately identifying poverty (and also in equivalising incomes).



---

# REFERENCES

- Altonji, J. G. and Dunn, T. A. (1996) 'The effects of family characteristics on the return to education', *Review of Economics and Statistics*, Vol. 78, No. 4, pp. 692–704
- Becker, G. (1962) 'Investment in human capital: a theoretical analysis', *Journal of Political Economy*, Vol. 70, No. 5, pp. 9–49
- Becker, G. (1964) *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. University of Chicago Press: Chicago
- Belzil, C. (2007) 'The return to schooling in structural dynamic models: a survey', *European Economic Review*, Vol. 51, No. 5, pp. 1059–105
- BIS (2010) *Skills for Sustainable Growth: Strategy Document*. Department for Business, Innovation and Skills: London
- Blundell, R., Dearden, L., Goodman, A. and Reed, H. (2000) 'The returns to higher education in Britain: evidence from a British cohort', *Economic Journal*, No. 110, F82–F99
- Blundell, R., Dearden, L., Meghir, C. and Sianesi, B. (1999) 'Human capital investment: the returns from education and training to the individual, the firm and the economy', *Fiscal Studies*, Vol. 20, No. 1, pp. 1–23
- Blundell, R., Dearden, L. and Sianesi, B. (2005) 'Evaluating the impact of education on earnings in the UK: models, methods and results from the NCDS', *Journal of the Royal Statistical Society Series A*, No. 168, pp. 473–512
- Card, D. (1999) 'The causal effect of education on earnings', in Ashenfelter, O. and Card, D. (eds) *The Handbook of Labor Economics*, 3. North-Holland: Amsterdam
- Carneiro, P., Heckman, J. J. and Vytlacil, E. J. (2010) 'Estimating marginal returns to education', NBER, working paper 16474
- Chamberlain, G. (1984) 'Panel data' in *Handbook of Econometrics*, Grilliches, Z. and Intriligator, M. D. (eds), 2, pp. 1247–318. North-Holland: Amsterdam
- Dearden, L. (1999) 'The effects of families and ability on men's education and earnings in Britain', *Labour Economics*, No. 6, pp. 551–67
- Dearden, L., McIntosh, S., Myck, M. and Vignoles, A. (2002) 'The returns to academic and vocational qualifications in Britain', *Bulletin of Economic Research*, Vol. 54, No. 3, pp. 249–74
- DWP (2008) 'Households below average income: an analysis of the income distribution 1994/95–2006/07', Department for Work and Pensions. Available at: [www.dwp.gov.uk/asd/hbai.asp](http://www.dwp.gov.uk/asd/hbai.asp)
- DWP and DIUS (2008) *Work Skills*, Department for Work and Pensions and Department for Innovation, Universities and Skills. HMSO: Norwich
- Dickerson, A. (2008) *The Distribution and Returns to Qualifications in the Four Countries of the UK*, SSDA, research report 21a. Sector Skills Development Agency
- Dickerson, A. and Lindley, J. (2008) *Parental Qualifications and Child Poverty*, JRF: York
- Ermisch, J. and Pronzato, C. (2010) 'Causal effects of parents' education on children's education', ISER working paper 2010–16

- Garrett, R., Campbell, M. and Mason, G. (2010) *The Value of Skills: An Evidence Review*, UK Commission for Employment and Skills, evidence report 22
- General Register Office (2004) *Scotland's Population 2003: The General Registrar's Annual Review of Demographic Trends*. General Register Office for Scotland: Edinburgh
- Goos, M. and Manning, A. (2007) 'Lousy and lovely jobs: the rising polarization of work in Britain', *Review of Economics and Statistics*, 89(1)
- Goos, M., Manning, A. and Salomons, A. (2009) 'Job polarization in Europe', *American Economic Review*, Vol. 99, No. 2, pp. 58–63
- Gosling, A., Machin, S. and Meghir, C. (2000) 'The changing distribution of male wages in the UK', *Review of Economic Studies*, No. 67, pp. 635–6
- Green, F. and Zhu, Y. (2010) 'Overqualification, job dissatisfaction, and increasing dispersion in the returns to graduate education', *Oxford Economic Papers*, Vol. 62, No. 4, pp. 740–63
- Harkness, S. and Machin, S. (1999) *Graduate Earnings in Britain, 1974–95*, DfEE, research report RR95
- Harmon, C., Oosterbeek, H. and Walker, I. (2000) 'The returns to education: a review of evidence, issues and deficiencies in the literature', Centre for the Economics of Education, discussion paper 5
- HM Government (2010) *State of the Nation Report: Poverty, Worklessness and Welfare Dependency in the UK*. Cabinet Office: London
- Jenkins, S. P. (1995) 'Accounting for inequality trends: decomposition analyses for the UK 1971–86', *Economica*, Vol. 62, No. 245, pp. 29–63
- Jenkins, S. P. and Rigg, J. A. (2001) *The Dynamics of Poverty in Britain*, Department for Work and Pensions, research report 157
- Machin, S. (1996) 'Wage inequality in the UK', *Oxford Review of Economic Policy*, Vol. 12, No. 1, pp. 47–64
- Machin, S. (2003) 'Wage inequality since 1975', in Dickens, R., Gregg, P. and Wadsworth, J. (eds) *The Labour Market under New Labour*. Palgrave Macmillan: Basingstoke
- Machin, S. (2008) 'An appraisal of economic research on changes in wage inequality', *Labour*, No. 22, pp. 7–26
- Martins, P. and Pereira, P. (2004) 'Does education reduce wage inequality? Quantile regression evidence from 16 countries', *Labour Economics*, No. 11, pp. 355–71
- McIntosh, S. (2006) 'Further analysis of the returns to academic and vocational qualifications', *Oxford Bulletin of Economics and Statistics*, Vol. 68, No. 2, pp. 225–51
- Mincer, J. (1974) *Schooling, Experience and Earnings*. Columbia University Press: New York
- Mundlak, Y. (1978) 'On the pooling of time series and cross section data', *Econometrica*, Vol. 46, No. 1, pp. 69–85
- National Equality Panel (2010) *An Anatomy of Economic Inequality in the UK: Report of the National Equality Panel*. Government Equalities Office and Centre for the Analysis of Social Exclusion: London
- Schmitt, J. (1995) 'The changing structure of male earnings in Britain 1974–1988', in Freeman, R. and Katz, L. (eds) *Differences and Changes in Wage Structures*. University of Chicago Press: Chicago
- Shury, J., Winterbottom, M., Davies, B. and Oldfield, K. (2010) *National Employer Skills Survey for England: Main Report*, IFF Research: UK Commission for Employment and Skills
- Taylor, M. P., Haux, T. and Pudney, S. (2012) *Skills, Employment, Income Inequality and Poverty: Theory, Evidence and an Estimation Framework*, report prepared for JRF, forthcoming
- Temple, J. (2001) 'Growth effects of education and social capital in the OECD countries', *OECD Economic Studies*, No. 33, pp. 57–101
- Tomlinson, M. and Walker, R. (2009) *Recurrent Poverty: The Impact of Family and Labour Market Changes*. JRF: York

---

UK Commission for Employment and Skills (2010) *Ambition 2020: World Class Skills and Jobs for the UK*. UKCES: London

Van Reenen, J. (2011) 'Wage inequality, technology and trade: 21st century evidence', *Labour Economics*, forthcoming

Walker, I. and Zhu, Y. (2001) *The Returns to Education: Evidence from Labour Force Surveys*, DfES research report RR313

Walker, I. and Zhu, Y. (2003) 'Education, earnings and productivity: recent UK evidence', *Labour Market Trends*, No. 111, pp. 145–152

Walker, I. and Zhu, Y. (2008) 'The college wage premium and the expansion of higher education in the UK', *Scandinavian Journal of Economics*, No. 110, pp. 695–709

Willis, R. and Rosen, S. (1979) 'Education and self-selection', *Journal of Political Economy*, No. 79, S7–S36

Wooldridge, J. M. (2005) 'Simple solutions to the initial conditions problem in dynamic, non-linear panel data models with unobserved heterogeneity', *Journal of Applied Econometrics*, No. 20, pp. 39–54

# APPENDIX

**Appendix Table 1 – Measures of poverty and income inequality – UK and home countries: BHPS and FRS 2006/07**

	UK	England	Wales	Scotland	N Ireland
<b>British Household Panel Survey (BHPS)</b>					
Poverty indicators					
Below 50% of median	10	9	10	9	12
Below 60% of median	17	16	18	16	20
Below 70% of median	25	24	30	25	28
Income inequality					
Ratio 9/1 decile	3.8	4.1	3.5	3.7	3.8
Ratio 5/1 decile	2.0	2.1	1.9	2.0	2.1
Ratio 9/5 decile	1.9	1.9	1.8	1.9	1.8
Gini coefficient	0.33	0.33	0.30	0.33	0.32
<b>Family Resources Survey (FRS)</b>					
Poverty indicators					
Below 50% of median	11	10	11	10	11
Below 60% of median	18	17	20	17	20
Below 70% of median	26	26	30	26	30
Income inequality					
Ratio 9/1 decile	4.2				
Ratio 5/1 decile	2.0				
Ratio 9/5 decile	2.0				
Gini coefficient	0.35				

Note: All indicators are based on net weekly household income, equivalised using the modified OECD scale before housing costs.

Sources: BHPS from authors' calculations. FRS indicators obtained from HBAI (DWP, 2008).

**Appendix Table 2 – Changing distribution of qualifications – home countries**

	LFS 2008 (%)	BHPS 2008 (%)	2020 ambition (%)	2020 projections (%)
<b>England</b>				
No qualifications	11	11	4	5
Below Level 2	18	17	6	15
Level 2	20	21	22	20
Level 3	20	20	28	19
Level 4+	31	32	40	41
<b>Scotland</b>				
No qualifications	12	12	4	5
Below Level 2	13	11	5	10
Level 2	18	16	18	16
Level 3	21	21	27	18
Level 4+	36	39	46	50
<b>Wales</b>				
No qualifications	13	15	5	7
Below Level 2	15	14	6	11
Level 2	22	21	24	22
Level 3	22	21	29	26
Level 4+	29	29	36	34
<b>N Ireland</b>				
No qualifications	21	20	7	11
Below Level 2	11	15	4	8
Level 2	20	22	23	19
Level 3	20	16	29	21
Level 4+	28	27	36	41

Notes: Column percentages. Working-age people 19–64. BHPS percentages weighted using appropriate cross-sectional weights.

Sources: Figures from LFS 2008. 2020 ambition and 2020 projections from UK Commission (2010).

## Appendix Section 1: Modelling the impact of skills on the probability of employment

The employment equation takes the form:

$$e_{it}^* = \beta_0 + \beta_1 S_{it} + \beta_2 X_{it} + \beta_3 B_i + \alpha_i + u_{it}$$

where  $e_{it}^*$  denotes the unobserved propensity of individual  $i$  to be employed at time  $t$ . An individual's propensity to be employed depends on their level of skills,  $S$ , a range of other time-varying individual characteristics,  $X$ , time-invariant background characteristics,  $B$  (which we include to help capture the marginal cost of education for each individual), and a time-invariant individual-specific effect  $\alpha$  which captures, for example, people's inherent ability or motivation to work. An individual is observed in work when  $e_{it}^* > 0$ .

There are three feasible potential ways of estimating such a model, given data limitations and the scope of this research. The first is to estimate cross-sectional models that essentially ignore any unobserved individual-specific effects, such as innate ability. Doing this will result in upwardly biased estimates

for the labour-market value of skills, and so is not appropriate. The second is to treat  $\alpha_i$  as random, and estimate using basic random effects probit models which typically assume that the individual-specific unobserved component is independent of the observed variables in  $X$ ,  $S$  and  $B$ . The correlation between (unobserved) ability and skill level of course violates this assumption. We therefore follow the third option, which is to estimate random effects models that relax this assumption by allowing for correlation between unobserved ability and motivation,  $\alpha$ , and time-varying observable characteristics ( $X$ ) following Mundlak (1978) and Chamberlain (1984). We do this by adding additional regressors which are the individual means of the time-varying covariates over time. The model to be estimated then becomes:

$$e_{it}^* = \beta_0 + \beta_1 S_{it} + \beta_2 X_{it} + \beta_4 \bar{X}_i + \alpha_i + u_{it}$$

where  $\bar{X}_i$  captures the within-individual means of the time-varying covariates over time. While this is unlikely to remove the correlation between unobserved ability and skills, we argue that incorporating an unobserved individual-specific component through random effects is important in generating coefficient estimates that are as robust as possible.

We do not explicitly include measures of the business cycle in our models, because our estimates are used to predict employment and earnings at some point in the future when the macroeconomic conditions are unknown. Excluding business-cycle indicators implies the effects are absorbed into the other coefficients and/or error term, and so our estimated coefficients are averages across the business cycle. This seems to be as good as making arbitrary assumptions about the nature of the business cycle in 2020.

We predict employment probabilities in 2008 from these models as:

$$pr(\text{employed}) = \Phi \left[ \frac{(\bar{\beta}_0 + \bar{\beta}_1 S_{it} + \bar{\beta}_2 X_{it} + \bar{\beta}_3 B_i)}{(1 + \sigma_\alpha^2)^{\frac{1}{2}}} \right]$$

where  $\Phi$  is the standard normal cumulative distribution function and  $\sigma_\alpha^2$  refers to the variance of the unobserved individual-specific effects (see, for example, Wooldridge, 2005). This yields a probability of employment that lies between 0 and 1 for each individual in the sample. We use stochastic multiple imputation to classify respondents into employment and non-employment based on this probability. In particular we replace the predicted probability of employment with a binary variable which takes the value 0 (1) if the probability of employment is less than (greater than or equal to) the mean of multiple random draws from a uniform distribution on the interval [0, 1].

## Appendix Section 2: Modelling the impact of skills on earnings

The earnings equations we estimate take the form:

$$\log(w_{it}) = \gamma_0 + \gamma_1 S_{it} + \gamma_2 X_{it} + \gamma_3 B_i + v_i + \epsilon_{it}$$

where  $w_{it}$  is the weekly earnings of individual  $i$  in year  $t$ . Including the vector of background characteristics  $B$  (which includes, for example, parental education) explicitly allows for correlation between earnings, educational attainment and the marginal cost of education. This may be lower for children with more privileged or more educated parents, and these children may also earn more for any level of schooling (Altonji and Dunn, 1996; Card, 1999; Ermisch and Pronzato, 2010). Estimates from ordinary least squares (OLS) cross-sectional

models are potentially biased because although higher earnings may be achieved through higher education, individuals with greater earnings capacity (ability, motivation) may choose to acquire more education, which artificially inflates its estimated impact on earnings. Potential biases also arise through correlations between unobserved ability and the marginal cost of schooling. OLS estimation therefore produces biased estimates if  $v_i$  (unobserved ability or motivation when in work) is correlated with earnings, skills and/or other observed characteristics. Therefore, more accurate estimates will be obtained by using a random effects model, assuming that  $v_i$  are random and normally distributed. Typically such estimation also assumes that the  $v_i$  are independent of observed characteristics. This is restrictive if, for example, more motivated individuals have higher earnings, are more highly qualified and work more hours per week, and estimated coefficients of interest will pick up some of the effects of the  $v_i$ . Again, we avoid this by following Mundlak (1978) and Chamberlain (1984) and relax the assumption that  $v_i$  are independent of observable time-varying covariates in  $X$ , so the model estimated becomes:

$$\log(w_{it}) = \gamma_0 + \gamma_1 S_{it} + \gamma_2 X_{it} + \gamma_3 B_i + \gamma_3 \bar{X}_i + v_i + \varepsilon_{it}$$

where  $\bar{X}$  captures the within-individual means of the time-varying covariates over time. Predicted earnings are calculated using:

$$w_{it} = \exp(\hat{\gamma}_0 + \hat{\gamma}_1 S_{it} + \hat{\gamma}_2 X_{it} + \hat{\gamma}_3 B_i + \text{random}(0, \sigma_v) + \text{random}(0, \sigma_\varepsilon))$$

where  $\sigma_v$  and  $\sigma_\varepsilon$  are the standard deviations of  $v_i$  and  $\varepsilon_{it}$  respectively.

**Appendix Table 3 – Estimates of the impacts of skills on employment for working-age men and women: BHPS 2000–08**

	England	Wales	Scotland	N Ireland
<b>Women</b>				
Skill level				
Level 4+	1.572*** [12.21]	1.407*** [7.25]	1.360*** [5.80]	2.806*** [9.26]
Level 3	0.937*** [7.28]	0.986*** [5.14]	0.760*** [3.23]	1.863*** [6.07]
Level 2	1.194*** [9.42]	1.293*** [6.81]	0.777*** [3.25]	0.907*** [3.11]
Level 1	0.775*** [6.45]	0.826*** [4.51]	0.556** [2.25]	1.066*** [3.54]
Joint sig. education	0.0000	0.0000	0.0000	0.0000
N observations	25,109	8,413	9,111	6,695
N individuals	3,985	1,344	1,405	1,005
Log-likelihood	-8,159.8	-2,705.2	-2,653.2	-1,983.6
<b>Men</b>				
Skill level				
Level 4+	1.363*** [8.82]	1.621*** [6.10]	1.208*** [4.37]	2.036*** [5.75]
Level 3	0.899*** [6.00]	1.036*** [4.04]	0.693*** [2.54]	1.219*** [3.26]
Level 2	0.944*** [6.45]	1.192*** [5.13]	0.963*** [3.49]	1.313*** [3.92]
Level 1	0.811*** [4.91]	1.505*** [5.48]	0.283*** [0.89]	1.461*** [3.36]

(continued overleaf)

### Appendix Table 3 continued

	England	Wales	Scotland	N Ireland
Joint sig. education	0.0000	0.0000	0.0000	0.0000
N observations	21,687	6,816	7,713	4,705
N individuals	3,580	1,125	1,254	738
Log-likelihood	-4,904.9	-1,678.8	-1,715.2	-1,016.2

Notes: Coefficients from random effects probit models.

All specifications also include age, age squared, whether suffers health problem, marital status, numbers of children, age of youngest child, migrant status, ethnicity, mother's and father's occupation when respondent aged 14, personality traits, whether above state pension age, individual means of time-varying covariates over time. The estimated coefficients on these variables are consistent with expectations and previous literature and so we do not present them here.

The absolute ratio of coefficient to standard error is shown in brackets.

\*\*\*p<0.01, \*\*p<0.05, \*p<0.1

### Appendix Table 4 – Estimates of the impacts of skills on earnings for working-age men and women: BHPS 2000–080

	England	Wales	Scotland	N Ireland
<b>Women</b>				
Skill level				
Level 4+	0.772*** [12.66]	0.736*** [8.27]	0.689*** [6.93]	1.048*** [10.19]
Level 3	0.339*** [5.45]	0.275*** [3.12]	0.188* [1.89]	0.417*** [3.83]
Level 2	0.347*** [5.78]	0.287*** [3.33]	0.190* [1.83]	0.490*** [4.59]
Level 1	0.299*** [5.05]	0.159* [1.79]	-0.007 [0.07]	0.361*** [3.37]
Joint sig. education	0.0000	0.0000	0.0000	0.0000
N observations	17,888	5,432	6,502	4,129
N individuals	3,263	1,013	1,134	732
R-squared	0.181	0.171	0.222	0.240
<b>Men</b>				
Skill level				
Level 4+	0.494*** [8.23]	0.548*** [4.69]	0.401*** [3.67]	0.666*** [5.18]
Level 3	0.211*** [3.53]	0.270** [2.32]	0.001 [0.01]	0.242* [1.69]
Level 2	0.114** [1.96]	0.199* [1.84]	0.068 [0.63]	0.278*** [2.23]
Level 1	0.122* [1.89]	0.318** [2.53]	0.004 [0.03]	0.350*** [2.19]
Joint sig. education	0.0000	0.0000	0.0000	0.0000
N observations	0.0000	5,342	6,358	3,671
N individuals	18,328	924	1,075	612
R-squared	3,182	0.108	0.123	0.170

Notes: Coefficients from random effects generalised least squares regressions.

Dependent variable is log (gross monthly earnings). All specifications also include age, age squared, whether suffers health problem, marital status, numbers of children, age of youngest child, migrant status, ethnicity, mother's and father's occupation when respondent aged 14, personality traits, whether above state pension age, individual means of time-varying covariates over time. The estimated coefficients on these variables are consistent with expectations and previous literature and so we do not present them here.

The absolute ratio of coefficient to standard error is shown in brackets.

\*\*\*p<0.01, \*\*p<0.05, \*p<0.1



### Appendix Section 3: Simulating the changing distribution of skills in the BHPS sample

The following describes the process by which we simulate the target and projected distribution of skills in the BHPS sample.

Suppose we have an ordered probit model for educational attainment at time  $t$ :

$$\Pr(Y_t = j|X_t) = \Phi(A_{jt} - X_t\beta) - \Phi(A_{j-1t} - X_t\beta)$$

where the  $A_{jt}$  are a set of threshold parameters. The population proportion of people with qualification level  $j$  at some future time  $t + s$  is:

$$P_{t+s}(j) = E_X[\Phi(A_{jt+s} - X\beta) - \Phi(A_{j-1t+s} - X\beta)]$$

where  $E_X$  is the expectation with respect to the projected future distribution of  $X$ . So, given an external projection of the future educational structure,  $P_{t+s}(0) \dots P_{t+s}(4)$ , it is necessary to find the values  $A_{1t+s} \dots A_{4t+s}$  which bring these expected values in line with the macro projections.

Given these solved values for  $A_{1t+s} \dots A_{4t+s}$  and the ordered probit estimate of  $\beta$ , we can stochastically simulate individual education levels which will be consistent in the aggregate with the external education distribution. For any individual, the simulation can be made conditionally on the observed individual level for that person in period  $t$  (since that gives some information about the value of the error term in the education model).

The estimates from the ordered probit model of educational attainment are shown in Appendix Table 5, and the resulting distribution of qualification level attained in Appendix Table 6. It is not possible to exactly replicate the 2020 ambition and UK Commission's projected distribution of skills because of the clustering of individuals at particular predicted probabilities in the BHPS.

**Appendix Table 5 – Marginal effects from models of skill attainment: BHPS working age, 2008**

	England	Wales	Scotland	N Ireland
Age	0.043*** [4.75]	0.056*** [3.54]	0.078*** [4.56]	0.026 [1.51]
Age squared/100	-0.065*** [6.21]	-0.081*** [4.37]	-0.112*** [5.66]	-0.053*** [2.62]
Male	0.099*** [3.22]	-0.020 [0.37]	-0.109** [1.99]	-0.016 [0.28]
Non-UK born	0.073 [0.91]	0.642*** [3.34]	0.282 [1.62]	0.277* [1.76]
Non-white				0.662 [1.05]
Black Caribbean	0.321 [1.20]			
Black African	0.454 [1.16]			
Black Other/all	0.432 [1.28]	-0.281 [0.41]		

(continued overleaf)

**Appendix Table 5 continued**

	<b>England</b>	<b>Wales</b>	<b>Scotland</b>	<b>N Ireland</b>
Indian	0.431*** [2.89]	-0.653 [0.63]		
Pakistani/Bangladeshi	-0.267 [1.40]	-1.891** [2.26]	-1.649*** [4.19]	
Chinese	-0.401 [1.03]			
Other ethnicity	0.336* [1.65]	-0.232 [0.41]	0.453 [0.95]	
Father not employed	-0.150 [1.45]	-0.234 [1.51]	-0.208 [1.26]	0.025 [0.20]
Father professional	0.840*** [14.73]	0.631*** [6.90]	0.852*** [9.03]	0.641*** [7.35]
Father non-manual	0.495*** [6.67]	0.468*** [3.63]	0.734*** [5.72]	0.618*** [4.91]
Father skilled manual	0.165*** [3.22]	0.076 [0.93]	0.226*** [2.75]	0.297*** [3.65]
Mother not employed	0.017 [0.34]	0.095 [1.21]	0.304*** [3.73]	0.103 [1.30]
Mother professional	0.433*** [6.81]	0.416*** [3.90]	0.566*** [5.23]	0.477*** [3.98]
Mother non-manual	0.311*** [5.46]	0.562*** [5.66]	0.540*** [5.65]	0.389*** [3.28]
Mother skilled manual	0.084 [1.10]	0.374** [2.40]	0.043 [0.33]	0.342** [2.17]
N observations	4,978	1,611	1,654	1,554
Log-likelihood	-7,276.8	-2,425.6	-2,296.7	-2,364.0

Notes: Table reports coefficients from an ordered probit model where the dependent variable is the level of qualification attained. Models also include variables indicating father's/mother's occupation not known, mother/father deceased when respondent aged 14.

Base category is female, white, UK born, whose mother and father were in unskilled manual occupations.

The absolute ratio of coefficient to standard error is shown in brackets.

\*\*\*p<0.01, \*\*p<0.05, \*p<0.1

**Appendix Table 6 – Distribution of qualifications: Targets and projections in BHPS sample**

<b>UK</b>	<b>2020 ambition (%)</b>	<b>2020 ambition: BHPS sample (%)</b>	<b>UK Commission projections (%)</b>	<b>UK Commission projections: BHPS sample (%)</b>
No qualifications	5	5	5	5
Below Level 2	6	6	14	15
Level 2	22	22	20	20
Level 3	28	28	19	19
Level 4+	40	40	42	41

(continued overleaf)

**Appendix Table 6 continued**

<b>UK</b>	<b>2020 ambition (%)</b>	<b>2020 ambition: BHPS sample (%)</b>	<b>UK Commission projections (%)</b>	<b>UK Commission projections: BHPS sample (%)</b>
<b>England</b>				
No qualifications	4	4	5	5
Below Level 2	6	6	15	15
Level 2	22	22	20	20
Level 3	28	27	19	19
Level 4+	40	40	41	41
<b>Scotland</b>				
No qualifications	4	4	5	6
Below Level 2	5	5	10	10
Level 2	18	18	16	16
Level 3	27	27	18	18
Level 4+	46	46	50	51
<b>Wales</b>				
No qualifications	5	5	7	7
Below Level 2	6	6	11	11
Level 2	24	24	22	22
Level 3	29	29	26	26
Level 4+	36	36	34	34
<b>Northern Ireland</b>				
No qualifications	7	7	11	11
Below Level 2	4	5	8	8
Level 2	23	23	19	19
Level 3	29	29	21	20
Level 4+	36	36	41	40

Notes: Column percentages. Working age people 19–64. Figures from 2020 ambition and UK Commission projections from UK Commission (2010). BHPS percentages weighted using appropriate cross-sectional weights.

**Appendix Table 7 – Observed and predicted employment probabilities**

	<b>Observed BHPS 2008/9</b>	<b>Predicted BHPS 2008/9</b>	<b>Predicted at 2020 ambition skills</b>	<b>Predicted at UK Commission projections</b>
<b>All</b>	0.77	0.76	0.78	0.78
<b>Men</b>	0.85	0.84	0.86	0.86
England	0.85	0.84	0.86	0.86
Wales	0.81	0.82	0.84	0.85
Scotland	0.85	0.86	0.87	0.87
N Ireland	0.77	0.77	0.79	0.78
<b>Women</b>	0.70	0.69	0.71	0.71
England	0.71	0.70	0.71	0.71
Wales	0.66	0.65	0.69	0.67
Scotland	0.72	0.71	0.73	0.73
N Ireland	0.63	0.62	0.69	0.69

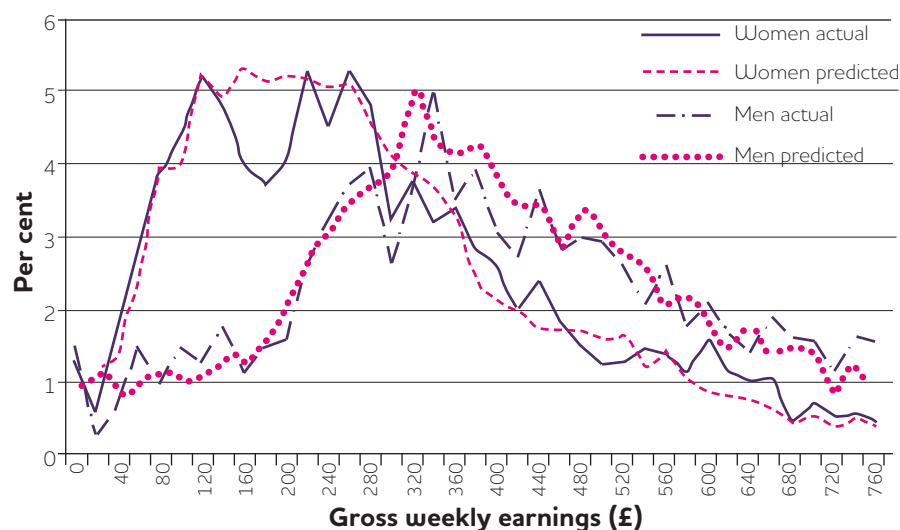
Notes: Authors' calculations based on random effects probit models estimated using BHPS 2000–08, presented in Appendix Table 3.

**Appendix Table 8 – Observed and predicted earnings conditional on employment**

	Observed BHPS 2008/9	Predicted BHPS 2008/9	Predicted at 2020 ambition skills	Predicted at UK Commission projections
<b>All</b>	427	429	451	450
<b>Men</b>	527	537	561	559
England	533	545	570	567
Wales	444	456	469	469
Scotland	523	516	538	547
N Ireland	444	450	471	474
<b>Women</b>	323	314	335	334
England	325	316	335	334
Wales	279	281	299	294
Scotland	324	322	348	352
N Ireland	296	284	317	330

Notes: Average gross weekly earnings, in January 2008 prices. Authors' calculations based on random effects models estimated using BHPS data 2000–08, presented in Appendix Table 4.

**Appendix Figure 1 – Actual and predicted gross weekly earnings: BHPS 2008**



**Appendix Table 9 – Estimates from models of gross-to-net income: BHPS 2006**

Gross income linear splines	Lone parents	Single no child	Couples with children	Couples no children	Pensioners
<£50	0.827* [1.84]	-0.466* [1.79]	0.987 [1.62]	-1.505*** [2.99]	-0.008 [0.05]
£50–99	-0.197 [0.36]	0.555 [1.58]	-1.287* [1.74]	2.061*** [3.99]	1.002*** [5.51]
£100–199	0.389** [2.13]	0.441*** [2.97]	0.397 [1.58]	-0.446* [2.05]	0.805*** [8.62]

(continued overleaf)

**Appendix Table 9 continued**

Gross income linear splines	Lone parents	Single no child	Couples with children	Couples no children	Pensioners
£200–399	0.533*** [7.22]	0.572*** [10.83]	0.501*** [7.35]	0.694*** [9.80]	0.955*** [18.70]
£400–749	0.488*** [10.18]	0.655*** [22.99]	0.547*** [24.38]	0.586*** [21.38]	0.781*** [17.50]
£750–1,499	0.694*** [15.45]	0.595*** [25.09]	0.621*** [62.81]	0.650*** [53.05]	0.747*** [14.65]
≥£1,500	0.576*** [4.66]	0.582*** [28.95]	0.576*** [81.18]	0.607*** [73.43]	0.544*** [9.80]
<b>Demographics</b>					
Age	-4.289*** [3.00]	1.477 [1.13]	-9.715*** [7.55]	-4.811*** [4.73]	19.962*** [4.77]
Age squared	5.879*** [4.48]	-0.270 [0.17]	13.192*** [9.40]	7.501*** [6.55]	-13.098*** [4.74]
N children	51.719*** [11.11]			31.297*** [11.89]	
N wage earners	24.967*** [4.21]		25.112*** [7.53]	16.378*** [3.45]	-52.560*** [5.81]
Pre-school child	-41.401** [2.48]		-30.136*** [3.90]		
Primary-school child	-43.295*** [3.15]		-37.758*** [4.98]		
Secondary-school child	-24.529** [2.12]		-32.092*** [4.64]		
Constant	222.987*** [6.01]	67.330** [2.67]	356.301*** [12.83]	240.990*** [10.34]	-566.529*** [3.59]
N observations	637	936	1,869	1,170	1,857
R-squared	0.818	0.927	0.944	0.953	0.822

Notes: OLS regression estimates based on BHPS 2006 data. Dependent variable is weekly net household income. The absolute ratio of coefficient to standard error is shown in brackets. \*\*\*p<0.01, \*\*p<0.05, \*p<0.1 <N>

**Appendix Table 10 – Summaries of actual and estimated net weekly equivalised household income**

	Observed in 2006	Estimated in 2006	Skills in 2008	2020 ambition skills	UK Commission projections
<b>England</b>					
10th percentile	135	143	141	148	148
25th percentile	187	189	207	213	213
Median	270	269	290	301	301
75th percentile	384	383	395	409	409
90th percentile	517	518	532	549	547
Mean	310	312	324	334	333

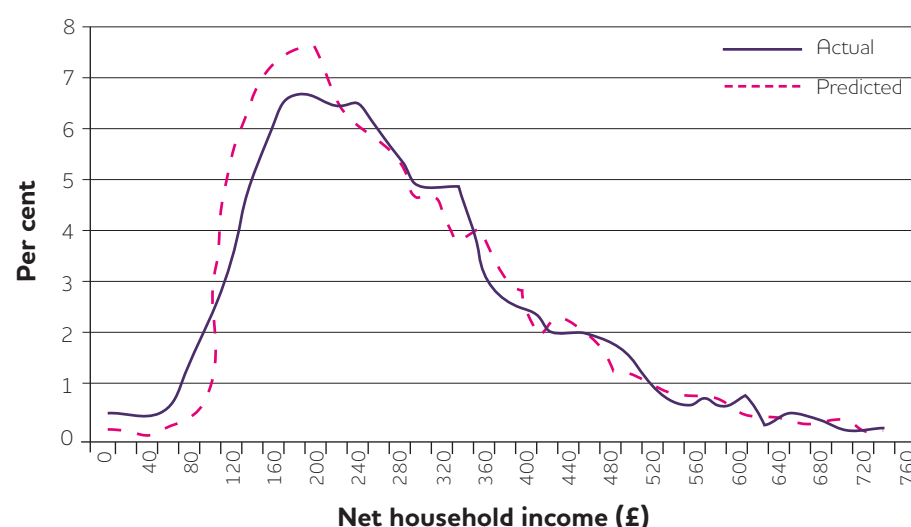
(continued overleaf)

**Appendix Table 10 continued**

	Observed in 2006	Estimated in 2006	Skills in 2008	2020 ambition skills	UK Commission projections
<b>Wales</b>					
10th percentile	130	135	129	136	133
25th percentile	172	170	181	188	187
Median	239	227	253	259	259
75th percentile	325	317	346	356	351
90th percentile	432	424	480	487	487
Mean	265	263	282	290	289
<b>Scotland</b>					
10th percentile	135	142	156	161	161
25th percentile	181	187	209	221	223
Median	262	258	285	300	302
75th percentile	358	360	383	404	414
90th percentile	483	473	524	531	536
Mean	294	296	318	331	332
<b>Northern Ireland</b>					
10th percentile	122	115	121	136	136
25th percentile	174	169	175	180	185
Median	244	243	248	260	260
75th percentile	329	342	343	360	366
90th percentile	440	446	443	467	479
Mean	270	274	274	289	292

Note: Deflated to January 2008 prices.

**Appendix Figure 2 – Actual and predicted equivalised net weekly household incomes: BHPS 2006**



#### Appendix Section 4: Weighting poverty indicators by household size and type projections

Suppose we have a prediction of net income for a set of BHPS individuals  $i = 1 \dots n$  in a recent year (say, 2006). Person  $i$  has personal characteristics  $x_i$  and lives in a household with structure  $z_i$ . Predicted equivalised net income is  $y_i$ .

Now suppose we have a set of demographic projections of the structure of the household population in 2020. There are  $H$  possible household types and the projected population proportion of type  $h$  in 2020 is  $p_h$ .

Assume that  $f_{2020}(x|z)$  is identical to  $f_{2006}(x|z)$ , so that it is only the change in family structure, not the change in individual characteristics within households, that matters.

Construct a weight for each BHPS individual as:

$$w_i = \frac{\sum_{h=1}^H 1(z_i = h) p_h}{\sum_{h=1}^H 1(z_i = h) p_h^{BHPS}}$$

where  $1(z_i = h)$  is a dummy variable for the event  $z_i = h$  and  $p_h^{BHPS}$  is the BHPS sample proportion of household type  $h$ .

Consider, for example, the poverty rate defined as the mean of a variable  $v = 1$  if  $y < L$  and 0 otherwise, where  $L$  is a poverty line. Then the projected poverty rate for 2020 is just:

$$\pi_{2020} = \frac{1}{n} \sum_{i=1}^n w_i y_i$$

We calculate these weights from projections on household size and structure in 2020 (available online) produced by the Department of Communities and Local Government (for England), the General Register Office (for Scotland), the Welsh Assembly Government, and the Northern Ireland Statistics and Research Agency.

**Appendix Table 11 – Actual and projected poverty rates in the UK: 50% and 70% of median income**

	<b>Actual, BHPS 2006</b>	<b>Predicted, 2008 education levels</b>	<b>Predicted, 2020 ambition education levels</b>	<b>Predicted, 2020 projected education levels</b>
<i>50% of median income</i>				
Fixed poverty line (2006)	9.6%	9.8%	8.0%	8.1%
		[9.3, 10.3]	[7.6, 8.5]	[7.6, 8.6]
Relative poverty line		10.6%	10.2%	10.3%
		[10.1, 11.1]	[9.7, 10.7]	[9.8, 10.8]
<i>70% of median income</i>				
Fixed poverty line (2006)	25.2%	23.6%	20.7%	21.0%
		[22.9, 24.3]	[20.0, 21.3]	[20.3, 21.6]
Relative poverty line		25.4%	24.2%	24.8%
		[24.7, 26.1]	[23.5, 24.9]	[24.0, 25.5]

Notes: Authors' calculations based on BHPS 2000–08. The figures in square brackets give the 95% confidence intervals. Fixed poverty line defined using the 2006 distribution of income, relative poverty lines defined using the relevant simulated distributions of income.

**Appendix Table 12 – Actual and projected poverty rates in the UK: 50% and 70% of median income**

	Predicted, 2008 education levels	Predicted, 2020 ambition education levels	Predicted, 2020 projected education levels
<b>Men</b>			
<i>50% of median income</i>			
Fixed poverty line (2006)	7.4%	6.1%	6.2%
	[6.7, 8.5]	[5.4, 6.7]	[5.5, 6.8]
Relative poverty line	8.2%	7.6%	7.8%
	[7.4, 8.9]	[6.9, 8.4]	[7.0, 8.5]
<i>70% of median income</i>			
Fixed poverty line (2006)	18.5%	16.0%	16.1%
	[17.4, 19.5]	[15.0, 17.1]	[15.1, 17.1]
Relative poverty line	20.0%	19.1%	19.5%
	[18.9, 21.1]	[18.0, 20.2]	[18.4, 20.6]
<b>Women</b>			
<i>50% of median income</i>			
Fixed poverty line (2006)	7.4%	6.0%	6.1%
	[6.7, 8.0]	[5.4, 6.6]	[5.5, 6.8]
Relative poverty line	8.0%	7.8%	7.9%
	[7.3, 8.7]	[7.1, 8.5]	[7.2, 8.6]
<i>70% of median income</i>			
Fixed poverty line (2006)	19.3%	17.0%	17.3%
	[18.3, 20.3]	[16.0, 18.0]	[16.3, 18.3]
Relative poverty line	20.9%	20.1%	20.7%
	[19.8, 22.0]	[19.0, 21.1]	[19.7, 21.8]

Notes: Authors' calculations based on BHPS 2000–08. The figures in square brackets give the 95% confidence intervals. Fixed poverty line defined using the 2006 distribution of income, relative poverty lines defined using the relevant simulated distributions of income.

**Appendix Table 13 – Actual and projected poverty rates in the UK: 50% and 70% of median income**

	Predicted, 2008 education levels	Predicted, 2020 ambition education levels	Predicted, 2020 projected education levels
<b>Families with children</b>			
<i>50% of median income</i>			
Fixed poverty line (2006)	17.7%	14.6%	14.7%
	[16.8, 18.7]	[13.7, 15.4]	[13.8, 15.5]
Relative poverty line	19.0%	18.0	18.2%
	[18.0, 20.0]	[17.1, 19.0]	[17.2, 19.1]

(continued overleaf)



**Appendix Table 13 continued**

	<b>Predicted, 2008 education levels</b>	<b>Predicted, 2020 ambition education levels</b>	<b>Predicted, 2020 projected education levels</b>
<i>70% of median income</i>			
Fixed poverty line (2006)	38.7%	33.5%	34.1%
	[37.5, 39.9]	[32.3, 34.6]	[32.9, 35.2]
Relative poverty line	41.3%	38.5%	39.2%
	[40.1, 42.5]	[37.3, 39.6]	[38.0, 40.4]
<b>Childless of working age</b>			
<i>50% of median income</i>			
Fixed poverty line (2006)	3.1%	2.5%	2.6%
	[2.6, 3.6]	[2.1, 3.0]	[2.2, 3.1]
Relative poverty line	3.7%	3.8%	3.8%
	[3.1, 4.2]	[3.3, 4.4]	[3.3, 4.4]
<i>70% of median income</i>			
Fixed poverty line (2006)	11.3%	10.0%	10.0%
	[10.3, 12.2]	[9.1, 10.9]	[9.1, 10.9]
Relative poverty line	12.3%	11.9%	12.4%
	[11.3, 13.2]	[11.0, 12.9]	[11.4, 13.3]

Notes: Authors' calculations based on BHPS 2000–08. The figures in square brackets give the 95% confidence intervals. Fixed poverty line defined using the 2006 distribution of income, relative poverty lines defined using the relevant simulated distributions of income.

**Appendix Table 14 – Actual and projected poverty rates in the UK – 50% and 70% of median income**

	<b>Predicted, 2008 education levels</b>	<b>Predicted, 2020 ambition education levels</b>	<b>Predicted, 2020 projected education levels</b>
<b>England</b>			
<i>50% of median income</i>			
Fixed poverty line (2006)	8.9%	8.1%	8.1%
	[8.2, 9.6]	[7.4, 8.7]	[7.4, 8.7]
Relative poverty line	9.7%	10.1%	10.0%
	[9.0, 10.4]	[9.3, 10.8]	[9.3, 10.7]
<i>70% of median income</i>			
Fixed poverty line (2006)	21.5%	19.4%	19.7%
	[20.5, 22.5]	[18.4, 20.3]	[18.8, 20.7]
Relative poverty line	23.0%	22.5%	23.1%
	[22.0, 24.0]	[21.5, 23.5]	[22.1, 24.1]
<b>Wales</b>			
<i>50% of median income</i>			
Fixed poverty line (2006)	11.2%	8.2%	8.7%
	[10.0, 12.5]	[7.1, 9.3]	[7.5, 9.8]

(continued overleaf)

**Appendix Table 14 continued**

	<b>Predicted, 2008 education levels</b>	<b>Predicted, 2020 ambition education levels</b>	<b>Predicted, 2020 projected education levels</b>
Relative poverty line	12.7% [11.3, 14.0]	11.4% [10.2, 12.7]	11.9% [10.6, 13.2]
<i>70% of median income</i>			
Fixed poverty line (2006)	28.9% [27.1, 30.8]	25.5% [23.7, 27.2]	26.5% [24.8, 28.3]
Relative poverty line	30.5% [28.7, 32.4]	30.2% [28.3, 32.1]	30.7% [28.8, 32.6]
<b>Scotland</b>			
<i>50% of median income</i>			
Fixed poverty line (2006)	7.4% [6.3, 8.5]	6.1% [5.1, 7.1]	6.0% [5.0, 7.0]
Relative poverty line	7.8% [6.7, 8.9]	7.2% [6.2, 8.3]	7.1% [6.0, 8.1]
<i>70% of median income</i>			
Fixed poverty line (2006)	18.6% [17.0, 20.1]	16.0% [14.5, 17.5]	15.8% [14.3, 17.3]
Relative poverty line	20.3% [18.7, 22.0]	18.8% [17.2, 20.4]	19.0% [17.3, 20.6]
<b>Northern Ireland</b>			
<i>50% of median income</i>			
Fixed poverty line (2006)	13.2% [11.8, 14.6]	9.6% [8.4, 10.9]	9.8% [8.5, 11.0]
Relative poverty line	13.9% [12.5, 15.3]	12.4% [11.1, 13.8]	12.7% [11.4, 14.1]
<i>70% of median income</i>			
Fixed poverty line (2006)	29.6% [27.7, 31.5]	24.3% [22.6, 26.1]	24.2% [22.4, 25.9]
Relative poverty line	32.3% [30.3, 34.2]	28.5% [26.7, 30.4]	29.5% [27.6, 31.4]

Notes: Authors' calculations based on BHPS 2000–08.  
The figures in square brackets give the 95% confidence intervals. Fixed poverty lines are defined using the 2006 distribution of income. Relative poverty lines are defined using the relevant simulated distributions of income.

---

# ACKNOWLEDGEMENTS

This report was part of a programme on the future of the UK labour market in association with the UK Commission for Employment and Skills. The authors would like to thank JRF and UKCES for supporting this research. We would also like to thank Chris Goulden and Helen Robinson at the Joseph Rowntree Foundation, and Abigail Gibson and Mark Spilsbury at the UK Commission for Employment and Skills for their invaluable advice and support throughout the project. We are also grateful to Jonathan Shaw (IFS), Paolo Lucchino (HM Treasury), Richard Exell (TUC), Adrian Alsop (ESRC), Paul Bivand (CESI), Rob MacDonald (Teesside University), Gillian Paul (Frontier Economics), Richard Baker (The Northern Way), Penny Tamkin (IES) and other members of the Future Labour Markets Programme Advisory Group for their constructive comments and suggestions. Finally, we are grateful to the Joseph Rowntree Foundation for funding the research.

# ABOUT THE AUTHORS

**Mark Taylor** is a Reader in Economics and Director of Research at ISER. His research interests include the microeconomic analysis of labour market behaviour, its causes and consequences and its relationship to wider economic wellbeing. He has led research projects commissioned by a range of funding providers including the ESRC, the Low Pay Commission, the Financial Services Authority and the Leverhulme Trust.

**Tina Haux** is a Research Fellow in the Department of Sociology, Social Policy and Social Work at Queen's University Belfast, and was formerly a researcher at ISER. Her research interests are in the areas of family policy, social security, comparative social policy and policy-making. She is the Honorary Secretary of the Social Policy Association and a member of various steering groups convened by JRF and the Nuffield Foundation.

**Steve Pudney** is a Professor of Economics and Director of the ESRC Research Centre on Micro-social Change, based at ISER. His research interests concern the statistical analysis of the economic behaviour of individuals, in particular with application to tax-benefit policy, poverty and labour markets.

---

The Joseph Rowntree Foundation has supported this project as part of its programme of research and innovative development projects, which it hopes will be of value to policy makers, practitioners and service users. The facts presented and views expressed in this report are, however, those of the authors and not necessarily those of JRF.

A pdf version of this publication is available from the JRF website ([www.jrf.org.uk](http://www.jrf.org.uk)). Further copies of this report, or any other JRF publication, can be obtained from the JRF website ([www.jrf.org.uk/publications](http://www.jrf.org.uk/publications)) or by emailing [publications@jrf.org.uk](mailto:publications@jrf.org.uk)

A CIP catalogue record for this report is available from the British Library.

All rights reserved. Reproduction of this report by photocopying or electronic means for non-commercial purposes is permitted. Otherwise, no part of this report may be reproduced, adapted, stored in a retrieval system or transmitted by any means, electronic, mechanical, photocopying, or otherwise without the prior written permission of the Joseph Rowntree Foundation.

© Institute for Social & Economic Research,  
University of Essex 2012  
First published 2012 by the  
Joseph Rowntree Foundation  
ISBN: 978-1-85935-905-1 (pdf)  
Project managed and typeset by  
Cambridge Publishing Management Limited

Joseph Rowntree Foundation  
The Homestead  
40 Water End  
York YO30 6WP  
[www.jrf.org.uk](http://www.jrf.org.uk)