

JRF Programme Paper
The future UK labour market

**SKILLS, EMPLOYMENT, INCOME
INEQUALITY AND POVERTY:
THEORY, EVIDENCE AND AN
ESTIMATION FRAMEWORK**

Mark Taylor, Tina Haux and Steve Pudney

June 2012

This paper:

- explains the meaning of ‘skills’ and some of the theories about the relationships between skills, employment and earnings;
- investigates the likely impact on income inequality and poverty of improving the skills of the population in the UK;
- presents a new framework to assess the impact on income inequality and poverty of future changes to the distribution of skills and qualifications.

The Joseph Rowntree Foundation (JRF) commissioned this paper as part of its programme on the future UK labour market, which aims to understand the links between people’s skills, the labour market and household income to develop coherent strategies to minimise future poverty and inequality in the UK.

ISBN 9781859358801

© Institute for Social & Economic Research (ISER) University of Essex 2012

Contents

		Page
Section 1	Introduction and background	3
Section 2	What are skills?	7
Section 3	Evidence of the links between skills, employment, income and poverty	15
Section 4	A framework for projecting the impact of skills on income and poverty	27
Section 5	Summary and conclusions	34
	References	36
	About the authors	51

Introduction and background

Longer term aims of United Kingdom governments include raising employment levels and reducing poverty. A key part of this is increasing qualification and skill levels across the board, with government funding targeted at reducing the size of the low-skilled, and thus the low-waged, workforce (BIS, 2010). The effectiveness of this approach rests on the assumptions that enhancing people's skills improves their employment prospects and that concentrating funding and support on those with the lowest skills will narrow the wage and income distributions. The Joseph Rowntree Foundation and UK Commission for Employment and Skills (UKCES) are funding a programme of research examining the future of the UK labour market. As part of this programme, this study investigates the likely impacts on income inequality and poverty of improving the skills held by the population in the UK.

The particular focus of this research is the impact on income inequality and poverty on meeting the UK Government's ambition for a world class skills base (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. This required that by 2020 more than 90 per cent of adults be qualified to at least Level 2 (equating to five or more GCSEs at grades A–C) and more than 40 per cent be qualified to at least Level 4 (first or other degree). The Coalition Government's 2010 skills strategy, *Skills for Sustainable Growth*, abolished these targets and moved beyond "the machinery of central control" as a means to achieve this ambition (BIS, 2010, p13). However, BIS (and others such as the OECD) do still measure the UK's progress against international comparisons of qualification levels (see, for example, BIS, 2010, p58). Thus, for the purposes of this study, these measures have been retained as indicators of progress towards world class skills, to enable the analysis of the potential impact of increasing skills levels on poverty and income inequality.

The assumption is that raising education and skills is crucial in ensuring future economic prosperity (BIS, 2010). It has been documented that countries with high levels of education and skill have on average high levels of productivity and economic growth (Hanushek and Woessmann, 2010). In 2010 the UK Commission for Employment and Skills assessed progress towards the 2020 ambition (UKCES, 2010) and projected that although ambitions at Level 4 were on course to be met, those at lower levels were not. The 2020 ambition, the UKCES (2010) projections, and the current distribution of skills are presented in

Table 1, which indicates the predicted shortfall at lower qualification levels – particularly Levels 1 and 3.

Table 1 Distribution of skills: current position, targets and projections for 2020

	Labour Force Survey 2008	Ambition 2020 indicators	UKCES projections (UKCES 2010)
No qualifications	12%	5%	5%
Level 1	17%	6%	14%
Level 2	20%	22%	20%
Level 3	20%	28%	19%
Level 4+	31%	40%	42%

Notes: Based on adults of working age (19-59/64).

Although skills can affect income and poverty in a number of ways, they are likely to have their biggest impact through their relationship with employment and earnings. As well as the labour market impact, more highly skilled individuals may better understand the social security system and be more aware both of their entitlement to and how to claim benefits. They may also be more able to manage their finances efficiently and so avoid problems associated with over-indebtedness (Taylor, 2011). Labour market earnings are one of the main components 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. As people tend to partner with others similar to themselves, low skilled (and high skilled) individuals tend to cluster within households, which strengthens the link between low pay and unemployment at the individual level and poverty and income inequality at the household level. For example, Gregg *et al.* (2010) find that 17 per cent of British households contained no working adult, while in 66 per cent of households all adults were in work. Both of these proportions have increased since the 1970s.

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). Wage inequality plays a major role in determining income inequality and poverty (Jenkins, 1995; HM Government, 2010). Therefore to understand the impacts of skills on income and poverty, it is necessary to understand the links between skills, employment and earnings (explored in Section 3 of this report).

Our initial objective is to describe theories of the economic impacts of skills, and which in particular relate skills to employment, earnings, poverty and inequality, and to assess their support in the empirical literature. The central concept is human capital theory (Becker, 1964), which relates people's skills to their productivity at the workplace. 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 conditional on employment. 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 large numbers of skilled people increase 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, there are other effects which we must consider that may act against such processes. For example, 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).

In this paper we review these theories and the relevant evidence. These are then used as a basis for an estimating framework that projects the effect on poverty levels and inequality of different skill distributions. We first discuss what is meant by skills before describing major theories that explain the links between skills, employment, income and poverty. The subsequent section reviews the empirical literature and how this relates to the theories. We then outline a framework for projecting the impact of skills on income inequality and poverty. The final section summarises our arguments and concludes with reflections on the next stage of the research.

What are skills?

Before documenting theories relating skills to employment, income inequality and poverty, it is worth briefly considering what we mean by skills. Skills can be measured in a number of ways – for example by education level, qualifications held, occupation, and training received (McIntosh and Vignoles, 2001) – and can relate to both ‘soft’ or employability skills and certified skills. Soft skills are often identified as part of human capital that has become increasingly valued by employers (Darr, 2004), such as communication, team-working and other interpersonal skills. However, measuring soft skills is problematical in large scale social surveys and so it is difficult to assess their direct impact on employment and earnings (see, for example, Dewson, *et al.*, 2000). Non-technical skills, which may be acquired at the workplace and be rewarded in terms of earnings, are often not accredited and tend not to fall neatly into categories of educational attainment, again making them difficult to identify in social surveys (DfES and DWP, 2007; Westwood, 2004).

As a result, the level of qualification or educational attainment is often used in research and analysis as a proxy for skills, as is occupation and sometimes age (DFES and DWP, 2007). This is not an issue if soft skills are correlated with qualification or educational attainment, as people with higher level qualifications will also have more soft skills. It has more implications for estimating the value of qualifications in the labour market if there is little relationship between the acquisition of soft skills and more formal educational attainment, or if this relationship has changed over time. In this case measuring skills through educational attainment will not capture any soft skills present in the worker, and potentially bias the value of any given qualification. This may be particularly relevant for the UK in recent decades, given the debates about grade inflation, about whether the improvements in GCSE and A-Level achievements are real or artificial, and whether the expansion in higher education has been achieved at the expense of quality.

The problems accurately measuring skills levels are reflected in the use of educational attainment as a policy tool. Despite their limitations, qualification attainment, accreditation and certification remain the most practical and pragmatic means of identifying and measuring skill levels. Doing so implicitly equates qualifications with skills and there is an important distinction between time spent in education (or acquiring skills) and the effective amount of education. However, success in examinations and certified educational

attainment can be interpreted as signals of the effectiveness of time spent in education and therefore as indicators of skill.

Theories relating skills, employment, income and poverty

A number of theories deal with the relationships between skills, employment and earnings. Human capital theory is crucial to the proposition that skills will increase earnings and directly links higher skill levels to higher productivity and hence a greater probability of employment and higher earnings and income, and a lower risk of poverty. However, how far human capital theory fully explains these relationships is challenged by a number of issues such as market failures; the extent and nature of labour market segmentation; demand for labour and the skills acquired; and wider macro-economic issues. Signalling theory (Spence, 1973) interprets educational and skill attainment as a screening device which employers use to identify good workers. Theories of dual labour markets 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 but escaping the secondary sector is difficult, irrespective of educational attainment, because of the nature of the jobs in each sector.

The impact of increasing skill levels on earnings, incomes and poverty also depends on the demand for highly skilled workers. If there are insufficient appropriate jobs available for highly skilled people, then high skilled workers who are unable to find suitable jobs take those of less skilled workers and the skills workers hold will exceed those required for the job for which they are employed. This raises the possibility that expanding education may reduce employment opportunities for mid- and low-skilled workers. Therefore aggregate employment levels may not change (skilled workers will displace less skilled workers) and so income inequality and poverty may persist. In contrast, skill-biased technical change theories suggest that demand for highly skilled workers will continue to grow as such workers are needed to take full advantage of changes in technology. Here it is possible that the demand for high skilled workers will grow faster than supply, resulting in increased earnings for high skilled workers relative to low skilled workers. This will widen the wage structure and increase wage and income inequality.

These theories are mostly concerned with the private (or internal) returns to education and skills. These are the benefits that accrue to the individual (in the form of, for example, more stable employment or higher earnings). In contrast social returns are those that benefit the economy more generally (e.g. through higher output and economic growth, better health, lower crime). Most of our

discussion relates to private returns, although we refer to spillover effects on the wider economy where relevant. However, we also describe macro-economic theories which relate education and skills within an economy to its growth, as high economic growth implies increasing incomes and hence potentially less poverty.

Human capital theory

The basis of human capital theory is that education makes people more productive at work. Individuals invest their time and money in education and skills on the expectation that such investment will yield future benefits in terms of employment and earnings (Becker, 1962; 1964). Mincer (1974) showed that if the only cost of an additional year of education is the opportunity cost of the student's time, and if the proportional increase in earnings caused by this additional education is constant over an individual's lifetime, then the rate of return to the investment in education can be derived from estimating relatively simple econometric models (see also Becker, 1964; Becker and Chiswick, 1966). The underlying theoretical assumption is that the skills acquired by the individual through education influence the individual's productivity by the same amount in all types of work for all employers (Mincer, 1974). Therefore, human capital theory implies that an effective anti-poverty strategy should incorporate increasing the skills of people in poor (low-income) households as this will increase their productivity and suitability for paid employment, and for career advancement within employment (Oxaal, 1997).

Signalling theory

Signalling (or screening) theory recognises that the positive effect of educational attainment on earnings may not result from enhanced productivity but because education signals innate personality characteristics such as ability and motivation (Arrow, 1973; Spence, 1973). It suggests that education acts as a filter that identifies more able workers rather than enhancing productivity directly. Workers use education to signal their ability and motivation to potential employers, while employers use education to identify more able and highly motivated workers who will be more productive (Blaug, 1992; Harmon, et al., 2000). Therefore, workers who obtain more education are more productive and earn higher wages yet by assumption education does not affect worker productivity. In the IT sector, for example, job requirements almost always entail knowledge of most recent developments acquired through informal and self-learning. Although this knowledge may not be taught through formal IT qualifications, and may not be relevant for the job, they are still used to select employees as they are seen as signals of the ability and willingness to learn (Adams and Demaiter, 2010).

Signalling and human capital theories are observationally equivalent in that they both indicate a positive association between earnings and education, but this arises for very different reasons (Blanden, et al., 2010; Harmon, et al., 2000). In both, those with higher educational attainment enjoy higher employment probabilities and higher earnings because they have higher productivity. The human capital model states that this higher productivity is a direct result of education, while the signalling model states that education instead allows employers to identify workers who would be more productive workers even in the absence of education.

The implications of signalling theory differ from those of human capital theory. Under signalling theory, improving the education levels of low-skilled workers may have no impact on their wages if high skilled workers acquire even more education to continue to signal to employers that they are different. Hence signalling theory raises the possibility that education has no impact on poverty or income inequality, as the least skilled would still not compete for jobs with higher earnings.

Dual labour market theory

Dual (or segmented) labour market theory also suggests that raising education levels may not improve economic outcomes among the low skilled. This approach sees the labour market as (at least) two sectors, a primary (or core, internal) sector and a secondary (or peripheral, external) sector (Piore, 1975; Reich, et al., 1973). The primary sector is characterised by good working conditions, high wages, job security and promotion prospects, while the secondary sector is characterised by poorly paid unstable employment with poor working conditions. Workers in the secondary sector find it difficult to move into the primary sector due to the nature of their employment, irrespective of their education, unless there is sustained and unmet demand from the primary sector for more highly skilled workers. Continued employment in the secondary sector leads to poverty and deprivation. Dual labour market theory indicates that raising skill levels among the low-skilled work force will have little impact on income inequality or poverty, which will persist in the presence of a secondary sector.

The relative demand for skills

Another factor that affects the relationships between skills, employment, income inequality and poverty is the extent to which there is demand by employers for a more educated work force. Raising the skills of individuals will have little impact on their employment or earnings trajectories if there are no suitable jobs for them to enter.

With the recent expansion in education, and higher education in particular, there is growing concern that the supply of highly educated workers may outpace demand (Green and Zhu, 2010; Harmon, *et al.*, 2000). If that happens the skills that workers hold will exceed those required to do the job for which they are employed. This means that the expansion in education becomes unprofitable for individuals and unproductive for society (Duncan and Hoffman, 1981). The implication is that highly skilled workers accept jobs formerly filled by less skilled workers, displacing them in the labour market. Hence less skilled workers are either forced into a lower paid job or into unemployment, with implications for their earnings and incomes and potential knock-on effects on poverty and income and inequality.

For this to be a long-term problem, the demand for high skilled workers needs to be unresponsive to supply. This counters traditional economic theory which argues that firms can almost always adapt their production processes to minimise costs (Duncan and Hoffman, 1981). When there is an excess supply of high skilled workers, their wages are reduced relative to less skilled workers and firms have an incentive to redesign production techniques to make use of the relatively cheaper skilled workers. This tends to eliminate situations in which workers work below skill levels, and thus an excess supply of skills is a short term phenomenon resulting from lack of coordination between individuals and firms (Freeman, 1976). It is also inconsistent with human capital theory which suggests that firms and employees fully use their education and skills (Brynin and Longhi, 2009).

According to theories of skill-biased technical change (SBTC), new technologies result in higher productivity but only highly educated workers have the necessary skills to operate them (Acemoglu, 2002; Machin, 2008). Consequently, introducing these technologies into the workplace increases the demand for, and wages of, highly skilled workers relative to less skilled workers (Machin and Van Reenen, 2007). This reduces the employment and wages of less skilled workers, and increases the employment opportunities and wages of highly skilled workers. Consequently, the wages and incomes of less skilled workers fall while those of highly skilled workers rise, and educational wage differentials and income inequality grows (Acemoglu, 2002). This could become a spiral if a rapid expansion in highly educated workers results in new technologies so that increasing the supply of skills accelerates the demand for skills (Acemoglu, 1998).

More generally, an implication of SBTC is that there is continual growth in demand for highly skilled workers. If this growth in demand is matched (or exceeded) by a growth in supply then wage differentials between high and low

skilled workers (and hence wage inequality) at worst remain constant. However if this demand is not met with matching increases in supply, then the wages of highly skilled workers will increase relative to those for low skilled workers, widening the wage structure and educational wage differentials. This will increase income inequality. Goldin and Katz (2007) argue that the slowdown in growth in educational attainment among young Americans has been the major factor contributing to the growth in relative wages of highly skilled workers, and hence to the large increase in US wage inequality since 1980.

Macro-economic growth models

As well as the potential microeconomic (private) returns to education and skills, macroeconomic models investigate the contribution of skills and human capital to national economic growth (social returns). Within this context, macroeconomic growth leads to a more affluent population, and education is recognized as a key factor of economic development and technological progress (Morrison and Murtin, 2010). Educational expansion, if concentrated on the least skilled, may reduce income inequality and poverty through raising growth and incomes in the economy (Topel, 1999).

New growth theories explicitly consider education as central to economic growth (Blundell, *et al.*, 1999). One approach sees human capital as an input in production – the level of output depends on the level of human capital in the economy, which implies that the growth rate of output depends on the rate at which countries accumulate human capital over time (Benabou, 1996; Glomm and Ravikumar, 1992; Lucas, 1988; Uzawa, 1965). These models emphasise how workers with different skill levels interact with each other and assume that highly skilled workers increase the productivity of others with whom they work (Acemoglu, 1996; Gemmell, 1997; Redding, 1996). A second approach (endogenous growth theory) assumes that human capital increases individuals' capacities both to produce technical change and to adapt to it (Sianesi and Van Reenen, 2003; Temple, 2001). The typical assumption is that research and development activities, and long-run growth, depend on the availability of skilled labour (Temple, 2001). Education levels are linked to productivity growth as a highly skilled workforce is more able to introduce and adapt to new technology (Nelson and Phelps, 1966; Redding, 1996; Romer, 1990; Shapiro, 2006). Raising skill levels in an economy will therefore raise growth and incomes and if concentrated on the least educated, reduce poverty and inequality.

Measurement and modelling issues

Several problems arise in empirically estimating the true (or causal) effect of education on earnings, and hence discriminating between these theories in empirical research. Firstly, it requires strong assumptions to claim that the estimated impact of educational attainment accurately measures an individual's return on the investment. These include the lack of any direct or psychic costs of schooling, no income taxes, and no loss of working life with additional years of education (Heckman, *et al.*, 2008). The plausibility of these assumptions within the UK context are questionable and evidence suggests that they do not fit the US economy in recent years. If imposed, the impact of education on earnings is substantially reduced (Heckman, *et al.*, 1996, 2008; Jaeger and Page, 1996). For example, tuition costs are non-trivial and Carneiro, *et al.* (2003) and Cunha, *et al.* (2005) report that the non-pecuniary costs of schooling (for example, the foregone experience and psychic benefits that would be obtained from entering work, and the psychic costs of schooling) may exceed tuition costs.

A second issue is whether the observed higher earnings for better educated workers are caused by their education or are instead a reflection of their higher levels of innate ability. People with particular personality characteristics (such as ability, commitment, ambition or persistence) may choose to acquire more education – and this is the main obstacle in distinguishing between human capital and signalling theories. If people with these personality traits are also more likely to earn higher wages, this will bias the estimated effects of education and skills on earnings. The general expectation is that the estimates are biased upwards because of the positive association between ability, motivation and education – more motivated and able people will both achieve higher levels of educational attainment and earn higher wages (Belzil, 2007; Blundell, *et al.*, 1999; Carneiro, *et al.*, 2010; Harmon, *et al.*, 2000; Willis and Rosen, 1979). Also those with more educated or privileged parents may face lower costs of education, because for example they are more able to afford tuition fees, have greater access to books and other learning materials, or inherit particular tastes for schooling. If such people also benefit in the labour market through inherited personality traits or access to particular networks, then this too will over-estimate the impact of educational attainment on labour market outcomes (Altonji and Dunn, 1996; Card, 1999; Ermisch and Pronzato, 2010). This suggests that increasing skills levels among the low skilled will have a smaller impact on their earnings, and hence on income inequality and poverty, than predicted by simple human capital models.

More recent models based on human capital theory attempt to explicitly allow for the fact that all people are unlikely to gain equally from education. For example,

in some models educational attainment is the result of people's perceived probability of entering a range of different occupations in the future, and their ability in those occupations. Hence educational attainment is a consequence of occupational (and future earnings) expectations (Keane and Wolpin, 1997, 2000; Lee, 2005). Similarly, Buchinsky and Leslie (2010) present a model in which individuals' educational attainments depend on their expectations of future earnings. Other models allow for the fact that educational attainment is at least partly driven by unobserved characteristics that also affect people's labour market performance (Heckman, et al., 1998; Belzil and Hansen, 2002, 2007). The general conclusion from these models is that as more able individuals choose to acquire more education, the estimated impacts of education on earnings are typically over-estimated. Hence improving the education of low-skilled individuals has less affect on their earnings and a limited impact on poverty and inequality.

Evidence of the links between skills, employment, income and poverty

In this section we review the empirical evidence on the links between skills, education, income, income inequality and poverty. In doing so we distinguish between evidence related to the various theories. We initially provide evidence about the role of employment in protecting people from poverty and low income, as this is central to the process through which skills can affect poverty and income inequality.

Strong links emerge between individual and household employment patterns and low income and poverty (Burchardt, *et al.*, 2002; Calandrino, 2003; DWP, 2010; Gordon, *et al.*, 2000; Ray, *et al.*, 2010; Tomlinson and Walker, 2010) and individuals in workless families make up the largest proportion of those in low income (Gardiner and Hills, 1999; Howarth, *et al.*, 1998; Vegeris and Perry, 2003). Two-thirds of working age households on low income are workless while more than 80 per cent of individuals in non-working families have low income (Oxley, 1999). More than 50 per cent of individuals in non-working households are in the bottom quintile of the income distribution compared with less than 5 per cent of those in dual-earner households (DWP, 2010). Vegeris and Perry (2003) also show that working families experienced income increases of 33 per cent between 1999 and 2001 compared with increases of 17 per cent among non-working families. This suggests that the income gap between working and non-working families has widened.

The relationship between employment, income and poverty is also reflected in persistence in low income and flows into and out of low income and poverty. Living in a workless household at the start of a low income spell is associated with above average persistence in low income (DWP, 2009; Jenkins and Rigg, 2001), while employment-related events and changes in labour market earnings explain a large proportion of entries and exits from low income (DWP, 2009; Oxley, 1999; Jenkins, 2000; Jenkins and Rigg, 2001). Job loss and the entry into unemployment has also been shown to be a major factor explaining exposure to poverty (Duncan, *et al.*, 2003; Jenkins, 2000; McQuaid, *et al.*, 2010) although such labour market triggers are more important for men than women (Rigg and Sefton, 2004; Ruspini, 1998). Being in a no-earner household increases both duration and recurrence of poverty (Cappellari and Jenkins, 2004; Devicienti, 2001).

Despite this, an increasing proportion of poor people are in work and evidence suggests that employment has become a less secure means of exiting poverty (Adelman, *et al.*, 2003; Kemp, *et al.*, 2004; McKnight, 2002; McQuaid, *et al.*, 2010). Only 67 per cent of households are lifted out of poverty when a household member enters full-time employment (DWP, 2009). Therefore, although evidence suggests that employment, unemployment, job loss and job entry are important in explaining the exposure to poverty and low income, other factors also contribute. We now consider the role played by education and skills in explaining the link between employment, income inequality and poverty by summarising how the empirical evidence relates to the relevant theories.

Human capital theory

Evidence largely confirms that people who invest in education and skills receive a return on their investment through higher employment rates, more stable employment and higher earnings. A difficulty in this extensive literature is distinguishing between the causal impact of education on employment and earnings and associations between education and labour market outcomes. Now we present evidence from a wide range of studies looking at the relationships between skills, employment and earnings, most of which do not attempt to distinguish between the role of observed skills, unobserved ability or signalling. In the subsequent section we highlight research that has explicitly attempted to deal with these issues.

Previous research has highlighted that the probability of being employed increases with the level of qualification attained, for example those with a degree face a substantially higher chance of being employed than those with only basic or no qualifications (Arulampalam, *et al.*, 2000; Dearden, *et al.*, 2002b). More generally, poor numeracy and literacy skills are associated with a greater risk of unemployment, while having basic numeracy and literacy skills, vocational and/or academic qualifications and participating in any form of life-long learning increases the probability of labour market activity and employment (Bynner and Parsons, 2005; Dearden, *et al.*, 2001; DWP and DIUS, 2008; Greenwood, *et al.*, 2007; Jenkins, *et al.*, 2003; McIntosh, 2006; McIntosh and Vignoles, 2001; Vignoles, *et al.*, 2010). Such relationships are found even for those with low level skills. For example, having Level 1 numeracy skills are associated with a two percentage point higher probability of employment, while Level 1 literacy improves the probability of being in work by as much as ten percentage points (Dearden, *et al.*, 2002b). Strong relationships between education and the probability of job termination also emerge, such that the probability of job loss is highest for those with no academic qualifications and lowest for those with tertiary level qualifications (Böheim and Taylor, 2002). Thus even minimal skill

and qualification attainment can help protect people from unemployment and job loss, which are major triggers for the experience of poverty and low income.

A positive relationship between qualification level achieved and participation in work-related training as an adult has also emerged (DfES and DWP, 2007; Howarth, *et al.*, 1998; Jenkins, *et al.*, 2003; Palmer, *et al.*, 2002). Skills enhancement can therefore be self-sustaining as acquiring some skills provides incentives and opportunities for further skill acquisition (Blundell, *et al.*, 2005). This suggests that training tends to amplify rather than reduce the skills gap, as those with some skills tend to accumulate more skills and those without become more disadvantaged in the labour market (Dearden, *et al.*, 2002a; Heckman, 1998). This highlights the importance of ensuring access to training and opportunities are available to those with the lowest skill levels, otherwise income inequality and poverty will be exacerbated.

This evidence indicates that skills and qualifications protect people from job loss and unemployment, consistent with human capital theory. But do skills have a more direct impact on personal (and household) incomes, and hence income inequality and poverty, via earnings when employed? Again, the evidence suggests this is the case. The general consensus is that the average annual return to an additional year of full-time education is between 5 – 12 per cent (Blundell, *et al.*, 1999; Chevalier, *et al.*, 2004; Harmon, *et al.*, 2000; Trostel, *et al.*, 2002; Walker and Zhu, 2003), which is among the highest in the EU (Trostel, *et al.*, 2002).

The education system in the UK more naturally lends itself to the study of the returns to various qualification levels rather than the years spent in education, and the importance of distinguishing between different types of qualifications is widely accepted (Dearden, 1999a; Dearden, *et al.*, 2002b). Doing so reveals that returns to qualifications at each stage of the educational process are large. For example, the average return to a first degree compared to A-Levels, in terms of hourly wages, are in the range of 15 – 24 per cent for men and 20 – 39 per cent for women; the returns to A-Levels relative to GCSEs are between 12 – 20 per cent, and those to holding GCSEs relative to having no qualifications are between 8 – 26 per cent (Blundell, *et al.*, 1999, 2000, 2005; Dearden, 1999b; Dearden, *et al.*, 2002b; Dickerson and Vignoles, 2007; Walker and Zhu, 2001, 2003). As well as to formal qualifications, there is some evidence of earnings returns to basic numeracy and literacy (Bynner and Parsons, 2005; Dearden, *et al.*, 2001, 2002b; McIntosh and Vignoles, 2001) that have remained stable across cohorts (Vignoles, *et al.*, 2010). Therefore, there is clear evidence of sizeable returns to even basic educational attainment in the form of higher earnings when employed, consistent with human capital theory. Raising levels of numeracy and

literacy, and generally improving skills and qualification levels among the least skilled, will increase their earnings relative to the more highly skilled.

There is less robust evidence about the returns to vocational qualifications, however, particularly NVQ2 (Dearden, *et al.*, 2002b, 2004b; Dickerson, 2005; Dickerson and Vignoles, 2007; Garrett, *et al.*, 2010; Greenwood, *et al.*, 2007; McIntosh, 2006; Powdthavee and Vignoles, 2006). The general consensus is that the rate of return received varies across qualification type, population subgroups, industries and occupations (Dearden, *et al.*, 2004a,b; De Coulon and Vignoles, 2008; Garrett, *et al.*, 2010; Greenwood, *et al.*, 2007; Powdthavee and Vignoles, 2006). In particular, NVQ2 qualifications receive greater returns when delivered via the employer (Dearden, *et al.*, 2004a, b; Jenkins, *et al.*, 2007; McIntosh and Garrett, 2009), and if acquired below the age of 25 (Jenkins, *et al.*, 2007). Higher returns to NVQ2 qualifications, of around 10 per cent, are also found when comparing workers within the same industry or occupation (McIntosh and Garrett, 2009).

The mixed evidence regarding returns to Level 2 vocational qualifications may be of concern given policy emphasis on achieving such levels in literacy and numeracy. At the same time, Level 2 is seen as a gateway to further qualifications – and in particular to Level 3 or higher – where returns are higher, and evidence suggests that achieving an NVQ2 is associated with a higher probability of gaining another qualification later (De Coulon and Vignoles, 2008; HM Treasury, *et al.*, 2004). Perhaps of most relevance here, Dearden *et al.* (2004b) find that individuals with no other qualifications have higher returns to NVQ2 than those who already have a Level 1 qualification, and that the benefits to NVQ2 receipt also seem to be larger for low ability individuals (where ability is assessed based on tests taken at ages 5 and 10). Hence the rewards to Level 2 qualifications are largest among those we might expect to be at the highest risk of poverty and low income – those with low ability and no qualifications.

There is also mixed evidence about the returns to later-life educational attainment more generally. Blanden *et al.* (2010) conclude that men and women who acquire any formal qualification after entry into the labour market experience a 20 per cent increase in hourly earnings ten years after gaining the qualification. Other studies, however, suggest acquiring formal qualifications in later-life has little measurable impact on wages (Jenkins, *et al.*, 2003; Wolf, *et al.*, 2006). Returns to employer-provided or vocational training of the order of 5 per cent relative to not undertaking such training have been found (Feinstein, *et al.*, 2004). Furthermore, evidence finds that returns to training seem to persist across employers but decline over time – perhaps due to the accelerated pace of technological change – which suggests vocational training needs to be renewed

to retain the benefits (Arulampalam, *et al.*, 1997; Blundell, *et al.*, 1996; OECD, 2004). Although the wage returns to employer-provided training are relatively small, evidence suggests that it can have a large impact on worker productivity (Dearden, *et al.*, 2000).

This evidence is generally supportive of human capital theory – acquiring education and skills is rewarded through both more stable employment and a smaller risk of unemployment, and higher earnings when employed. In particular, such returns are found even for low level skills and qualifications levels, and for basic numeracy and literacy skills. This suggests that raising education levels among the least skilled will increase their employment stability and relative earnings and so reduce income inequality and poverty.

Signalling and ability bias

However, all people are unlikely to gain equally from education. More motivated and able people may choose to remain in education longer and attain higher qualifications than less motivated and able people. Some of the returns from education may even be caused by people signalling their productivity to potential employers. The evidence that employment and earnings are positively related to education is robust, but the difficulty lies in assigning causality as important variables that are related both with labour market outcomes and education (such as family background and ability) are typically not available. Various methods have been used to examine this, including adding measures of ability to the models or adopting more refined statistical approaches. The latter, for example, exploit variations across individuals in dates of birth or changes in school leaving age so that the differences in school leaving age are not due to personal choices (Angrist and Krueger, 1991; Oreopolous, 2006; Walker and Zhu, 2003), or data on siblings or twins who have the same genes and share family background but have different educational attainment and wages (Ashenfelter and Rouse, 1998). Others use possible connection between geographical proximity of colleges to individuals and their educational attainment (Card, 1999).

Results from UK studies indicate that correcting for differences in ability and family background is important and reduces returns to education at all levels, although returns remain substantial and significant (Blundell, *et al.*, 2005; Dearden, 1999a,b; Dearden, *et al.*, 2002b; Harmon, *et al.*, 2000). The general conclusion is that although biases caused by differences in ability levels and the costs of acquiring education may over-inflate the estimated impact of educational attainment on employment and earnings, this is cancelled out by problems to do with accurately identifying educational outcomes and earnings in survey data which tend to reduce the impact of education on earnings (Dearden, 1999a, b).

Chevalier, *et al.* (2004), Oreopolous (2006) and Walker and Zhu (2003) use the change in school leaving age from 15 to 16 in England and Wales in 1973 as a natural experiment that affects the schooling individuals receive but is independent of their inherent ability. They find little evidence to support signalling theory and instead suggest that education does enhance productivity, consistent with human capital theory (see also Dickson, 2009; Harmon, *et al.*, 2000; Harmon and Walker, 1995, 1999, 2000). UK studies of twins are rare although Bonjour *et al.* (2003) use a sample of UK twins and find little evidence of any bias. Therefore, the evidence favours a productivity-enhancing impact of education levels, consistent with human capital theory. Raising education levels among the low-skilled will increase their employment propensities and earnings when in work relative to the more highly skilled, reducing income inequality and poverty.

However, there is evidence that the impacts on earnings of employer-provided or vocational training are more affected by potential biases. For example, earnings gains to employer-provided or vocational training of the order of 5 per cent relative to not undertaking such training have been found (Feinstein, *et al.*, 2004). However, this study also concludes that workers who did not receive training would not have gained higher wages from the training had they done so. This is because workers who firms choose to train are not representative of all workers, and instead firms choose to train those most likely to gain from training. The implications are that low productivity and low ability workers are unlikely to receive earnings gains from employer-provided training while their more able counterparts will. Hence the widespread provision of such training may in fact increase earnings differences between low and medium-ability workers, and raise income inequality and poverty.

There is other evidence that the impacts of education on earnings are not equal for all individuals. For example, returns to education are greater at the top of the wage distribution than at the bottom, and hence more able, more motivated workers receive greater benefits from acquiring qualifications than the less able and less motivated (Walker and Zhu, 2001). This is inconsistent with standard human capital theory where wages depend on skills and the return to these skills grows over time (Lemieux, 2006). It suggests that education has a bigger impact on the more able than the less able and that ability and education are therefore complements (Walker and Zhu, 2001). Less able workers (who are likely to be most disadvantaged) receive smaller earnings gains than more able workers from acquiring skills and qualifications, although they still receive positive returns. Hence a policy that focuses on raising the skill levels of the least skilled (and

hence less able) should still increase their earnings relative to higher skilled workers and so reduce income inequality and poverty.

Dual labour market theory

There is evidence consistent with dual labour market theory. For example, although we have already documented that entering work is an important factor in escaping poverty, an increasing proportion of poor people are in work. This suggests that employment has become a less secure means of exiting poverty (Adelman, *et al.*, 2003; Kemp, *et al.*, 2004; McKnight, 2002; McQuaid, *et al.*, 2010). Evidence suggests a large proportion of the UK working population is in peripheral or unstable labour markets characterised by low pay and short-term contractual arrangements, which increases their chances of experiencing poverty and material deprivation (Cappellari and Jenkins, 2008; Shildrick, *et al.*, 2010; Tomlinson and Walker, 2010). Only one third of individuals in persistent low income lived in workless households (DWP, 2009), suggesting that the majority of low income households have some contact with the labour market. One third of families who move into work do not escape poverty, and a significant proportion of those that do end up back in poverty (Browne and Paull, 2010; Ray, *et al.*, 2010). In-work poverty is made a more serious problem by low, and falling, earnings mobility which makes it more difficult for people to move out of low pay over time (Dickens, 1999; Machin, 1998). Persistence in low pay is not only related to the characteristics of workers but also to experiencing low pay previously (Stewart and Swaffield, 1999). Therefore, low paid jobs do not act as stepping stones to better paid jobs and instead result in a low pay no pay cycle, consistent with dual labour market theory (Cappellari and Jenkins, 2008; Dickens, 1999; Ray, *et al.*, 2010; Shildrick, *et al.*, 2010; Stewart, 1999; Stewart and Swaffield, 1999).

Moving from unstable employment into secure, stable jobs is made difficult because of the recruitment process. For example, recent relevant experience, skills and references are important in gaining job interviews (Atkinson, *et al.*, 1996; Belt and Richardson, 2005; Devins and Hogarth, 2005; Newton, *et al.*, 2005), and this hinders movement between secondary and primary labour market sectors. McQuaid and Lindsay (2002, 2005) refer to an 'employability gap' that relates to a lack of recent work experience and the effects of social exclusion associated with unemployment and marginal employment. Evidence suggests that having networks of people in employment affects the ability of an individual to hear about and be recommended for a job (Atkinson, *et al.*, 1996; Newton, *et al.*, 2005; Wright-Brown and Konrad, 2001), so people in the secondary sector need networks in the primary sector in order to access better jobs. This suggests that raising skill levels may not be sufficient in matching low

skilled workers with stable, high wage employment and to bring them out of poverty and low income. Other mechanisms may be necessary to raise the labour market and job search awareness of low skilled people in poor households, or to encourage firms to employ workers with a history of unemployment or of employment in unstable, unskilled jobs.

The demand for skills

To what extent does evidence suggest that the demand for highly skilled workers is keeping up with the increase in supply resulting from the recent expansion of education? Since the late 1970s, a period of large increases in educational attainment, the wages of highly educated workers have increased relative to those of the less educated (resulting in growing wage and income inequality) and highly educated workers have accounted for an increasing proportion of employment (Machin, 2008). This suggests that technical change and the demand for highly skilled workers have absorbed the increase in supply. Machin and van Reenen (1998) show that in the 1970s and 1980s demand shifted more quickly towards skilled workers in more technologically advanced industries.

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). Until recently the average returns to education have been little affected by the expansion of education, and so demand for skilled labour has increased as fast as its supply (Dearden, *et al.*, 2002b; Dearden, *et al.*, 2004a; Dickerson, 2005; McIntosh, 2006; Trostel, *et al.*, 2002). This is consistent with the policy perspective that the supply of high skill jobs is not a problem (DWP and DIUS, 2008). However, more recent studies provide evidence of declining wage benefits to university degrees and to GCSEs, suggesting that the expansion in education is reducing their value for new cohorts (McIntosh, 2006; O'Leary and Sloane, 2005; Walker and Zhu, 2008).

There is also evidence that the highly educated are not always employed in high skill jobs. Studies suggest that as many as 45 per cent of UK graduates were in 'non mainstream' graduate jobs consistent with a growing literature that argues that a large proportion of employees are over-qualified for the jobs they do (Alpin, *et al.*, 1998; Borghans and de Grip, 2000; Mason, 1996; Sloane, 2003; Thompson, 2010). Dolton and Vignoles (2000) found that 38 per cent of graduates were not in graduate jobs in their first job and 30 per cent remained in non-graduate jobs six years later, suggesting that this persists (see also Battu, *et al.*, 1999; Dolton and Silles, 2003; Green, *et al.*, 2000).

Early evidence suggests that despite the expansion in education the proportion of graduates in non-graduate jobs did not increase in the 1990s (Battu, *et al.*, 2000; Groot and Maassen van den Brink, 2000), although more recent evidence suggests that it has (Chevalier and Lindley, 2009; Green and Zhu, 2010). Green and Zhu (2010) distinguish between graduates employed in a non-graduate job but fully utilising their skills, and graduates employed in a non-graduate job and not fully utilising their skills. They report a large growth in the former group in recent years, but that the latter remained stable at less than 10 per cent of graduates. Green and McIntosh (2007) found that less than half of employees who are not in appropriate level jobs report having skills and abilities that they are not using in their work. This suggests that graduates differ in unobservable factors such as motivation and inherent ability (Chevalier, 2003; Green and McIntosh, 2007). Some graduates develop qualities that make them suitable for a graduate job whereas others lack these skills (Chevalier, 2000; Chevalier and Lindley, 2009; Green and Zhu, 2010).

The large proportion of graduates who are less able to find graduate-level employment could explain the growing dispersion in the returns to a degree reported in some studies (Green and Zhu, 2010; Harmon, *et al.*, 2000; Martins and Pereira, 2004; Walker and Zhu, 2003). While graduates in graduate jobs continue to benefit from high earnings, those in non-graduate jobs do not. This results in growing wage and income inequality among graduates (Green and Zhu, 2010). Research suggests that having excess education for a particular job has a positive effect on wages compared to matched people working in the same job – which suggests that there are some productivity enhancing benefits to acquiring education. However, there is a wage penalty to excess education relative to people with same education who are correctly placed (Brynin and Longhi, 2009; Chevalier and Lindley, 2009; Dolton and Vignoles, 2000; Rubb, 2003). The size of the earnings penalty to having excess education is between 10 – 25 per cent relative to those who are matched to a job at their own level (Chevalier, 2000; Dolton and Vignoles, 2000; McGuinness, 2006; Sloane, 2003). Dolton and Silles (2003) find that these differences persist and indeed grow across the career, and there is evidence that they have increased in recent years to as much as 36 per cent (Green and Zhu, 2010).

This evidence indicates that considerable levels of earnings and income inequality would exist even if the population consisted of only highly skilled individuals who on average receive high wages (Martins and Pereira, 2004). It also indicates the need to ensure that the policy focus remains 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 evidence suggests that an increasing proportion of graduates are employed in non-graduate jobs, and therefore that they do displace less qualified workers. 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 will exacerbate poverty and income inequality further. In addition, the increased earnings dispersion within education levels may raise the perceived financial risk of participating in higher education and reduce enrolment (Charles and Luoh, 2003), making it increasingly difficult to meet government targets for greater higher education participation (Green and Zhu, 2010). However, at the same time it is important to ensure that the growth in supply of highly skilled workers keeps pace with growth in demand. The alternative is that the wage returns to high skills increase relative to those for low skills, widening the wage structure and exacerbating inequality. This has been a major contributor to the growth in wage inequality in the US since 1980, and has also contributed to wage inequality in Britain (Goldin and Katz, 2007; Machin, 2008).

Macro-economic growth models

Our discussion until now has focused mostly on evidence of the private returns to skills and education, examining its impact on individuals and their position in the employment, earnings and income distribution. Private returns may exceed social returns if, for example, qualifications are valued in the labour market because they signal ability rather than because they increase productivity. Social returns may exceed private returns either because of externalities – such as that working with highly skilled individuals increases the productivity of less skilled workers – or because education plays a role as a filtering system which allows a more efficient matching of workers to jobs. This improvement in matching could raise overall productivity without workers receiving higher earnings (Temple, 2001).

A relatively simple way to assess this is to compare the economic performance of countries with different levels of educational provision while controlling for other factors. Several studies report a substantial impact of education on growth, but most are based on large samples of developing countries (Barro and Sala-i-Martin, 1995; Gemmell, 1997; Hanushek and Kim, 1995; Temple, 1999). Studies that focus more exclusively on developed countries also find associations between human capital and economic growth. OECD evidence suggests that countries that expanded their higher education more rapidly during the 1960s experienced faster growth, and that differences in educational attainment account for most of the output variation across OECD countries (Bassanini and Scarpetta, 2001; de la Fuente and Domenech, 2006; Engelbrecht, 1997; Hanushek and Woessman, 2010; Mankiw, *et al.*, 1992). Thus it has become

harder to argue that the private rates of return estimated from micro-data reflect only signalling effects (Sianesi and Van Reenen, 2003). There is also evidence of positive spillover effects of education, in that low skilled workers receive positive wage returns to working in regions with a high proportion of highly skilled workers (Brynin and Longhi, 2009).

However, few studies offer much direct insight into the position of the UK. Exceptions are Jenkins (1995) and Bell *et al.* (2005). Jenkins (1995) provides evidence covering 1971 to 1992 suggesting that a one percentage point increase in the proportion of workers with higher qualifications raised annual output in the UK by between 0.4 per cent and 0.6 per cent, although results were sensitive to the measure of educational quality used. Bell *et al.* (2005) conclude that improvements in skills accounts for over 50 per cent of previously unexplained economic growth. Hence the general conclusions from macro-economic studies are that improvements in human capital levels do have genuine productivity enhancing impacts which are likely to affect national wealth and incomes, and therefore reduce poverty.

Reconciling the evidence

What are the implications of this evidence for the relationships between skills, employment, income inequality and poverty and the likely impact on inequality and poverty of improving skills? The general pattern that emerges is that educational and skill attainment has a major impact on both employment and earnings, even at the bottom of the skills distribution. Furthermore, low skilled workers receive earnings benefits to working with highly skilled workers. Hence raising basic literacy and numeracy and increasing the education levels of the least skilled will improve their labour market productivity, with beneficial impacts on their employment stability and earnings. While this is consistent with human capital theory, there is also evidence that unobserved personality characteristics (such as motivation and inherent ability) may result in the estimated impacts of skills and qualifications being over-stated and exaggerating the predicted falls in inequality and poverty that result from skill improvements. Nevertheless, evidence suggests that policies which raise the skill levels of the least educated should raise their productivity and consequently their incomes relative to the more highly educated, which narrows the income distribution and reduces income inequality and poverty.

This picture is complicated by two other factors. The first is the rising proportion of poor families that have income from employment, which is consistent with dual labour market theories. This is partly due to a combination of low earnings and household employment patterns – a single earner within a family may not be

sufficient to raise the family out of poverty. There is an increasing trend within the UK for employment to be polarised across households, with a growth in both workless households and dual-earner households while the proportion of single-earner households has fallen (Gregg, *et al.*, 2010). A further implication is that it is not just access to employment that alleviates income inequality and poverty, but access to stable and secure employment is also important. Again, evidence suggests that enhancing skills and educational attainment among those in poor households will contribute to providing access to stable employment, as having just basic literacy and numeracy reduces the probability of job loss and unemployment. However, it is important to also improve more generic skills associated with labour market awareness and developing social networks that may be lacking among the most disadvantaged due to prolonged unemployment or economic inactivity. Evidence suggests such skills are important in facilitating successful job searches, although there may be structural barriers preventing labour market progression (e.g. glass ceilings, discrimination, the importance of social and business networks) that improving skill and qualification levels may be insufficient to overcome.

The second concerns evidence that the impacts of educational attainment on earnings are becoming increasingly dispersed – particular individuals benefit more in terms of earnings from acquiring skills than others. The literature suggests that this is at least partly caused by the fact that as education expands and average educational attainment increases, the average inherent ability of any individual achieving a particular level of education falls. For example, the increase in access to university has widened the ability distribution of university graduates, and this has resulted in graduates being employed in a wider variety of jobs with different earnings distributions. The implications of extending this pattern across the whole qualification distribution are 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 on 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 which will exacerbate poverty and income inequality.

A framework for projecting the impact of skills on income and poverty

The aim of the second stage of this research (see Taylor, *et al.*, 2012, forthcoming) is to model the likely impact of the changing distribution of skills on income inequality and poverty in the UK. One approach would be to directly model the probability of individuals being in poverty, and use the results to simulate poverty rates given the new distribution of skills – the methodology successfully adopted by Dickerson and Lindley (2008). However, this does not consider the direct impacts of skills on employment and earnings. We propose to develop a more complete modelling framework that explicitly identifies the impact of skills on employment and earnings, and use this as a basis for assessing how the changing distribution of skills in the UK workforce will affect poverty and income inequality.

The evidence reviewed in this paper indicates that to project the impact of a changing distribution of skills on income inequality and poverty requires accurately identifying the impact of skills on employment and earnings conditional on employment by:

- adjusting for the effects of other characteristics of individuals;
- adjusting for unobserved personality characteristics (such as motivation and ability);
- incorporating the costs of acquiring skills; and
- incorporating the changing supply of qualifications.

There are two inter-related considerations in developing such a framework. The first is the nature of the data necessary to allow this to be achieved, and the second is the model itself. To accurately project the impact of changing skills on income inequality and poverty requires information on:

- individuals' skill level and educational attainment;
- individuals' incomes by source so that we can separately identify labour market earnings, investment income, and benefit income;
- individuals' employment status; and

- household composition, to allow us to aggregate individual incomes within households and construct a measure of household income on which to assess income inequality and poverty.

In addition, the review of theories and evidence indicate that to accurately estimate the impact of skills and qualifications on employment and earnings requires information on:

- other individual and family background characteristics that influence employment and earnings; and
- the distribution of skills in the labour market more generally, to indicate the supply of workers with each skill level and to capture how this feeds back into employment and earnings outcomes within each skill level.

Few available datasets meet all these requirements. The Family Resources Survey contains detailed information on incomes by source, but lacks important information on educational attainment. The Labour Force Survey (LFS) contains information on earnings, skills and household composition, but lacks data on incomes from other sources. We propose to use data from the British Household Panel Survey (BHPS).

The BHPS provides data on the same nationally representative sample of about 10,000 individuals and the households in which they live on an annual basis from 1991 to 2008. These data have several advantages over other potential sources – (i) it collects detailed information from individuals on both labour market earnings and on income from other sources; (ii) it collects this information from all adults in each household sampled and details of household composition; (iii) it collects detailed information on educational attainment and qualifications held; (iv) it contains booster samples from Scotland, Wales and Northern Ireland which allows country-specific analysis; (v) it collects a wide range of other contextual information on individuals and their families to allow robust estimation of the impact of skills and qualifications on earnings and employment; and (vi) its panel nature facilitates the use of statistical models that also incorporate individual-specific unobserved factors that do not vary over time, such as personality traits (innate ability, motivation, persistence, etc.) that have been shown to be important in accurately estimating the impact of education on employment and earnings. (Note that the sample sizes in the BHPS are insufficient to allow separate analysis by for example, ethnicity or region of residence, although we can capture differences in employment and earnings by ethnic background.) Ideally we would also like to account for the impact of the supply of skills in a

region on employment and wages. We therefore matched the BHPS with data from the LFS on the distribution of skills and qualifications within each region each year, and included these in our models. However, when doing this we encountered problems of model over-specification, where the coefficients of interest became large and imprecisely estimated due to a lack of variation in the distribution of skills within regions over time. We therefore chose not to pursue this approach (see Taylor *et al.* 2012, forthcoming, for further details.)

The modelling framework itself needs to account for:

- the interactions between earnings, income and the tax-benefit system;
- the fact that skills, qualifications and earnings relate to individuals but poverty and income inequality are typically measured at the household level and so are influenced by household composition; and
- unobserved personality characteristics (such as motivation and inherent ability) which may be associated with educational attainment, employment and earnings, and if ignored result in exaggerating the role of skills.

The aim is to model the impact of future changes to the distribution of skills and qualifications on the distribution of net household income, which is typically used to estimate income inequality and poverty. Incorporating these into a single comprehensive framework would involve developing a dynamic general equilibrium model of employment that (i) allows for educational attainment to be determined by the costs of schooling, inherent ability and expected future wages; that (ii) incorporates the structure of the tax-benefit system; and (iii) allows for equilibrium effects on wages. Examples of these include Keane and Wolpin (1997), Eckstein and Wolpin (1999), Heckman *et al.* (1998, 2008), Lee and Wolpin (2006) and Buchinsky and Lelie (2010). This approach is clearly outside the scope of the current project and also requires very strong assumptions, for example about the way people behave and the operation of capital markets, which may not be plausible. Instead we develop a simpler approach based on human capital theory in which we allow for some feedback effects, and which requires panel data for estimation. Our framework consists of five steps.

Step One

The first step is to derive estimates of the impacts of skills on both employment and gross earnings from employment, as it is largely through these relationships that the distribution of skills affects poverty and income inequality. Both theory and evidence indicates that the educational attributes of an individual are

important determinants of their employment prospects and their earnings conditional on employment, and therefore we directly model the impact of qualifications on employment and earnings. The review of the literature has also highlighted the importance of conditioning on other individual and household characteristics which may bias the estimates (such as experience, family background and unobserved personality characteristics) to obtain a more accurate measure of the causal impact of skills. Also, it is important to estimate the models separately for men and women to allow for the fact that qualifications (and other characteristics) are known to have different impacts on the employment and earnings of men and women.

Estimation of these models will initially provide information on the impact of skill and qualification levels on the propensity of individuals to be employed, adjusting for a range of other individual and household characteristics and unobserved personality traits. The latter are likely to be important given that more motivated, able people are more likely to both attain higher qualifications and to be in work, and so omitting this component would lead to over-estimating the impact of skills on employment. The resulting estimates can then be used to predict each individual's propensity to be employed given any projected skills distribution. We estimate random effects models of employment and earnings which incorporate unobserved individual-specific traits such as ability and motivation. Typically such models assume that these unobserved factors are unrelated to observed factors such as skill level, which is clearly unrealistic in the current context. We will therefore allow for correlation between the unobserved individual-specific factors and observed time-varying covariates by including as regressors the individual means of the time-varying covariates over time (Chamberlain, 1984; Mundlak, 1978). While this will not completely deal with the problem of potential biases caused by unobserved ability, it is preferable to ignoring the problem completely.

The earnings models explicitly allow for correlation between earnings, educational attainment and the cost of education by including measures of family background such as parental occupation when the BHPS respondent was aged 14. Parental education is likely to be correlated with household income (which for most of the BHPS sample is unknown at the time of schooling), attitudes to education, and employment and social relations, which we expect to be associated with children's costs of education. The costs of education are likely to be lower for children with more privileged parents, and these children may also earn more at any level of schooling (Altonji and Dunn, 1996; Card, 1999; Ermisch and Pronzato, 2010). Highly educated parents are also likely to have more resources and stronger tastes for schooling and their children may inherit this. Again, in estimating the impact of education on earnings it is important to allow

for unobserved personality traits as although higher earnings may be caused by higher education, individuals with greater ability and/or motivation are likely both to acquire more education and have higher earnings. This artificially inflates the estimated impact of education on earnings.

Step Two

The second step is to combine predictions from the employment and earnings models to generate forecasts of gross earnings from employment for each individual. Using the estimates from these models, we can weight predicted earnings by the probability of employment to generate forecasts of earnings for each individual given any projected skills distribution. Doing this for all individuals in the sample reproduces a gross earnings distribution relating to the new distribution of skills in the economy. We can then add the predicted gross earnings of each individual in the sample to their incomes from rents and investments (unearned, non-means tested income) to generate an estimate of total non-means tested gross personal income. (Our modelling framework allows us to predict employment and earnings at a particular point in time for a given distribution of qualifications. While this does not explicitly address issues of job stability and turnover, people in less stable employment are less likely to be observed in the data as being in work. Consequently the earnings of such people will be allocated lower weights at any given qualification level, producing lower predicted earnings. Hence our strategy also to some extent addresses issues related to dual and segmented labour markets).

Step Three

As the BHPS collects information from all adults in the sampled households, these predicted gross personal incomes can be aggregated within households to give an estimated gross household non-means tested income. 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. This concept of income before taxes and means-tested benefits is important, because it gives the individual's capacity to contribute to society through taxes or his/her need for support through means-tested benefits. Since the tax-benefit system of 2020 is unknown (and may change radically due to current policy reforms), projected original incomes are the basis for any simulation of net incomes under alternative assumptions about future policy. We will analyse the projected distribution of income and compare it with the present distribution.

Step Four

The next stage 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 is necessary in order to allow for the redistributive effects of the taxation of incomes 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. The construction of the net income adjustments is achieved by a simple empirical approximation to the gross-net transformation produced by the current tax-benefit system, within each of a number of relatively homogeneous population groups (e.g. single-earner families with children, two-earner couples with children, etc.). 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. 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 other important contextual information. Constructing an alternative microsimulation routine which can incorporate either panel data or richer cross-sectional data is not feasible within the timescale or budget of the current project.

Step Five

The final step is to allow for projected changes in household size and structure in 2020. We do this by weighting the predicted poverty rates using projections on household size and structure from the Government Actuary's Department and the Department of Communities and Local Government (see Taylor et al. 2012, forthcoming, for details). This gives a poverty rate that reflects skills, employment and household structure projections for 2020.

There are a number of issues to bear in mind in this process. One factor to consider is that the rates of return to education and qualifications are being estimated by looking at the current labour market earnings of individuals who acquired different levels of education in the past. This will not necessarily predict the future labour market value of the education acquired today or in future years (Powdthavee and Vignoles, 2006). Another issue is that whatever education does for income and earnings growth it is unlikely to do so quickly. Changes to

compulsory educational provision will typically only affect new labour market entrants, and these new entrants are only a small fraction of all those currently employed. Therefore, the consequences of a shift in compulsory education policy will emerge fully only over several decades (Temple, 2001). Changes to post-compulsory education and workforce development may however have a more immediate effect addressing the 80 per cent of the 2020 workforce that is already beyond the age of compulsory education, and 50 per cent over the age of 25 (BIS, 2010; DWP and DIUS, 2007).

Summary and conclusions

Continued investment in promoting skills and education as a means of both maintaining and increasing global competitiveness and of reducing income inequality and poverty is made on the assumption that enhancing people's skills improves their employment prospects and productivity. This paper has provided a review of current theories linking skills, qualifications, employment, income and poverty, and summarised the evidence as it relates to the British context. Drawing on these theories and evidence, we have developed a simple framework that permits the estimated impact on the income distribution (and income inequality and poverty) of projected changes to the distribution of skills and qualifications.

The predominant relevant theory is that of human capital, which hypothesises that education has genuine productivity-enhancing effects which results in both private and social returns. Identifying these effects is complicated by ability biases, schooling choices based on unobserved personality characteristics that also affect earnings and employment outcomes, and a lack of information on the costs of schooling. The general consensus from microeconomic evidence however is that investment in education does genuinely enhance productivity, resulting in higher employment and earnings and less exposure to low income and poverty. This evidence is supported by more recent macroeconomic studies that relate changes over time in economic growth to levels of human capital in the economy.

The recent expansion in education has raised concerns about the potential over-supply of highly skilled workers. The skill-biased technical change literature suggests that demand has shifted towards skilled workers, and that demand has increased at a similar pace to supply. However there is growing evidence that over-qualification is becoming more widespread among the highly educated, with a large proportion of graduates being employed in non-graduate jobs. This incurs a substantial wage penalty relative to working in a graduate job, and may be contributing to the growing dispersion in graduate wages. Also as participation in further and higher education grows and average educational attainment increases the average inherent ability of any individual achieving a particular level of education falls. Hence the wages associated with having each level of qualification vary increasingly across individuals, and such dispersion makes it more difficult to accurately identify the impact of the changing distribution of skills on income.

Access to stable and secure employment is also important, and evidence suggests that enhancing skills and educational attainment among those in poor households will improve access to stable employment, as having just basic literacy and numeracy reduces the probability of job loss and unemployment. However, it is important to also improve more generic skills associated with labour market awareness and developing social networks that may be lacking among the most disadvantaged due to prolonged unemployment or economic inactivity. The next stage of this research involves using the framework outlined here to examine the probable effects on poverty and inequality of meeting a range of projected skills distributions in 2020, as outlined in UKCES (2010).

References

- Acemoglu, D. (1996) 'A microfoundation for social increasing returns in human capital accumulation' *Quarterly Journal of Economics*, 111, 799–804
- Acemoglu, D. (1998) 'Why do new technologies complement skills? Directed technical change and wage inequality' *Quarterly Journal of Economics*, 113 (4), 1055–1089
- Acemoglu, D. (2002) 'Technical change, inequality and the labor market' *Journal of Economic Literature*, 40 (1), 7–72
- Adams, T. L. and Demaiter, E.I. (2010) 'Skills, education and credentials in the new economy: the case of information technology workers' *Work, Employment and Society*, 22(2), 351–362
- Adelman, L., Middleton, S. and Ashworth, K. (2003) *Britain's poorest children: Severe and persistent poverty and social exclusion*, Save the Children: London
- Alpin, C., Shackleton, J. and Walsh, S. (1998) 'Over- and undereducation in the UK graduate labour market' *Studies in Higher Education*, 23 (1), 17–34
- Altonji, J.G. and Dunn, T.A. (1996) 'The effects of family characteristics on the return to education' *Review of Economics and Statistics*, 78 (4), 692–704
- Angrist, J.D. and Krueger, A.B. (1991) 'Does compulsory school attendance affect schooling and earnings' *Quarterly Journal of Economics*, 106, 979–1014
- Arrow, K. (1973) 'Higher education as a filter' *Journal of Public Economics*, 2, 193–216
- Arulampalam, W., Booth, A. L. and Elias, P. (1997) 'Work-related training and earnings growth for young men in Britain' *Research in Labor Economics*, 16, 119–47
- Arulampalam, W., Booth, A.L. and Taylor, M.P. (2000) 'Unemployment persistence' *Oxford Economic Papers*, 52, 24–50
- Ashenfelter, O. and Rouse, C. (1998) 'Income, schooling, and ability: evidence from a new sample of identical twins' *Quarterly Journal of Economics*, 113, 253–284
- Atkinson, J., Giles, L. and Meager, N. (1996) *Employers, recruitment and the unemployed* Institute for Employment Studies report no. 325
- Barro, R. and Sala-i-Martin, X. (1995) *Economic growth*, McGraw Hill: New York

- Bassanini, A. and Scarpetta, S. (2001) 'Does human capital matter for growth in OECD countries? Evidence from pooled mean-group estimates' OECD Economics Department Working Papers, No. 282
- Battu, H., Belfield, C. and Sloane, P. (1999) 'Overeducation among graduates: a cohort view' *Education Economics*, 7 (1), 21–38
- Battu, H., Belfield, C. and Sloane, P. (2000) 'How well can we measure graduate overeducation and its effects?' *National Institute of Economic Review*, 171, 82–93
- Becker, G. (1962) 'Investment in human capital: a theoretical analysis' *Journal of Political Economy*, 70 (5), 9–49
- Becker, G. (1964) *Human capital: A theoretical and empirical analysis, with special reference to education*, University of Chicago Press: Chicago
- Becker, G. and Chiswick, B. (1966) 'Education and the distribution of earnings' *American Economic Review*, 56 (2), 358–369
- Bell, V., Burriel-Llombart, P. and Jones, J. (2005) 'A quality-adjusted labour input series for the United Kingdom 1975–2002' Bank of England Working Paper 280
- Belt, V. and Richardson, R. (2005) 'Social Labour, employability and social exclusion: Pre-employment training for call centre work' *Urban Studies*, 42 (2), 257–270
- Belzil, C. (2007) 'The return to schooling in structural dynamic models: a survey' *European Economic Review*, 51 (5), 1059–1105
- Belzil, C. and Hansen, J. (2002) 'Unobserved ability and the return to schooling' *Econometrica*, 70, 575–591
- Belzil, C. and Hansen, J. (2007) 'A structural analysis of the correlated random coefficient wage regression' *Journal of Econometrics*, 140 (2), 827–848
- Benabou, R. (1996) 'Heterogeneity, stratification and growth: macroeconomic implications of community structure and school finance' *American Economic Review*, 86, 584–609
- Blanden, J., Buscha, F., Sturgis, P. and Urwin, P. (2010) 'Measuring the returns to lifelong learning' *Centre for the Economics of Education Discussion Paper 110*
- Blaug, M. (1992) 'Where are we now in the economics of education?' in M. Blaug (ed) *The economic value of education: studies in the economics of education*, Edward Elgar: Aldershot

- Blundell, R., Dearden, L., and Meghir, C. (1996) *The determinants of work-related training in Britain*, IFS: London
- 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*, 20 (1), 1–23
- Blundell, R., Dearden, L. Goodman, A. and Reed, H. (2000), 'The returns to higher education in Britain: evidence from a British cohort' *Economic Journal*, 110, F82–F99
- 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*, 168, 473–512
- Böheim, R. and Taylor, M.P. (2002) 'The search for success: do the unemployed find stable employment?' *Labour Economics*, 9, 717–735
- Bonjour, D., Cherkas, L.F., Haskel, J.E., Hawkes, D.D. and Spector, T.D. (2003) 'Returns to education: evidence from U.K. twins' *American Economic Review*, 93 (5), 1799–1812
- Borghans, L. and de Grip, A. (2000) 'The debate in economics about skill utilization' in L. Borghans and A. de Grip (eds) *The overeducated worker? The economics of skill utilization*, Edward Elgar: Cheltenham
- Browne, J. and Paull, G. (2010) *Parent's work entry, progression and retention, and child poverty*, DWP Research Report 626, HMSO: Norwich
- Brynin, M. and Longhi, S. (2007) 'Job competition amongst university graduates' *ISER Working Paper 2007-18*
- Brynin, M. and Longhi, S. (2009) 'Overqualification, major or minor mismatch?' *Economics of Education Review*, 28 114–121
- Buchinsky, M. and Leslie, P. (2010) 'Educational attainment and the changing U.S. wage structure: Dynamic implications of young individuals' choices' *Journal of Labor Economics*, 28 (3), 541–594
- Burchardt, T., Le Grand, J. and Piachaud, D. (2002) 'Degrees of social exclusion: Developing a dynamic measure' in J. Hills, J. Le Grand and D. Piachaud (eds) *Understanding social exclusion*, Oxford University Press: Oxford
- Bynner, J. and Parsons, S. (2005) *New light on literacy and numeracy: results of the literacy and numeracy assessment in the age 34 follow-up of the 1970 cohort*

study (BCS70), National Research and Development Centre for Adult Literacy and Numeracy: London

Calandrino, M. (2003), 'Low income and deprivation in British families: An exploratory analysis of the consistent poverty approach to poverty measurement using data for Great Britain drawn from the Families and Children Survey', Working Paper no. 10, Department for Work and Pensions, London

Cappellari, L. and Jenkins, S. P. (2004) 'Modelling low income transitions' *Journal of Applied Econometrics*, 19 (5), 593–610

Cappellari, L. and Jenkins, S.P. (2008) 'Transitions between unemployment and low pay' in S. Polachek and K. Tatsiramos (eds) *Work, earnings and other aspects of the employment relation*, Research in Labour Economics, 28, JAI Press: Bingley

Card, D. (1999) 'The causal effect of education on earnings' in O. Ashenfelter and D. Card (eds) *The handbook of labor economics* Volume 3, North Holland Elsevier: Amsterdam

Carneiro, P., Hansen, K. and Heckman, J.J. (2003) 'Estimating distributions of treatment effects with an application to the returns to schooling and measurement of the effects of uncertainty on college choice' *International Economic Review*, 44 (2), 361–422

Carneiro, P., Heckman, J.J. and Vytlacil, E.J. (2010) 'Estimating marginal returns to education' NBER Working Paper 16474

Charles, K.K. and Luoh, M.C. (2003) 'Gender differences in completed schooling' *Review of Economics and Statistics*, 85, 559–77

Chevalier, A. (2000) 'Graduate over-education in the UK', Centre for the Economics of Education Discussion Paper 7

Chevalier, A. (2003) 'Measuring over-education' *Economica*, 70 (3), 509–531.

Chevalier, A. and Conlon, G. (2003) 'Does it pay to attend a prestigious university?' IZA Discussion Paper 848

Chevalier, A., Harmon, C., Walker, I. and Zhu, Y. (2004) 'Does education raise productivity or just reflect it?' *Economic Journal*, 114, F499-F517

Chevalier, A. and Lindley, J. (2009), 'Overeducation and the skills of UK graduates' *Journal Of The Royal Statistical Society Series A*, 172 (2), 307–337

Cunha, F., Heckman, J.J. and Navarro, S. (2005) 'Separating uncertainty from heterogeneity in life cycle earnings, The 2004 Hicks Lecture' *Oxford Economic Papers*, 57 (2), 191–261

Darr, A. (2004) 'The Interdependence of Social and Technical Skills in the Sale of Emergent Technology' in C. Warhurst, I. Grugulis and E. Keep (eds), *The skills that matter*, Palgrave: Basingstoke

Dearden, L. (1999a) 'Qualifications and earnings in Britain: how reliable are conventional OLS estimates of the returns to education?' IFS Working Paper W99/7

Dearden, L. (1999b) 'The effects of families and ability on men's education and earnings in Britain' *Labour Economics*, 6, 551–567

Dearden, L., Reed, H. and van Reenen, J. (2000), 'Who gains when workers train? Training and corporate productivity in a panel of British industries', IFS Working Paper 00/04

Dearden, L., McIntosh, S. and Vignoles, A. (2001), *Basic skills, soft skills and labour market outcomes: secondary analysis of the NCDS*, DfEE Research Report No. 250

Dearden, L., Ferri, J. and Meghir, C. (2002a) 'The effect of school quality on educational attainment and wages' *Review of Economics and Statistics*, 84 (1), 1–20

Dearden, L., McIntosh, S., Myck, M. and Vignoles, A. (2002b) 'The returns to academic and vocational qualifications in Britain' *Bulletin of Economic Research*, 54 (3), 249–274

Dearden, L., McGranahan, L. and Sianesi, B. (2004a) 'Returns to education for the 'marginal learner': Evidence from the BCS70' Centre for Economics of Education Discussion Paper No. 45

Dearden, L., McGranahan, L. and Sianesi, B. (2004b) 'An in-depth analysis of the returns to National Vocational Qualifications obtained at Level 2.' Centre for the Economics of Education Discussion Paper No. 46

De Coulon, A. and Vignoles, A. (2008) 'An analysis of the benefit of NVQ2 qualifications acquired at age 26-34' Centre for the Economics of Education Discussion Paper 106

de la Fuente, A. And Doménech, R. (2000) 'Human capital in growth regressions: how much difference does data quality make?', *Journal of the European Economic Association*, 4 (1), 1–36

- Department for Business, Innovation and Skills (2010), *Skills for sustainable growth: Strategy Document*, BIS: London
- Department for Education and Skills and Department for Work and Pensions (2007) *DFES and DWP: A shared evidence base: The role of skills in the labour market*, HMSO: Norwich
- Department for Work and Pensions (2009) *Low income dynamics*, DWP: London
- Department for Work and Pensions (2010) *Households Below Average Income: An analysis of the income distribution 1994/95 – 2008/09*, DWP: London
- Department for Work and Pensions and Department for Innovation, Universities and Skills (2007) *Opportunity, employment and progression: Making skills work*, HMSO: Norwich
- Department for Work and Pensions and Department for Innovation, Universities and Skills (2008) *Work skills*, HMSO: Norwich
- Devicienti, F. (2001) 'Poverty Persistence in Britain: A Multivariate Analysis Using the BHPS 1991–1997' ISER Working Paper 2001-02
- Devins, D. and Hogarth, T. (2005) 'Employing the unemployed: Some case study evidence on the role and practice of employers' *Urban Studies*, 42 (2), 245–256
- Dewson, S., Eccles, J., Tackey, N.D. and Jackson, A. (2000), *Guide to measuring soft outcomes and distance travelled*, The Institute for Employment Studies, Brighton
- Dickens, R. (1999) 'Wage mobility in Britain' in J. Wadsworth and P. Gregg (eds) *The state of working Britain*, Manchester University Press: Manchester
- Dickerson, A. (2005) *A study on rates of return to investment in level 3 and higher qualifications*, Department for Trade and Industry
- Dickerson, A. and Vignoles, A. (2007) *The distribution and returns to qualifications in the Sector Skills Councils*, SSSA Research Report 21, Sector Skills Development Agency.
- Dickerson, A. and Lindley, J. (2008) *Parental qualifications and child poverty in 2020*, Joseph Rowntree Foundation: York
- Dickson, M. (2009) 'The causal effect of education on wages revisited' IZA Discussion Paper 4419

Dolton, P. and Vignoles, A. (2000), 'The incidence and effects of overeducation in the UK graduate labour market', *Economics of Education Review*, 19, 179–198

Dolton, P.J. and Silles, M. (2003) 'The determination and consequences of graduate overeducation' in F. Büchel, A. de Grip and A. Mertens (eds), *Overeducation in Europe, current issues in theory and policy*, Edward Elgar: Cheltenham

Duncan, G. and Hoffman, S. (1981) 'The incidence and wage effects of overeducation' *Economics of Education Review*, 1 (1), 75–86

Duncan, G., Paugam, S. and Jacobs, S. (2003) 'Unemployment, poverty and social isolation: is there a vicious circle of social exclusion?' *European Societies*, 5 (1), 1–32

Eckstein, Z. and Wolpin, K. (1999) 'Why youths drop out of high school: The impact of preferences, opportunities and abilities' *Econometrica*, 67 (6), 1295–1339

Engelbrecht, H-J. (1997) 'International R&D spillovers, human capital and productivity in OECD economies: an empirical investigation' *European Economic Review*, 41, 1479–1488

Ermisch, J. and Pronzato, C. (2010), 'Causal effects of parents' education on children's education' ISER working paper 2010-16

Feinstein, L., Galinda-Rueda, F. and Vignoles, A. (2004) 'The labour market impact of adult education and training: a cohort analysis' *Scottish Journal of Political Economy*, 51 (2), 266–280

Freeman, R. (1976) *The overeducated American*, Academic Press: New York

Fuller, A. and Unwin, L. (1999) 'Credentialism, national targets, and the learning society: perspectives on educational attainment in the UK steel industry' *Journal of Education Policy*, 14 (6), 605-617

Gardiner, K. and Hills, J. (1999) 'Policy implications of new data on income mobility' *Economic Journal*, 109 (453), F91–F111

Garrett, R., Campbell, M. and Mason, G. (2010) *The value of skills: an evidence review*, UK Commission for Employment and Skills Evidence Report 22

Gemmell, N. (1997) 'Externalities to higher education: A review of the new growth literature' in National Committee of Inquiry into Higher Education (Dearing Committee), *Higher education in the learning society*, HMSO: Norwich

Glomm, G. and Ravikumar, B. (1992) 'Public vs private investment in human capital: endogenous growth and income inequality' *Journal of Political Economy*, 100, 818–834

Goldin, C. and Katz, L. (2007), 'Long-run changes in the wage structure: narrowing, widening, polarizing' *Brookings Papers on Economic Activity*, 2, 135–165

Gordon, D., Adeleman, L., Ashworth, K., Bradshaw, J., Levitas, R., Middleton, S., Pantazis, C., Patsios, D., Payne, S., Townsend, P. and Williams, J. (2000) *Poverty and social exclusion in Britain*, Joseph Rowntree Foundation: York

Gosling, A., Machin, S. and Meghir, C. (2000) 'The changing distribution of male wages in the UK' *Review of Economic Studies*, 67, 635–666

Green, F., Ashton, D., Burchell, B., Davies, B. and Felstead, A. (2000) 'Are British workers becoming more skilled?' in L. Borghans and A. de Grip (eds) *The overeducated worker? The economics of skill utilization*, Edward Elgar: Cheltenham

Green, F. and McIntosh, S (2007) 'Is there a genuine under-utilisation of skills amongst the over-qualified?' *Applied Economics*, 39 (4), 427–439

Green, F. and Zhu, Y. (2010) 'Overqualification, job dissatisfaction, and increasing dispersion in the returns to graduate education' *Oxford Economic Papers*, 62 (4), 740–763

Greenwood, C., Jenkins, A. and Vignoles, A. (2007) 'The returns to qualifications in England: updating the evidence base on Level 2 and Level 3 vocational qualifications' Centre for the Economics of Education Discussion Paper 89

Gregg, P., Scutella, R. and Wadsworth, J. (2010) 'Why we should (also) Measure Worklessness at the Household Level. Theory and Evidence from the US, Britain, Spain, Germany and Australia', *Journal of Population Economics*, 23 (1), 139–167

Groot, W. and Maassen van den Brink, H. (2000) 'Over-education in the labor market: a meta-analysis' *Economics of Education Review*, 19, 149–58.

Hanushek, E. and Kim, R. (1995) 'Schooling, labor force quality and economic growth' NBER Working Paper 5399

Hanushek, E. and Woessmann, L. (2010) 'How much do educational outcomes matter in OECD countries?' NBER Working Paper 16515

Harkness, S. and Machin, S. (1999) *Graduate earnings in Britain, 1974–95*, DfEE Research Report No. 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

Harmon, C. and Walker, I. (1995) 'Estimates of the economic return to schooling for the United Kingdom' *American Economic Review*, 85 (5), 1278–1286

Harmon, C. and Walker, I. (1999) 'The marginal and average return to schooling in the UK' *European Economic Review*, 43, 879–887

Harmon, C. and Walker, I. (2000) 'The returns to the quantity and quality of education: evidence for men in England and Wales' *Economica*, 67 (265), 19–35

Heckman, J.J. (1998) 'What should be our human capital investment policy?' *Fiscal Studies*, 19, 103–119

Heckman, J.J., Layne-Farrar, A. and Todd, P.E. (1996) 'Human capital pricing equations with an application to estimating the effect of schooling quality on earnings' *Review of Economics and Statistics*, 78 (4), 562–610

Heckman, J.J., Lochner, L.J. and Taber, C. (1998) 'Explaining rising wage inequality: explorations with a dynamic general equilibrium model of earnings with heterogeneous agents' *Review of Economic Dynamics*, 1 (1), 1–58

Heckman, J.J., Lochner, L.J. and Todd, P.E. (2008) 'Earnings functions and rates of return' *Journal of Human Capital*, 2 (1), 1–31

HM Government (2010) *State of the nation report: poverty, worklessness and welfare dependency in the UK*, Cabinet Office: London

HM Treasury, DfES, DWP and DTI (2004), *Skills in the global economy*, HMSO: Norwich

Howarth, C., Kenway, P., Palmer, G. and Street, C. (1998) *Monitoring poverty and social exclusion: Labour's inheritance*, Joseph Rowntree Foundation: York

Jaeger, D. A. and Page, M.E. (1996) 'Degrees matter: New evidence on sheep-skin effects in the returns to education' *Review of Economics and Statistics*, 78 (4), 733–740

Jenkins, A., Vignoles, A., Wolf, A. and Galindo-Rueda, F. (2003) 'The determinants and labour market effects of lifelong learning' *Applied Economics*, 35 (16), 1711–1721

- Jenkins, S.P. (1995) 'Accounting for inequality trends: decomposition analyses for the UK 1971–1986' *Economica*, 62 (245), 29–63
- Jenkins, S.P. (2000) 'Modelling household income dynamics' *Journal of Population Economics*, 13, 529–567
- Jenkins, S.P. and J.A. Rigg (2001) *The dynamics of poverty in Britain*, Department for Work and Pensions Research Report no. 157
- Keane, M.P. and Wolpin, K. (1997) 'The career decisions of young men' *Journal of Political Economy*, 105 (3), 473–522
- Keane, M.P. and Wolpin, K. (2000) 'Eliminating race differences in school attainment and labor market success' *Journal of Labor Economics*, 18 (4), 614–652
- Kemp, P., Bradshaw, J., Dornan, P., Finch, N. and Mayhew, E. (2004) *Routes out of poverty: a research review*, Joseph Rowntree Foundation: York
- Lee, D. (2005) 'An estimable dynamic general equilibrium model of work, schooling and occupational choice' *International Economic Review*, 46 (1), 1–34
- Lee, D. and Wolpin, K. (2006) 'Intersectoral labor mobility and the growth of the service sector' *Econometrica*, 74 (1), 1–46
- Leitch, S. (2006), *Prosperity for all in the global economy – world class skills*, HMSO: Norwich
- Lemieux, T. (2006) 'Postsecondary education and increasing wage inequality' *American Economic Review*, 96 (2), 195–199
- Lloyd, C. and Mayhew, K. (2010) 'Skill: The solution to low wage work?' *Industrial Relations Journal*, 41 (5), 429–445
- Lucas, R. (1988) 'On the mechanics of economic development' *Journal of Monetary Economics*, 22, 3–42
- Machin, S. (1996) 'Wage inequality in the UK' *Oxford Review of Economic Policy*, 12 (1), 47–64
- Machin, S. (1998) 'Intergenerational transmissions of economic status' in J. Hills (ed) *Persistent poverty and lifetime inequality*, Centre for the Analysis of Social Exclusion and HM Treasury

- Machin, S. (2003) 'Wage inequality since 1975' in R. Dickens, P. Gregg and J. Wadsworth (eds) *The labour market under new Labour*, Palgrave Macmillan: Basingstoke
- Machin, S. (2008) 'An appraisal of economic research on changes in wage inequality' *Labour*, 22, 7–26
- Machin, S. and Van Reenen, J. (1998) 'Technology and changes in skill structure: evidence from seven OECD countries' *Quarterly Journal of Economics*, 113, 1215–1244
- Machin, S. and Van Reenen, J. (2007) 'Changes in wage inequality', CEP Special Paper 18
- Mankiw, N.G., Romer, D. and Weil, D. (1992) 'A contribution to the empirics of economic growth' *Quarterly Journal of Economics*, 107, 407-437
- Martins, P. and Pereira, P. (2004) 'Does education reduce wage inequality? Quantile regression evidence from 16 countries' *Labour Economics*, 11, 355–371
- Mason, G. (1996) 'Graduate utilisation in British industry: the initial impact of mass higher education' *National Institute Economic Review*, May, 93-103
- McGuinness, S. (2006) 'Overeducation in the labour market' *Journal of Economic Surveys*, 20, 387–417
- McIntosh, S. (2006) 'Further analysis of the returns to academic and vocational qualifications' *Oxford Bulletin of Economics and Statistics*, 68 (2), 225–251
- McIntosh, S. and Garrett, R. (2009) *The economic value of intermediate vocational education and qualifications*, UK Commission for Employment and Skills Evidence Report 11
- McIntosh, S. and Vignoles, A. (2001) 'Measuring and assessing the impact of basic skills on labour market outcomes' *Oxford Economic Papers*, 53 (3), 453–481
- McKnight, A. (2002) 'Low-paid work: drip-feeding the poor' in J. Hills, J. Le Grand and D. Piachaud (eds) *Understanding social exclusion*. Oxford University Press: Oxford
- McQuaid, R.W., Fuentès, V. and Richard, A. (2010) *How can parents escape from recurrent poverty?* Joseph Rowntree Foundation, York

McQuaid, R.W. and Lindsay, C. (2002) 'The employability gap? Long term unemployment and barriers to work in buoyant labour markets' *Environment and Planning C: Government & Policy*, 20(4), 613–628

McQuaid, R.W. and Lindsay, C. (2005) 'The concept of employability' *Urban Studies*, 42 (2), 197–219

Mincer, J. (1974) *Schooling, experience and earnings*, Columbia University Press: New York

Morrison, C. and Murtin, F. (2010) 'The Kuznets curve of education: A global perspective on education inequalities', Centre for the Economics of Education Discussion Paper 116

Nelson, R. and Phelps, E. (1966) 'Investment in humans, technological diffusion and economic growth' *American Economic Review*, 56, 69–75

Newton, B., Hurstfield, J., Miller, L., Page, R. and Ackroyd, K. (2005) *What employers look for when recruiting the unemployed and the inactive: skills, characteristics and qualifications*, Department for Work and Pensions research report no. 295

O'Leary, N. and Sloane, P. (2005) 'The changing wage return to an undergraduate education in Great Britain' IZA Discussion Paper 1549

Oreopoulos, P. (2006), 'Estimating average and local treatment effects of education when compulsory schooling laws really matter' *American Economic Review*, 96 (1), 152–175

Organisation for Economic Cooperation and Development (2004) *Policy Brief: Lifelong learning*, OECD: Paris

Oxaal, Z. (1997) 'Education and poverty: A gender analysis' BRIDGE Report no. 53, University of Sussex

Oxley, H. (1999) 'Poverty dynamics in four OECD countries' in *Persistent poverty and lifetime inequality, the evidence*, CASE report 5/HM Treasury Occasional Paper No 10. London: LSE and HM Treasury

Palmer, G., Rahman, M. and Kenway, P. (2002) *Monitoring poverty and social exclusion 2002*, Joseph Rowntree Foundation: York

Piore, M.J. (1975) 'Notes for a theory of labour market segmentation' in R.C. Edwards, M. Reich and D.M. Gordon (eds) *Labour market segmentation*, D.C. Heath and Co: Kentucky

- Powdthavee, N. and Vignoles, A. (2006) 'Using Rate of Return Analyses to Understand Sector Skill Needs' Centre for Economics of Education Discussion Paper 70
- Ray, K., Hoggart, L., Vergeris, S. and Taylor, R. (2010), *Better off working? Work, poverty and benefit recycling*, Joseph Rowntree Foundation: York
- Redding, S. (1996) 'Low-skill, low-quality trap: strategic complementarities between human capital and R&D', *Economic Journal*, 106, 458–470
- Reich, M., Gordon, D.M. and Edwards, R.C. (1973) 'Dual labor markets: a theory of labor market segmentation' *American Economic Review*, 63 (2), 359–365
- Rigg, J. and Sefton, T. (2004) 'Income dynamics and the life cycle' Centre for the Analysis of Social Exclusion paper 81
- Romer, P. (1990) 'Endogenous technological change' *Journal of Political Economy*, 98, S71–S102
- Romer, P. (2000) 'Should the government subsidize supply or demand in the market for scientists and engineers?' NBER Working Paper 7723
- Rubb, S. (2003), 'Overeducation in the labor market: a comment and re-analysis of a meta-analysis' *Economics of Education Review*, 22, 621–629
- Ruspini, E. (1998) 'Women and poverty dynamics: the case of Germany and Britain' *Journal of European Social Policy*, 8 (4), 291–316
- Schmitt, J. (1995), 'The changing structure of male earnings in Britain 1974–1988' in R. Freeman and L. Katz (eds) *Differences and changes in wage structures*, University of Chicago Press: Chicago
- Shapiro, J.M. (2006) 'Smart cities: quality of life, productivity and the growth effects of human capital' *Review of Economics and Statistics*, 88 (2), 324–335
- Shildrick, T., MacDonald, R., Webster, C. and Garthwaite, K. (2010) *The low-pay, no-pay cycle: understanding recurrent poverty*, Joseph Rowntree Foundation: York
- Sianesi, B. and Van Reenen, J. (2003) 'The Returns to Education: Macroeconomics' *Journal of Economic Surveys*, 17 (2), 157–200
- Sloane, P.J. (2003) 'Much ado about nothing? What does the overeducation literature really tell us?' in F. Buchel and A. Mertens (eds) *Overeducation In Europe*, Edward Elgar: Cheltenham

- Smith, N. and Middleton, S. (2007) *A review of poverty dynamics research in the UK*, Joseph Rowntree Foundation: York
- Spence, M.A. (1973) 'Job market signalling' *Quarterly Journal of Economics*, 87, 355–375
- Stewart, M. (1999) 'Low pay in Britain' in P. Gregg and J. Wadsworth (eds) *The state of working Britain*. Manchester University Press: Manchester
- Stewart, M. and Swaffield, J. (1999) 'Low pay dynamics and transition probabilities' *Economica*, 66, 23–42
- Taylor, M. (2011) 'Measuring financial capability and its determinants using survey data', *Social Indicators Research*, 102 (2), 297–314
- Taylor, M., Haux, T. and Pudney, S. (2012) *'World class skills' for the UK: What are the implications for poverty and inequality?* Joseph Rowntree Foundation: York. (Forthcoming).
- Temple, J. (1999) 'A positive effect of human capital on growth' *Economics Letters*, 65, 131–134
- Temple, J. (2001) 'Growth effects of education and social capital in the OECD countries' *OECD Economic Studies*, 33, 57-101
- Thompson, J. (2010) *Male and female participation and progression in higher education: further analysis. Part 1: Employment outcomes*, Oxford: Higher Education Policy Institute
- Tomlinson, M. and Walker, R. (2009) *Recurrent poverty: the impact of family and labour market changes*, Joseph Rowntree Foundation: York
- Topel, R. (1999) 'Labor markets and economic growth' in Ashenfelter, O.C. and Card, D. (eds) *Handbook of labor economics*, Volume 3A, North Holland Elsevier: Amsterdam
- Trostel, P., Walker, I. and Woolley, P. (2002) 'Estimates of the economic return to schooling for 28 countries' *Labour Economics*, 9 (1), 1–16
- UK Commission for Employment and Skills (2010), *Ambition 2020: World class skills and jobs for the UK*, London: UKCES: London
- Uzawa, H. (1965) 'Optimal technical change in an aggregative model of economic growth' *International Economic Review*, 6, 18–31

Vegeris, S. and Perry, J. (2003) *Families and children 2001: living standards and the children*, Department for Work and Pensions Research Report no. 190

Vignoles, A., De Coulon, A. and Marcenaro-Gutierrez, O. (2010) 'The value of basic skills in the British labour market' *Oxford Economic Papers*, 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*, March

Walker, I. and Zhu, Y. (2008) 'The college wage premium and the expansion of higher education in the UK' *Scandinavian Journal of Economics*, 110, 695–709

Westwood, A. (2004) 'Skills that matter and shortages that don't' in C. Warhurst, I. Grugulis and E. Keep (eds) *The skills that matter*, Palgrave: Basingstoke.

Willis, R. and Rosen, S. (1979) 'Education and self-selection' *Journal of Political Economy*, 79, S7–S36

Wolf, A., Jenkins, A. and Vignoles, A. (2006) 'Certifying the workforce: economic imperative or failed social policy?' *Journal of Education Policy*, 21 (5), 535–565

Wright-Brown, D. and Konrad, A. (2001) 'Job-seeking in a turbulent economy: Social networks and the importance of cross-industry ties to an industry change' *Human Relations*, 54 (8), 1015–1044

About the authors

Dr Mark Taylor

Reader, Institute for Social and Economic Research at the University of Essex

Tina Haux

Research Fellow, School of Sociology, Social Policy and Social Work, Queen's University Belfast.

Professor Steve Pudney

Professor of Economics and Director of the ESRC Research Centre on Micro-social Change, Institute for Social and Economic Research, University of Essex.

JRF commissioned this paper as part of its programme on the future UK labour market. The programme is exploring the links between skills, the labour market and household income to aid the creation of strategies to minimise future poverty and inequality levels in the UK.

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, nor of UKCES.

Joseph Rowntree Foundation
The Homestead
40 Water End
York YO30 6WP
www.jrf.org.uk

This report, or any other JRF publication, can be downloaded free from the JRF website (www.jrf.org.uk/publications/).

© Institute for Social & Economic Research (ISER) University of Essex 2012

First published 2012 by the Joseph Rowntree Foundation
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.

ISBN: 9781859358801 (pdf)

Ref: 2712

Contact:

Chris Goulden (chris.goulden@jrf.org.uk) and Helen Barnard (helen.barnard@jrf.org.uk)