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Methodological Issues in Estimating
the Value Added of Further Education,
Higher Education and Skills: A review
of relevant literature

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RESEARCH

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Executive Summary

The University of Warwick Institute for Employment Research (IER) and Cambridge Econometrics (CE) were commissioned by the Department for Business, Innovation and Skills (BIS) to carry out a systematic and focused review of literature and evidence relevant to particular methodological issues encountered in estimating the returns to Higher Education (HE), Further Education (FE) and Skills interventions. The objective of the review was to formulate recommendations for the most appropriate ways of addressing each of the key issues in future analysis of the economic value added of these different forms of learning. The research team has combined analytical insights with the findings of the literature review and discussions which took place at an Expert Workshop (involving academics and policy experts) in developing the study's recommendations.

Motivation and aims of the study

In the current economic climate, there is a greater than ever need to demonstrate the value for money associated with all forms of public investment, including Government support for education and training. With respect to HE, FE and Skills there is emphasis on ensuring that estimates of the returns on public investment use the most appropriate methods and adopt rational and reasonable assumptions about the underlying phenomenon and processes driving these returns to different forms of learning.

A substantial body of research has attempted to estimate the private and, to a lesser degree the social, returns to investments by individuals, employers, and the State in HE. This literature encompasses a range of methodologies and various types of data. The research base relating to FE and Skills interventions is perhaps less extensive than that for HE but this area is growing. This is particularly so in the UK and Europe where there is increasing policy emphasis on alternatives to HE, including Apprenticeships and vocational education and training (VET) and in the face of the on-going economic downturn and rising youth unemployment.

There are some differences in the approaches applied in studies of the returns to HE compared to those concerned with FE and Skills. The main differences tend to be related to the treatment of deadweight and additionality and other issues which are related to public financing of programmes. There is much to be gained from attempting to achieve a common underpinning approach to measuring the returns from HE, FE and Skills though it is recognised that completely harmonising approaches across all programmes is likely to be impracticable and not necessarily desirable. The estimates currently used by BIS already demonstrate a considerable degree of similarity in approach but there is desire to have broader consistency and comparability across studies of the various learning streams, as far as is appropriate (See London Economics (2011b) and most recently Walker and Zhu (2013) for HE estimates; and CE/IER (2011) for FE and Skills.

The seven key methodological issues

The review does not revisit all aspects of analysing the returns to HE, FE and Skills interventions but instead focuses on seven methodological questions of particular interest to BIS. These are:

1. To what extent are the observed wage and employment benefits from qualifications a result of their productivity-enhancing effects or because they are a signal of the learner's innate ability?
2. What benefits arise from learning which are not captured by individuals in the form of higher earnings e.g. increased profits for the learner's employer, other productivity spillovers and wider individual and social benefits?
3. For how long do the economic benefits of learning persist?
4. How should allowances for deadweight, displacement and substitution be factored into the estimates in order to demonstrate the additionality of public funding?
5. How should the 'option value' of skills/qualifications/education (i.e. the extent to which learning facilitates progression to further learning and its associated benefits) be factored into the estimates?
6. Are the benefits of qualifications undertaken in the past a reasonable indication of the likely benefits of those being undertaken currently and in the future? Related to this, what is the value of an education/training programme to the marginal, rather than the average, learner?
7. How should benefits to individual learners be aggregated to derive total benefits to the economy?

The table below summarises the main assumptions/approaches which have been adopted in relation to these issues in recent BIS estimates. As stated above, there is already a considerable degree of similarity between the two learning streams in approach.

Treatment of key issues in current BIS estimates

Methodological Issue	Approach / assumptions in Further Education and Skills	Approach / assumptions in Higher Education
1. Productivity-enhancing / signalling effects	Higher earnings reflect higher productivity as a result of learning (i.e. there is effectively no signalling effect)	Same
2. Non earnings benefits	The productivity gain is double the wage gain*. No wider / social benefits included.	None. Wider / social benefits are recognised, but not included in estimates
3. Persistence	Constant average wage / employment premia persist until retirement age	Wage premia calculated in different age bands
4. Additionality	Figures are gross of deadweight, but we typically present a deadweight estimate of 30% alongside them**	Not generally considered, given context in which the estimates are used
5. Progression to further learning	No additional benefits to allow for progression	Same, although benefits of progression are included in recent analysis***
6. Past benefits as a guide to future benefits / benefits for the marginal learner	- Assumes benefits to current qualifications are an average of those taken in the past - Assumes that benefits to the marginal learner are equal to benefits to the average learner	Same
7. Aggregation	Simply multiply net benefits to the average qualification by the number of qualifications	Same – though this is not often done (there are separate macro studies on impact of HE sector)

* Based on Dearden, L, Reed, H, & Van Reenen, J (2005), 'Estimated Effect of Training on Earnings and Productivity, 1983-99.' *CEP Discussion Papers dp0674*, Centre for Economic Performance, LSE.

** Based on BIS Research Report No. 71 'Assessing the Deadweight Loss Associated With Public Investment in Further Education and Skills'

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32281/12-767-assessing-deadweight-loss-with-investment-further-education.pdf

*** Based on Walker, I. and Y, Zhu (2013). 'The impact of university degrees on the lifecycle of earnings: some further analysis. BIS Research Paper Number 112. London: Department for Business, Innovation and Skills.

Findings from the literature

Productivity and signalling effects

The first issue considered by this review is that of the difference between productivity-enhancing effects of education and training and the effects arising due to the signal provided by educational attainment or completion of training. More specifically, the review has considered: *To what extent are the observed wage and employment benefits from qualifications a result of their productivity-enhancing effects or because they are a signal of the learner's innate ability?*

Human capital theory (Mincer, 1958; Becker, 1960; Shultz, 1961) proposes that individuals (and society more widely) obtain economic gains from different types of investments in themselves or in their 'human capital' (including investments in their health, nutrition and education). These investments improve the productive efficiency of individuals which leads to economic benefits for individuals through higher pay (and for employers through improved productivity and performance, and for society as a whole). In contrast, the signalling effect of education is thought to operate through the signal that attainment of particular qualifications/credentials (e.g. an undergraduate degree, professional designation) provides to prospective employers about the individual's underlying natural ability or productivity.

The signalling hypothesis (Arrow, 1973; Spence, 1973; Stiglitz, 1975) (also referred to as screening or sheepskin¹ effects) suggests that as employers cannot observe applicants' actual productivity before they hire them, educational attainment (e.g. qualifications) is assumed to indicate individuals' true underlying productivity. This productivity is produced through their innate ability and motivation rather than the skills or knowledge imparted by education and training improving their productivity. Those with certain qualifications or levels of educational attainment are assumed to have higher productivity and / or greater underlying ability than those without qualifications or with lower levels of education.

Where some signalling effect of education exists, estimating the economic value of HE, FE or Skills through individuals' wage gains likely overestimates the returns. If the estimates are mainly meant to inform individuals' in making choices about investments in education then it is inconsequential whether the returns arise mainly due to signalling or through enhanced productivity - both the human capital and the signalling theories predict that earnings improve with education. If however, the estimates of the returns to qualifications are intended to inform choices about *public investment* in education or training programmes, then enhancing productivity is important so that benefits can be obtained beyond gains to just the individual. That said, signalling effects may still present some value through their facilitation of matching employers and employees.

The literature does not clearly achieve a common estimate for the size of the signalling or screening effect of education. A number of studies indicate that the effect is not statistically

¹ 'Sheepskin' effects are a type of signalling effect in which it is not the years of schooling or education which signal to employers a certain underlying productivity or ability of an individual but rather particular credentials (e.g. a degree) provide this signal to employers)

significant (e.g. Sianesi and Van Reenen, 2003). Other results are mixed with some indicating relatively large signalling effects of education (e.g. Gibson, 2000) and many others finding relatively small effects but acknowledging that there is some impact of this nature (e.g. Chevalier *et al*, 2004). Providing a precise value for the size of the signalling effects of education, or even a specific range of estimates is further complicated by the fact that there are numerous approaches to estimating / testing for signalling effects, many of which are not easily compared to others.

Ideally, evidence of the signalling hypothesis can only be obtained by comparing the returns to individuals over time within two groups who undertake the same training / education but where one group obtains a qualification and the other does not (thus the former has a signalling device and the latter does not). Matched data (administrative) may be able facilitate such analysis in future and thus provide useful insights, however the capacity for the data to be used in this way has not yet been thoroughly evaluated. Such a comparison however is not without problem - individuals who drop out before receiving the final qualification/credential are likely to differ in some other ways from those who complete. Information about the individuals' characteristics would be required to control for other factors. Matched data will likely be able to provide a wealth of information on the characteristics of individuals in future however it is apparent that such analysis is not readily available and further consideration of the feasibility of using matched data for this purpose and of the methodological challenges is necessary.

Even if the signalling hypothesis could be proved and its magnitude robustly estimated, this would not solve all policy issues. Human capital theory lends itself to demonstrating the investments in learning which might be expected from the employer and the individual or the State. In reality, even if there are significant signalling effects attached to education this does not entirely represent a loss from a public spending perspective as the mechanism of learning/education as a signal may help to match individuals to employers in the most efficient manner.

Non-earnings benefits

The second issue considered in this study is that of non-earnings benefits associated with different forms of learning. A key question related to this is: *what benefits arise from learning which are not captured by individuals in the form of higher earnings e.g. increased profits for the learner's employer, other productivity spillovers*. The focus of this study has been on employer benefits and other spillovers. Consideration of wider returns to learning is important in evaluating the overall economic value of HE, FE and Skills as excluding the benefits to employers (and more widely) will most likely result in underestimation of the productivity-enhancing effects of different forms of education and training. From a policy perspective, ensuring that all relevant costs and benefits of learning are accounted for can help to inform decisions regarding public investments in different forms of education. Providing an indication of the returns to employers can also help encourage employers to make investments in training and skills and can provide rationale for the sharing of the costs between government and employers (as well as individuals) as all parties have something to gain. Currently, the BIS estimates for FE and Skills already make allowances

for such benefits to employers however estimates for the returns to HE tend to focus mainly on either private returns to learners or on more macroeconomic effects.²

Overall there is robust evidence indicating the *existence* of non-earnings benefits to the employer (e.g. increased productivity) but there is a limited amount of evidence, beyond Dearden *et al* (2005), which quantifies such effects and indicates how to precisely derive the effects on employers from the observed individual earnings effects of training/education. Much research has provided evidence of there being important returns captured by employers as a result of the education/training of workers (e.g. Blundell *et al*, 1999; Hogarth *et al*, 2012) and thus these should be incorporated into estimates of the overall value of HE/FE and Skills (Blundell *et al* conclude that wage gains provide a lower bound on the total productivity gains stemming from training). There has been more difficulty however in quantifying/monetising such gains to employers. A number of estimates of the returns to FE and Skills, for instance, utilise sensitivity analysis which assesses the effects of assuming different levels of employer gains as a percentage of the wage effects for employees (e.g. CE and IER, 2011; NAO, 2012a). An often adopted assumption regarding this issue is that the overall productivity gain associated with training is equal to twice the observed increase in a worker's wages (Dearden *et al*). This implies that the gain for the employer is equal to the wage gain to the worker (Barron, Black and Lowenstein 1989; Blakemore and Hoffman, 1988). This assumption is particularly common in FE and Skills studies, especially where the returns to work-based learning are considered.

Persistence

The third issue considered in the present study is the persistence of benefits associated with different forms of learning. In reviewing relevant studies questions which have been considered include: *For how long do the economic benefits of learning persist? How do the benefits of learning vary over the years following the achievement of a qualification? For example, do the benefits take a period after learning has been completed to be realised?*³ *Do benefits decline over time as skills depreciate, or as non-learners 'catch up' through the likes of learning-by-doing?* In the current estimates of the economic value-added utilised by BIS, there is either an assumption of constant, average wage returns persisting until individuals retire (or reach retirement age), or the wage premia are calculated in different age bands and used to derive the NPV estimates accordingly. Whilst these assumptions are reasonable, and at least afford some simplification to calculations of future and lifetime returns, reviewing other approaches provides further insights.

A commonly used assumption in estimating the total value added by different forms of learning has been that the returns to qualifications and different forms of learning persist over an individual's working life (which can be estimated in various ways). Several studies suggest however that it may be too simple to assume that gains are achieved by former learners immediately upon completion of a learning event / qualification and that returns do not vary significantly over the lifetime. A number of studies indicate that the returns,

² See Sianesi and Van Reenen (2003) for a review of macroeconomic studies.

³ Hanushek (2009) reasons that the human capital and investment model indicates that the substantive issues are those related to long term outcomes with the future income of an individual being a function of their past investments in human capital (through education/training) and that their income in whilst studying or in their first job does not capture fully the lifetime benefits. ,'

particularly to FE and VET, are not obtained immediately upon completion of a programme/qualification (e.g. Hogarth *et al*, 2012) rather it may take time for the benefits of learning to become significant (e.g. De Coulon and Vignoles, 2008).

Much of the existing evidence finds that returns do persist over a considerable period (though some have found evidence of deterioration of returns and, by implication, skills) over time, particularly for VET (e.g. Robinson, 1997)). A study by London Economics (2011a) finds that earnings and employment premia persist for seven years (post-completion of qualifications) and that in some cases (for some qualifications) the returns increase over this period. A recent BIS report by CE/IER (2013a) suggests that longitudinal data constructed from administrative records – looking at how returns vary in each of the seven years after completion – currently provides the best opportunity for estimating the persistence of returns to learning.

Additionality and deadweight loss

The level of deadweight loss associated with public funding of education and training programmes is particularly crucial from a policy perspective. Related to this are the issues of additionality, substitution and displacement. The key question is *how should allowances for deadweight, displacement and substitution be factored into the estimates – to demonstrate the additionality of public funding?*

Deadweight loss, in the context of government funding for education interventions, is the amount of training or learning (typically indicated by the number of learners taking part in particular programmes) that is supported by government funding but that would have been delivered to individuals anyway without Government funding. Conversely, additionality captures training (or learning more generally) that was provided with funding but which would not have taken place in the absence of this support. A number of alternative measures of DWL and additionality can be found along a spectrum of outcomes of government funding for different forms of learning.

These issues tend to be given most attention (unsurprisingly) in research commissioned by BIS (and other Departments). This issue is abstracted from in the HE returns literature, but it is becoming an increasingly common feature in studies of FE and skills interventions. This difference between the types of learning may have much to do with the greater involvement of employers in FE and skills programmes, most noticeably Apprenticeships. Studies that consider the private returns to education and training are not typically concerned with the level of deadweight loss arising from public funding of different forms of learning.

The evidence is beginning to reveal a degree of consensus in findings regarding the degree of deadweight loss but there are a number of caveats attached to existing estimates of additionality and deadweight. The main issue is that it is extremely difficult to ensure that appropriate groups are being compared when calculating deadweight loss. The level of deadweight loss adopted in a number of UK studies is that obtained by London Economics (2012b) who estimate deadweight loss to be equal to 28 per cent of training (Apprenticeships). CE/IER (2013b) consider various aspects of estimating deadweight and additionality associated with Apprenticeships and make recommendations about the data required to obtain more accurate estimates and to overcome some of the limitations of existing evidence.

The option value of progression to further learning

A further methodological issue considered in this review is the option value of learning and how this should be factored into the estimates of the economic value added of different types of learning. In this context, the option value of learning refers to the extent to which learning enables progression to further learning. To illustrate this concept, one can consider English and maths provision where the training/qualifications received through the programme are considered to have enabled individuals to undertake other qualifications and training which they otherwise would not have been able to access. If the returns to the subsequent (higher) qualifications only are considered then these returns would include the option value of the preceding lower level training as well.

The question arises then as to how the overall benefit should be credited to the highest qualification versus other intermediary qualifications which allowed entry into the higher ones. In the current estimates of the economic value added of FE which BIS cite, no additional benefits are incorporated to account for this option value.

Evidence specifically on the 'option value' of education is limited. In the literature reviewed there is little explicit accounting for the 'option value' of particular qualifications, with the main exception of the FE impact model. A number of studies account for all levels / types of qualifications held in order to recognise the separate contributions of each qualification to overall returns (e.g. Dearden *et al*, 2002; McIntosh, 2004; Blundell *et al*, 2005) and some have considered the incremental increases in wages arising from progression to the next level of learning (e.g. Robinson, 1997). Many analyses comment on the implications of particular qualifications for progression onto subsequent learning and how this has a value in itself (e.g. Dickson and Harmon, 2011). CE and IER (2013a), in their review of a number of studies of the benefits of training and qualifications, discuss how qualifications which enable progression to further learning are likely to be associated with a particular pattern of earnings in the future.

Most recently, Walker and Zhu (2013) also highlight the option value of education. Unlike London Economics (2011a), Walker and Zhu do not estimate the returns to each qualification separately. Instead they attribute the value of different options (e.g. graduates pursuing other qualifications with value in the labour market; non-graduates entering the labour market, pursuing vocational qualifications up to and beyond the level of a degree) to the choices made at 18 years of age (i.e. the choice to either undertake HE or not). The estimated returns to undertaking HE include some value for the options available after a particular choice is made.

Of growing interest in the literature is the nature and incidence of progression in its own right. In a number of recent surveys of learners, the incidence of learners progressing to further learning (typically formal in nature) has been examined. The Evaluation of Apprenticeships: Learner Survey (Vivian *et al*, 2012) found a trend for individuals completing Level 2 Apprenticeships to continue onto a Level 3 Apprenticeship. Amongst respondents, 24 per cent of completers had already progressed in this manner at the time of the survey and a further 30 per cent were considering doing so. Amongst those who had completed a Level 3 Apprenticeship, 33 per cent were considering undertaking Level 4 Apprenticeship and 5 per cent had already done so. It is not necessarily the case however that these learners would not have progressed without the initial Apprenticeship, and the findings should be interpreted in this light. The results regarding apprentices from the National Learner Satisfaction Survey similarly indicate a high interest in progression to

further learning (BIS 2011a). Just over three quarters of apprentices said they were likely to undertake further learning in the next three years. The NLSS results for all FE learners indicate that a greater proportion of these learners compared to apprentices felt that they were likely to undertake further learning in the next three years (84 per cent of FE learners compared to 75 per cent of apprentices) (BIS 2011b).

There has been greater consideration of progression to higher qualifications or further learning and training as an outcome or benefit for individuals in itself rather than considering how a value can be attached to such progression. Studies indicate that previous learning/training and qualifications tend to have a positive impact on the likelihood of progression onto further learning (e.g. De Coulon and Vignoles, 2008; London Economics and Ipsos Mori, 2013). There is also evidence of individuals with higher educational qualifications having more opportunities for future human capital investments, particularly work-related training.

Past benefits relative to future benefits and returns to marginal versus average learners

Two (related) issues are considered here: (1) *are the benefits of qualifications undertaken in the past a reasonable indication of the likely benefits of those being undertaken currently and in the future?* And (2) *what is the return to the marginal (rather than the average) learner?*

Whether there have been changes in the returns to education over time and whether the returns to specific qualifications can be assumed to be the same in the future as they are currently and have been in the past is an important question – even more so in light of expansion in HE and FE (especially Apprenticeships) in recent years. Given the substantial public investment entailed in this expansion, there is unsurprisingly a need to ensure that the returns are holding up. Such assessment can indicate whether supply is aligned with the demand for skills.

In the current BIS estimates of the economic value added by FE, the benefits associated with current qualifications are assumed to be an average of those taken in the past (CE/IER, 2011). The estimates for HE assume the same (London Economics, 2011b). Given significant increases in the supply of qualifications however these assumptions may no longer be as appropriate as they may have once been. Concerns over the quality of qualifications with such high learner volumes, particularly for Apprenticeships with expansion having been concentrated amongst older apprentices and in non-traditional Apprenticeship sectors, may also add weight to the argument that the returns are no longer the same as say, 10 years ago. If employers perceive recent qualifications to be of lower quality then they may reduce the wage premia they are willing to pay for these.

Though there is some scepticism about recent cohorts compared to earlier graduates, most of the evidence reviewed suggests that the returns are standing up despite massive expansion of the system. A number of studies indicate the graduate premium has held up pretty well despite expansion of education systems (e.g. Psacharopoulos, 1981; Elias and Purcell, 2004; London Economics 2011b; Walker and Zhu, 2013) but this is contingent on the demand for workers with HE qualifications keeping pace with the supply of graduates – the same is required for FE learning and other Skills programmes.

It is important also to recognise the difference between *average learners* and *marginal learners* when considering the returns to different forms of learning. In this review, analyses which have considered not just the average learner but also different sub-sets of learners or the marginal learner have been considered. In this context, the ‘marginal returns’ or ‘returns for the marginal learner’ refer to the returns to any particular type of learning (e.g. a degree) which are obtained by a learner with particular characteristics rather than the returns to any learner on average. One way of defining the marginal learner is as the next individual who would undertake a particular qualification if such provision were to be expanded. In practice however, identifying this individual is difficult. The main approach in the literature is to consider different sub-sets of the learner population which are of interest, mainly from a policy perspective.

In the current BIS estimates of the economic value added by FE, the benefits for the marginal learner are assumed to be the same as for the average learner (CE/IER, 2011). The estimates for HE adopt the same assumptions in relation to this issue (London Economics, 2011b). Changes in the returns to qualifications over time can also reflect the different composition of groups of learners over time (Dearden *et al*, 2004). In the literature the returns to the average learner tend to be most commonly reported but many studies highlight the potential difference between these and the returns to the marginal learner. Many note the importance of considering the returns to different types of individuals and the implications for policy in particular (e.g. Dearden *et al*, 2004; Migali and Walker, 2011; London Economics, 2011a).

Aggregation and total economic benefits

The final issue considered in this study considers *how the benefits to individual learners which are associated with different forms of learning should be aggregated to derive total benefits to the economy*. In current BIS FE and skills estimates (CE/IER, 2011), the benefits are aggregated by multiplying the net benefit to the average qualification by the number of qualifications. The same approach is taken for HE though the aggregate effects of HE have typically been considered in separate macro studies (see for example, Sianesi and Van Reenen (2000) for a review of macro-econometric studies considering the effect of education on productivity and growth with a focus on UK policy).

Two main approaches are observed in the literature considering the total benefits of learning to the economy: 1) studies that estimate the returns to individuals and then aggregate up to the firm and / or economy level (with various assumptions underlying the process of aggregation); and, 2) macro studies where the economy-wide return to education is estimated more directly. The overall economic impact of different forms of learning depends on the approaches and assumptions adopted in relation to the issues discussed above. One issue which can arise in analysis of the total returns to the economy is the lack of suitable information on the total costs of different programmes (noted by e.g. Card *et al*, 2009; Nilsson, 2010).

A key shortcoming of most studies where individual level effects are aggregated to derive total benefits of learning is that many do not account for displacement effects in any substantive manner. Whilst displacement of other learners is a particularly important issue when considering the total returns to publicly funded education and training, amongst the studies reviewed here this issue has been largely been overlooked or at least not fully addressed.

Implications for the FE Impact Model

In considering the findings of the literature review⁴ the study has explored the implications for the FE Impact model (CE/IER, 2011). In 2010, CE in collaboration with IER developed an Excel-based modelling tool for BIS to measure the economic impact of FE, where net present value (NPV) is the primary measure of economic impact. The present study has taken the overall findings from the literature review and considered them within the context of the FE Impact Model.

The FE impact model measures the benefits and costs of improving the skills of the workforce through the FE sector. FE provision, by improving skill levels, is assumed primarily to raise productivity and the employment rate (the economic activity of the working-age population, and success in matching workers to jobs). The current assumptions of this model with respect to each of the key methodological issues considered in this study are outlined in the table below.

Issue		Assumption
1	Productivity-enhancing / signalling effects	Higher earnings reflect higher productivity as a result of learning (i.e. there is effectively no signalling effect).
2	Non-earnings benefits	The spillover productivity gain is double the wage gain. No wider/social benefits are included.
3	Persistence	Constant average wage and employment premia persist until retirement age.
4	Additionality	Not modelled. The model results are gross of any additionality.
5	Progression to further learning	Progression factor is included assuming: 10% probability (with uniform distribution) of continuing to the higher qualification level during the five years following initial achievement.
6	Past benefits as a guide to future benefits / benefits for the marginal learner	Benefits to current qualifications are an average of those taken in the past. Benefits to the marginal learner are equal to benefits to the average learner.
7	Aggregation	Multiply net benefits to the average qualification by the number of qualifications.

The model provides a systematic framework to investigate the uncertainties associated with many of the issues reviewed in the present study. Sensitivity analyses were undertaken to consider the implications of varying the assumptions related to productivity-enhancing / signalling effects, non-earnings benefits (productivity spillovers) and

⁴ Also considered in this study was the discussion which took place at an Expert Workshop held at the University of Warwick on 7 May 2013. This workshop included academics with research interests in the returns to different types of education and learning and policymakers from BIS.

progression to further learning. The analyses show that the wage premia and consequent productivity spillovers are the key drivers of the estimated returns in the model. It is less feasible to adapt the underlying assumptions and consequent structure of the FE Impact Model with regards to the remaining issues, namely: persistence; additionality; and the associated issues of aggregation and marginal versus average returns. Though it is not included in the structure of the FE impact model, it would be relatively straightforward to adjust the estimates produced by the model using a reasonable figure for additionality.

Recommendations

The main findings and recommendations of the review are summarised for each of the methodological issues considered:

Productivity-enhancing and signalling effects

- In future estimates of the economic value added of HE, FE and skills, it is recommended on the basis of this review that potential signalling effects be acknowledged (i.e. state that some of the observed returns to learning may be in part due to such effects) but it should also be noted that signalling has economic value as it sorts people into jobs (related to this, signalling is likely to play a role mainly in getting people into a job, rather than thereafter);
- There is a role for sensitivity analysis in presenting estimates in the light of potential signalling effects but it would be highly arbitrary to simply reduce central estimates by any given percentage;
- Matched data has the potential in future to provide the information necessary to more precisely test and estimate potential signalling effects within the observed returns to education, but this does pose a number of methodological challenges.

Non-earnings benefits

- Beyond the study by Dearden *et al* there are a limited number of precise estimates of the total productivity gains and benefits to employers (as a percentage of wage returns to workers). Their study is often used in BIS estimates and other official estimates of the returns to training, as such there is a need to update the findings of that study so that assumptions can reflect the current relationship;
- The applicability of the assumption generated by Dearden *et al* to the way in which it is currently used in estimates for FE and skills to HE is not straightforward. The focus of Dearden *et al* is on work-based learning generally and the study's finding that the 'wedge' between wage and productivity effects is only found in lower skilled jobs. Further consideration needs to be given to the approach which would be most sensible for HE as in this area analysis typically concerns just the individual. Typically studies concerned with HE do not focus on this issue thus there is a need for further analysis to consider how, or if, some sort of reasonable figure might be used which is analogous to that adopted in FE studies. It may be that this approach is not as applicable for HE studies where employers are usually outside the education investment decision-making process and do not commonly fund participation in HE;

- Again, there is a role for sensitivity analysis in relation to this issue. It is advised that a lower bound for such analyses be based on the NAO assumption of the productivity gains to employers being equal to 25 per cent of the wage increase for workers (if employers are prepared to increase wages, then the productivity uplift needs to be at least sufficient to cover non-wage labour costs as well).

Persistence of benefits

- The use of longitudinal data on individuals can provide useful insights into the persistence of benefits for individuals as the returns can be tracked year by year, as can subsequent participation in training/education and changes in employment. Longitudinal data constructed from matched administrative records perhaps offer the best opportunity for estimating the persistence of returns to education and training presently.
- Currently, estimates indicate that the returns persist over the seven year measurement period used in this analysis, and in some instances the returns are increasing over this time. With a greater amount of matched data it may be possible to ascertain whether returns persist beyond this period and over time to consider whether persistence changes. Further analysis could also usefully include information on attainment of subsequent qualifications and learning.
- Incorporating flexibility in the FE impact model to capture variation in returns over time would add an additional layer of complexity to the model. The added value of doing this should be considered before investing in such development of the model as the current assumption (constant returns over time) does not seem unreasonable to compute lifetime benefits, given the current evidence base;
- Average annual returns to different forms of learning could be usefully presented alongside NPV figures. The annual returns may be more intuitive for many and also more acceptable in terms of magnitude conveyed. Presentation of an internal rate of return (IRR) could similarly appeal to different audiences and aid understanding.

Additionality and deadweight loss

- Deadweight, additionality, etc. are not explored to any great degree in the case of HE. Given the increase in tuition fees and the greater burden of costs shifting to learners relative to the State there is probably less motivation to investigate this issue expressly for HE.
- The currently adopted estimate of about 30 per cent deadweight (for FE and skills) does not seem an unreasonable holding assumption across the board, though it may overstate the amount of deadweight for particular programmes such as basic skills. For presentational purposes, it is advised that NPV estimates be presented both *net* and *gross* of deadweight.
- In line with the recommendations of CE/IER (2013b), some of the limitations of existing estimates (for Apprenticeships and also for other forms of learning) would be improved through better definition and measurement of the treatment and comparator groups (i.e. employers participating in Apprenticeships and those not

participating in the programme, respectively). This requires data additional to those already available. CE/IER also recommend that qualitative additionality be given importance alongside quantitative additionality.

- The above recommendation for further consideration of the counterfactual holds not just for Apprenticeships and work-based learning but also for other forms of learning. It is imperative to ensure the correct comparisons are being made to best assess the levels of deadweight and additionality associated with public funding.
- Surveys of learners, whilst having limitations due to potential self-reporting bias and the use of hypothetical questioning regarding costs of learning after individual have already undertaken different programmes, can provide insights into individuals' behaviours, attitudes and willingness to pay for different forms of learning. Such data can be, and have been, used to provide approximations of the degree of deadweight loss and additionality associated with public funding.

Option value of progression

- The matched data analysis carried out by London Economics (2011a) and others goes some way in considering this issue already. This analysis captures the wage and employment outcomes that might be associated with any progression to further learning during the seven years after completion of a particular qualification. Walker and Zhu (2013) note that their estimates capture the option value of any subsequent learning/qualifications undertaken (dependent on the choices made at 18 years of age as to undertaking academic or other routes through education or work).
- For LFS analysis, reported results should be more explicit in indicating that the estimated returns are in reference to qualifications undertaken as an individual's *highest* level of attainment – thus the estimates capture some of the option value of lower / intermediary qualifications also held. This should aid understanding of what the returns truly represent.
- There is an important role for qualitative research tracking learners over time to further investigate this issue and progression more generally. Already various surveys of learners consider the degree to which individuals have an appetite to progress to further learning and how many are already doing so. Patterns according to level of study and personal characteristics of learners can also be considered using such survey data. Considering actual outcomes compared to attitudes to progression for learners further may help to identify and address barriers to progression.

Past benefits as a measure of future benefits and returns to the marginal versus average learner

- Instead of simply using a weighted average based on the historical make-up of participants (e.g. with respect to demographic and other features) in different programmes of learning, there is a need to consider how the learner population has changed over time. How programmes themselves may have changed over time (in terms of content, structure and institutional arrangements, etc.) also should not be overlooked.
- For HE in particular, the vast expansion of learner numbers over time should be considered when comparing past and future returns. Whilst evidence suggests that the returns to HE have been holding up over time, continued review of this issue is valuable and would help to ascertain if some aspects of expansion (e.g. in terms of particular subject areas) might be less desirable than others. An analogous point can be raised with respect to recent expansion of participation in Apprenticeships, particularly as far as expansion has been greater amongst older, existing employees and within non-traditional sectors (e.g. retail and hospitality).
- Considering only the returns to learners on average can risk ignoring dramatically different returns for marginal learners (however defined). In doing this, it is possible that policy may not achieve the optimal results in terms of equality in particular. The heterogeneity of learners and programmes should be considered in estimating returns as far as possible. There are limitations to how far this can be achieved from a practical data perspective (e.g. insufficient sample cell sizes at very detailed level). It should also be borne in mind that presenting estimates for a great number of learner groups would not be appealing or meaningful (particularly from a policy perspective). The level of disaggregation in this regard should be based on what is interesting and meaningful, not only what is possible given the available data.

Aggregation of returns

- While the disaggregated estimates of returns to learning provide the most valuable insights for policy development it is necessary to also have an aggregated estimate of NPV (for nearly all programmes) in order to evaluate alternative uses of public money. It is imperative then that the estimates (at an individual level) which are to be aggregated be robust to minimise the risk of adding-up.
- Multiplying the returns per qualification by the number of achievements seems a sensible approach to aggregation and achieving an overall estimate of value added. This is the approach taken in the current FE impact model. It is important however that these aggregated estimates factor in at least some adjustment for displacement effects and other possible equilibrium effects that may be induced through expansion of participation in learning and government funding.

Cross-cutting issues

- Overall, additional data analysis would be beneficial to clarify the returns to different forms of learning and to ensure estimates which are utilised in budget decision-making and in communications with employers and the public more generally are robust. There should be a focus on longitudinal data (including matched administrative records) in order to facilitate analysis of causal relationships, as well as employer-employee matched data;
- Quantitative analysis is of the utmost importance however qualitative approaches should not be overlooked and a mixed methods approach would enhance the evidence base. More qualitative approaches can be used to shape quantitative analysis of the returns to different forms of learning and is useful in designing policies aimed at maximising these returns and optimising their distribution;
- It is important to reiterate the role of heterogeneity amongst learners, employers and learning/training programmes. Heterogeneity should be considered and an overriding aggregate estimate of the returns to learning, whilst important in practice, should not provide the final verdict on a programme's worth or value as the returns to different groups are varied.

1. Introduction

The University of Warwick Institute for Employment Research (IER) and Cambridge Econometrics (CE) were commissioned by the Department for Business, Innovation and Skills (BIS) to carry out a systematic and focused review of the relevant literature and evidence on the returns to different forms of learning in order to recommend the best approaches to addressing particular methodological issues encountered in estimating the returns to Higher Education (HE), Further Education (FE) and Skills interventions.

A variety of sources have been covered in the literature review, including academic journal articles, papers from reputable discussion and working papers series, and reports commissioned by BIS and other Departments. In addition to the literature review, the study has drawn on the team's own analytical insights and discussions amongst academic researchers in the area and individuals from BIS' policy team at an Expert Workshop. These additional inputs have been invaluable in formulating the study's recommendations as set out in this report.

The remainder of this report proceeds as follows. Chapter 2 sets out the aims and objectives of the study along with a summary of the approach undertaken by the research team. Chapter 3 sets out the findings from the literature review with respect to each of the seven methodological issues under consideration. For each issue, there is an introductory section outlining the issue at hand and its policy relevance. Then the current treatment of the issue in the current BIS estimates is summarised followed by discussion of findings in the literature more broadly. At the end of the discussion for each of the seven methodological issues, the main findings and implications are summarised and a table is included which outlines the key points raised in each cited reference. Chapter 4 focuses on the FE Impact Model and considers how findings from the literature review might be incorporated into NPV estimates for FE and Skills. Finally, Chapter 5 summarises key findings for each of the methodological issues and provides recommendations for treatment of these in future estimates of the economic value added by HE, FE and skills.

2. Aims and objectives

2.1 Background to the study

There is increasing emphasis and importance attached to demonstrating the value for money associated with public investment in all areas, including education and training. With respect to HE and FE and Skills there is greater need to ensure that estimates of the economic value added resulting from public funding employ appropriate methods and adopt reasonable assumptions. It needs to be said at the outset that there is a substantial body of research which has attempted to estimate the private and, to a lesser degree, the public returns to investments by individuals, employers, and the State in HE, and this body of evidence encompasses a range of methods and methodologies.

Gambin *et al* (2011) pointed out the many difficulties analysts face in estimating the impact of public funding of the Apprenticeship programme. In many respects the difficulties summarised by Gambin and her colleagues are applicable to all HE and FE qualifications and programmes: that is, the absence of readily identifiable comparator groups and the difficulties in assessing changes in returns over time. The latter is especially pertinent when considering HE qualifications given the massive increase in the number of people going to university over recent decades. Accordingly, the interested reader needs to appreciate the methodological limitations in considering the estimated returns to HE and FE. That said, there are many excellent studies which make optimal use of available data.

The estimates currently used by BIS in relation to the economic value added through public funding of HE and FE respectively, already demonstrate a degree of similarity in approach. The main differences in the approach to studies of the returns to HE and FE are in the treatment of issues such as deadweight and additionality, and other issues which are related to public financing of programmes. The priorities and concerns which prevail for each type of learning differ (e.g. due to differences in historical participation in each and due to differences in the levels of government funding for each) but there is merit in striving for some form of consensus in the approach to measuring the returns from HE, FE and Skills. Harmonisation can make it easier to understand where public funding has the greatest impact and why. Aligning the analyses of other skills interventions and programmes (e.g. work-based learning, basic skills programmes, etc.) with these two education streams in this way is also desirable.

2.2 Aims of the study

This study has aimed to review the evidence base and develop a set of recommendations regarding the most appropriate treatment of a number of issues which are encountered in considering the value-added associated with HE and FE and Skills interventions. The recommended approaches are intended to reflect the 'consensus view' found in the literature – so far as there is one - but they are also sensitive to the practicalities of analysing specific streams of learning (e.g. data and budgetary constraints).

The overall aim of the study is:

To review the literature and evidence on the returns to HE and FE & Skills (and other policies as relevant) in order to assess the range of assumptions adopted with regard to the methodological issues (listed below) and based on this review, along with analytical judgement to recommend the best approaches to use in addressing these issues in future estimates of the returns to these forms of learning.

The specific objectives of the study include:

- systematic review of relevant literature / evidence to assess how the key issues have been treated to date and the strengths and weaknesses of these approaches;
- comparison of methodological issues and assumptions between different forms of learning and education (i.e. HE, FE and Skills interventions);
- synthesis of findings from the literature to provide recommendations of the most appropriate and consistent set of approaches/assumptions to be used in future estimates;
- re-casting of results in the headline studies used by BIS for the impact of FE in light of the findings of the literature review (i.e. imposing different assumptions, guided by the literature review) in order to explore how sensitive these estimates are to the underlying assumptions.

The review does not revisit all aspects of analysing the returns to HE and FE and Skills interventions but instead focuses on seven methodological questions of particular interest to BIS. These are as follows:

1. To what extent are the observed wage and employment benefits from qualifications a result of their productivity-enhancing effects or because they are a signal of the learner's innate ability?
2. What benefits arise from learning which are not captured by individuals in the form of higher earnings e.g. increased profits for the learner's employer, other productivity spillovers and wider individual and social benefits?
3. For how long do the economic benefits of learning persist?
4. How should allowances for deadweight, displacement and substitution be factored into the estimates – to demonstrate the additionality of public funding?
5. How should option value be factored into the estimates i.e. the extent to which learning facilitates progression to further learning and its associated benefits?
6. Are the benefits of qualifications undertaken in the past a reasonable indication of the likely benefits of those being undertaken currently and in the future? Related to this, what is the value of the marginal (rather than the average) learner?
7. How should benefits to individual learners be aggregated to derive total benefits to the economy?

2.3 The approach

The overall approach to this project has involved a systematic yet focused review of the relevant literature with the aim of identifying the assumptions underlying estimates of value-added. Whilst the focus is very much on HE, FE and Skills (in England, the UK and further afield) other methodologies and approaches have been drawn upon as appropriate.

The study attempts to summarise the estimates produced in the literature and to consider the sensitivity of these estimates to the underlying assumptions on key issues. Also included is a summary of commentary on relevant studies about the implications of these issues for undertaking analysis of the returns to different forms of learning. In addition, the NPV model of FE (CE/IER, 2011) has been revisited in this study to consider how far that particular model can go in accommodating some of the overall findings in the literature with respect to the seven methodological issues considered in this review. Where the model can incorporate changes to the assumptions about any of these issues, the impact of such changes on the NPV estimates is also considered.

3. Findings from the literature

This chapter is structured so that it provides a summary of the evidence relating to each of the seven questions outlined in Section 2.2. Short summaries of key points of interest from each study are presented in tabular form in Annex A.

3.1 Productivity-enhancing and signalling effects

The first issue considered by this review is that of the difference between productivity-enhancing effects of education and training and the effects arising due to signals provided by educational attainment or completion of training. More specifically, the review has considered: To what extent are the observed wage and employment benefits from qualifications a result of their productivity-enhancing effects or because they are a signal of the learner's innate ability?

Human capital theory suggests that both individuals and society more widely, obtain economic gains from different types of investments in people. Within this theory, individuals invest, in terms of time and money, in such things as nutrition, healthcare and education with the expectation that this investment increases the stock of 'human capital' held by an individual (and in total, by society) leading to economic returns. The most commonly studied form of investment in human capital is education, however defined (e.g. by years of schooling, levels of education, qualifications obtained, training undertaken, etc.). The field of human capital theory was officially established in 1970 but much important research related to and supporting this field had been carried out previously. The studies which can be considered to have laid the foundation for economic human capital theory include those by Mincer (1958), Becker (1960, 1964) and Schultz (1961).

In contrast to the predictions of human capital theory, within signalling theory (Spence, 1973; Stiglitz, 1975) completion of particular qualifications or programmes of study indicate to employers that the individual has a higher level of productivity than a person who does not have the same level or type of educational achievement. This innate productivity is considered to be unaffected (or at least little affected) by education, including the duration of learning. Productivity may be influenced by a number of factors including upbringing and personal experience but according to the signalling hypothesis, education does not significantly affect a person's productive efficiency.

The signalling effect of education⁵ is thought to operate through the signal that particular qualifications/credentials (e.g. an undergraduate degree, professional designation) provide to prospective employers. The signalling hypothesis (also referred

⁵ There are different types of signalling effects. Some studies distinguish between different strengths of signalling effects as well as between signalling effects that are considered to act without any productivity-enhancing effects of training/ education ranging to those which operate in combination with productivity improvements.

to as screening or sheepskin effects⁶) suggests that as employers cannot observe applicants' actual productivity before they hire them, educational attainment (e.g. qualifications) is taken to indicate individuals' underlying productivity which is driven by their innate ability/motivation rather than the qualification/education equipping them with skills or knowledge that improve their productivity. Those with certain qualifications or levels of educational attainment are assumed to have higher productivity and / or greater underlying ability than those without qualifications or with lower levels of education. Where there is some signalling effect of education, using individuals' wage gains only as a proxy for productivity in measuring the economic value of HE, FE or Skills would likely result in an overestimate of the returns.

The importance of the relative productivity-enhancing versus signalling effects of education is very much dependent on the purpose for which estimates of the value of qualifications are to be used. From a policy perspective in particular, the relative size of the signalling effect (should it be found) is important as this implies that spending on training/education may not truly enhance productivity. If the estimates are mainly meant to inform individuals' in making choices about education then it makes little difference whether the returns arise mainly due to signalling or through enhanced productivity – in both cases, an individual can expect to achieve an increase in earnings or improved employment prospects by obtaining a certain qualification. If, however, the estimates of the returns to qualifications are intended to inform choices about public investment in education or training programmes, then enhancing productivity is important so that benefits can be obtained for the economy as a whole.

Signalling is also an important issue to consider in the presence of increased participation in post-compulsory education and training. As the proportion of prospective workers who hold particular qualifications increases, the signal of underlying productivity to employers is likely weakened – it may be more difficult for employers to infer different levels of productivity amongst individuals with the same qualifications. Wages may then reflect more greatly the actual improvements to productivity which qualifications might induce.

3.1.1 Treatment in BIS estimates

The studies which provide BIS with its current estimates assume that there is no signalling effect within the earnings returns and other economic returns to HE and FE qualifications (London Economics, 2011b; CE/IER, 2011). Whilst at least this assumption is consistent between FE and HE, ignoring the possibility of signalling may result in inaccurate estimates of the returns to education/skills, as noted above. The current assumption is that all wage gains reflect productivity improvements (as implied by human capital theory), but it is likely that in at least some settings and for some employers,⁷ qualifications are used by employers to infer the natural ability or inherent

⁶ Sheepskin' effects are a type of signalling effect in which it is not the years of schooling or education which signal to employers a certain underlying productivity or ability of an individual but rather particular credentials (e.g. a degree) provide this signal to employers

⁷ In Chatterji *et al*, M., Seaman, P. and L. Singell (2003) suggest that the requirement for qualifications to provide a signal is dependent on firm attributes such as size, the degree of

productivity of workers. For the worker and the employer, there is no quantitative difference in the gains accrued whether the signalling or human capital hypothesis holds true but for the wider benefits, particularly in terms of aggregate economic performance and growth, the relative contribution of these two effects does matter. If qualifications are only providing a signal about underlying abilities then there may be overinvestment in education as the qualifications do not necessarily improve individuals' productivity and they would ultimately produce the same amount of output with or without the qualifications. And crucially, there could be a more cost-effective signal of an individual's innate ability to employers.

In the current estimates of the economic value added by FE and HE cited by BIS, the overall assumption is that the wage premium found in relation to particular qualifications or education reflect higher productivity as a result of learning (i.e. abstracting from any signalling effect). CE/IER (2011) in estimating the NPV of FE draws on estimates of wage premia in the literature but they do not model for any signalling effects. There is then a possibility that the NPV estimates for FE may overstate the returns to particular qualifications. However, the possibility that some qualifications or the completion of some types of learning may provide a negative signal should also not be ruled out. This treatment (or omission) of signalling effects is in line with the approach commonly adopted in the literature on the returns to qualifications.

3.1.2 Findings from the literature

In discussing the findings in the literature which are relevant to the current study, the review here is presented in two sub-sections. The first considers analyses which seek to estimate the size (or at least the existence) of signalling effects. The second section considers those studies in which authors have attempted to factor assumptions about signalling into their assessment of cost-benefit or the returns to qualifications. In many instances, the assumptions adopted in the latter studies are fairly *ad hoc* in nature and often authors consider the issue mainly through sensitivity analysis.

Testing and estimating the signalling effects of education

Overall, the literature does not clearly achieve a common estimate for the size of the signalling/screening effect of education. Tests of the relative importance of productivity improvements versus signalling effects are difficult to implement in practice due to the difficulty in observing the relationships between recruits and employers and in observing individuals' baseline abilities and aptitudes. A variety of approaches have been used to investigate the existence and magnitude of signalling effects. Chevalier *et al* (2004) describe a number of existing tests for signalling effects of education. They argue that the existing tests do not provide definitive evidence in support of or against the signalling hypothesis and they suggest an additional approach. The tests noted include:

difficulty in monitoring to monitor employees, whether or not the firm promotes internally and for roles where the time it takes for a worker to become proficient is relatively short.

- Allowing for employer learning over time by considering wage changes after an individual has been in a job for some time as their true productivity would then be revealed – Chevalier *et al* note that the results from this approach are unclear as there is a large tenure effect and it is likely that ‘learning begets more learning’;
- Comparing the returns to education for individuals who are self-employed versus employees with the expectation that there would be lower returns to education for the self-employed in the presence of signalling effects as the return to education for this group should only reflect productivity-enhancement stemming from education⁸ – Chevalier *et al* note that there are few datasets with reasonable income data for self-employed individuals and there are also important selection issues in relation to self-employment;
- Including ability measures in the specification of the wage equation in order to control for underlying ability – Chevalier *et al* suggest that it is difficult to find ability indicators that are not affected by education and that measures taken at the earliest age possible would be most useful for such analysis. In practice, however good measures of ability or motivation are not widely agreed upon and data are not widely available;
- Considering the time taken to achieve qualifications with the assumption that those who complete programmes more quickly have higher levels of natural ability – Chevalier *et al* test this assumption in two ways, first considering the joint significance of education years and qualifications and second, testing for joint significance of dummies for each year of education when years of education are also controlled for. They find significant effects of the qualifications variables (even when years of education are controlled for) which suggests some evidence of sheepskin effects. Similarly, they cannot reject the null hypothesis that returns to education are non-linear which provides some support of screening as there are discontinuities in the returns to education at points in time when qualifications would typically be acquired (e.g. three years of post-18 education might be associated with attainment of a first degree);
- Considering the education level of an individual relative to their cohort assuming that it is this relative level of education that employers use to infer ability – Chevalier *et al* find that relative education has only a weak effect on earnings whilst the absolute level has a larger effect. They thus conclude that signalling is weak compared to the human capital effect of education;

⁸ There may also be relevant signalling effects at play even for the self-employed however as they may use their qualifications or level of education to signal their ability, productivity or quality to prospective clients. This of course depends upon the type of employment a self-employed person carries out and on the relationship they have with clients or main contractors.

- Finally, Chevalier *et al* introduce another approach that considers the raising of the school leaving age (RoSLA). They hypothesise that if a low productivity group were to raise its education level due to such a policy intervention then more productive groups would also invest in additional education in order to continue to distinguish themselves from less productive groups. In contrast, if education enhances people's productivity then educating one group to a higher level will not affect the decisions of other groups.

The tests outlined above are utilised by many studies in order to consider the presence (and sometimes relative importance/magnitude) of signalling effects of different forms of learning.

Riley (2001) reviews studies of signalling (or screening) effects of education produced over twenty five years. He notes some of the main findings and shortcomings of such studies on signalling and refers to Layard and Psacharopoulos (1974), for instance, who compare earnings functions of students who achieve some educational credential (e.g. a bachelor degree) with those who do not and conclude that the credential should have strong explanatory power only in a 'screening world,' The data used in this study however does not produce a strong effect which at first glance provides evidence against the existence of educational screening. Heywood (1994) undertook an analysis of Current Population Survey (CPS) data from the US and found a significant sheepskin effect but Riley cautions that this effect is significant only in the private non-union sector and not necessarily elsewhere.

Riley notes that a serious problem with some previous studies of screening and signalling effects in education and labour economics is that they do not explicitly indicate which variant of the traditional human capital model or screening model is being tested. In the human capital model, the productivity of college graduates is assumed to be a function of what graduates have learned at college which is positively related to the graduate's grades and the quality of the college attended. Individuals who drop out of college are assumed to have lower productivity than the average class member. If income or earnings is regressed against years of college as well as a 'sheepskin' dummy, then this dummy variable will pick up the difference in the rate of human capital accumulation between drop-outs and the rest of the college class. Riley notes that if information on drop-outs is to be used as evidence then it is necessary to provide a theory of why some students drop-out. One criticism of the screening hypothesis is that if the main role of graduating from a particular university with a high grade is to provide information to an employer about natural ability then prospective employers do not need to wait until individuals graduate, rather they can consider early performance and recruit from earlier years of the degree programme. If this situation arises then the signalling equilibrium (where more able or more productive individuals choose more education) collapses.

In a review of the returns to education, Psacharopoulos (1981) concludes that the signalling hypothesis is not generally supported in the literature. Whilst there is some evidence that signalling effects may arise initially when workers are hired, there is little evidence that screening persists. Where employers take on workers on the basis of the signal provided by their qualifications and educational achievements, it is unlikely that the employer continues to pay wages above actual productivity of the worker once they

have observed the worker over some time. More recently, Sianesi and Van Reenen (2003) summarise the literature on the returns to education and conclude that there is a compelling case that human capital (and investments in that capital) increases the productivity of individuals rather than just providing a signal to employers of their natural level of ability. They note that if human capital were solely a signal of innate ability or underlying productivity (which is not increased by investments in human capital) then the social rate of return to such investments would be less than the private rate of return.

Keep *et al* (2002) review evidence on returns to employers stemming from investment in training and note that there are a number of variants of the signalling hypothesis. Whilst the evidence does not provide a precise estimate of the magnitude of signalling effects, they conclude that overall there is evidence that such effects exist. A number of studies consider not just whether signalling effects exist at all but whether there is a difference in the potential effect over time and if there are variants of the signalling hypothesis. Brown and Sessions (1998) attempt to test for evidence of the strong signalling hypothesis (SSH) and the weak signalling hypothesis (WSH) by looking at returns for self-employed individuals compared to employees.⁹ Under the SSH, it is assumed that an individual's productivity is fixed (i.e. unaltered by investment in education) and that schooling is therefore wholly a signal of innate productivity. Schooling is considered to be primarily a signal under the WSH but there is recognition that it may also augment productivity. Brown and Sessions use data on individuals from the British Social Attitudes survey and adopt the self-employed versus employee approach (see p. 7 above). Any returns to education for self-employed individuals are assumed to represent returns to human capital as opposed to signalling effects (otherwise, why would self-employed individuals invest in education¹⁰). They also control for self-selection into self-employment. They estimate the coefficient on years of education to be 0.0770 for the self-employed and 0.1078 for employees. The coefficient for the self-employed group is smaller than that for employees and it is statistically significant thus Brown and Sessions conclude that this is evidence favour of the WSH but not the SSH - there is at least some productivity-enhancement generated by schooling according to their analysis.

Dupray (2001) considers the importance of signalling effects by firm size and looks at the ensuing implications for workers' careers over the longer term. Within his study, the effect of time in employment and thus employer learning on the strength or effects of the signal of education are considered. He uses data from France and estimates an earnings equation (by firm size) in which aspects of education such as years of education and levels are used as regressors. Dupray suggests that signalling effects are strong at the time of an individual's first entry into work and that the informational role of the signal is reduced with increased experience. The results suggest that large firms pay a premium for the information conveyed by an individual's qualifications at time of recruitment but once applicants have been hired and assigned to particular jobs,

9 This approach, as discussed above and argued by Chevalier *et al*, is limited in providing robust results.

10 There is a possibility that self-employed individuals' qualifications may signal to clients their inherent level of productivity.

educational qualifications have a lesser impact on wages. This lends support to the existence of signalling effects of education but highlights that the effect does not necessarily negate the productivity-enhancing effects of education. Dupray also illustrates that the relative magnitude of signalling effects depends on a number of factors (e.g. employer size, other individual level factors).

Kaymak (2012) also considers the role of time and employer learning when looking at evidence of signalling effects of education. Using US panel data to estimate the returns to education and the relative effect of signalling, Kaymak groups individuals into two broad categories of occupations which are based on ability as indicated by their Armed Forces Qualification Test (AFQT) scores. It is assumed that the extent of signalling depends on how fast employers learn about the true productivity of workers – where employers are able to learn faster there is a relatively limited need for a signal of ability; they can ascertain workers' true productivity rather quickly thus there is low cost involved in doing this rather than relying on some signal such as education. The average return to signalling for workers with lower ability (as indicated by lower intelligence test scores) is estimated to be 22 per cent of the total OLS return to education (with lower and upper bounds of 19 and 25 per cent). For high ability workers (defined according to their AFQT scores), the signalling effect is estimated to be equal to just 1 per cent of the OLS return on education (bounds between 0 and 2.7 per cent). The study also reports that after 15 years of experience (in the labour market), education has almost no signalling value.

Some studies find evidence of more substantial signalling effects however the limitations of some studies, as outlined above should be kept in mind. Vedder (2004) suggests that signalling effects are relatively large and surmises that HE serves primarily as a screening device. An earlier study by Gibson (2000) concludes that there are large sheepskin effects¹¹. Gibson uses survey data from New Zealand and finds that the overall returns to credentials outweigh the returns to years of schooling concluding that there are large sheepskin effects (the credential effect being equal to about two-thirds of the total increase in earnings). He argues that in the presence of sheepskin effects there are external costs of education as individuals fail to take into account the effect of their behaviour on the market equilibrium. As individuals achieve higher levels of education this raises the levels of attainment required by those with greater ability to successfully signal their higher productivity to employers. Gibson also suggests that sheepskin effects are indicative of there being a large wedge between the private and social returns to education and, as such, increased public investment in education may increase inequality and reduce net national income.

In their analysis of the raising of the school-leaving age (RoSLA) (as an additional test for signalling effects (see page 8 above)), Chevalier *et al* (2004) find no evidence to support the signalling effect – it is only those at the margin of the school leaving age who are found to have been affected by the reform and not those who would have gone onto higher levels of education anyway. They estimate the returns to O-Levels versus

11 'Sheepskin' effects are a type of signalling effect in which it is not the years of schooling or education which signal to employers a certain underlying productivity or ability of an individual but rather particular credentials (e.g. a degree) provide this signal to employers

no qualifications for men to be around 25 per cent however their estimates may suffer from positive ability bias as they are based on OLS specifications. They reject pure signalling but suggest the 'sheepskin' effects are important after controlling for years of education.

Grenet (2010) adopts an approach similar to Chevalier *et al* by considering the returns associated with increased schooling resulting from raising the school leaving age in England and Wales and in France. The reform in England and Wales (where the change resulted in a significant drop in the share of individuals with no qualifications) was found to be associated with a 6 to 7 per cent increase in average earnings but the effect on earnings was close to zero for France (where there was no change in the share of unqualified individuals). In both countries, the reforms led to an increase in years in education of about 0.30. Grenet argues that this difference between countries reflects that the signal associated with achieving qualifications has some effect but he notes that the signalling hypothesis alone is too extreme to account for the full increase in wages. There are two reasons for this: 1) the increase in the number of people acquiring qualifications in England and Wales was too large to go unnoticed in the labour market thus the signalling effect of these qualifications would be affected; 2) the increased time in education was found to have some positive effect on cognitive test scores. Grenet suggests that there is at least some improvement in the labour-market relevant skills of learners as a result of additional schooling which came about due to the raising of the leaving age. He also cites some evidence of improvement in cognitive skills resulting from spending more time in school. Unfortunately, Grenet does not produce an estimate of the size (absolute or relative) of the signalling effect.

Dickson and Smith (2011) also use the RoSLA approach to analyse potential signalling effects and they find relatively large effects. Their analysis however, considers the *employment* returns rather than wage returns to additional education. Their analysis considers an increase in the school-leaving age and they find that qualifications drive most, but not all of the employment returns to education. They estimate that qualifications account for 70 per cent of the employment return but they do not find significant results for wage returns. They conclude that qualifications, rather than additional time in learning, drive most, but not all of the returns to education.

Attempts have been made to create a variable which directly measures the signalling effect. Chatterji *et al* (2003) propose a direct measure of signalling defined as the difference between the qualifications required to obtain a job and those necessary to do that job. Using data from a survey of workers, they find a significant, positive, gender-specific (in terms of magnitude) return to the signal. They find a return to education, through their signalling indicator and directly (time in education), to be almost 10 per cent. They suggest that accounting for signalling increases the wage returns achieved by the individual. The measure used to indicate the signal in their study (the difference between required and utilised qualifications) however, may itself be biased thus their results are to be interpreted with some caution.

As noted by Chevalier *et al* (above), accounting for ability or intelligence is another often adopted approach to considering the existence (and size) of the signalling effects of education. Kjelland (2008) attempts to test for a signalling effect of education by controlling for intelligence and motivation in estimating an earnings function. The results

are inconclusive. This approach, of controlling as far as possible for the underlying ability of individuals, is common in the literature as a way of accounting for possible signalling effects of education. Kjelland suggests that in order to determine the signalling effects of education, a more representative measure of an individual's inherent productivity is needed and that motivation or work ethic and intelligence are important determinants of educational success and labour market productivity. He suggests that controlling for both intelligence and motivation should result in there being lower returns to education (in the productivity-enhancing sense). It is important to note that measures of work ethic, motivation and intelligence used by Kjelland are contentious and their results are sensitive to the actual measures used for these entities in estimating the wage effects. Using data from the National Longitudinal Survey of Youth (NLSY), Kjelland derives an indicator of motivation from the Rotter Scale which is meant to reflect whether individuals have an external or internal locus of control (an internal locus is assumed to reflect more highly motivated individuals). Armed Forces Qualification Tests (AFQT) scores are used to provide a measure of inherent ability or intelligence. Kjelland finds a strong positive and significant correlation between the intelligence indicator and earnings in the labour market but there is no significant correlation between his measure of motivation and earnings. He also finds that after accounting for ability, the return to education is reduced by 45.2 per cent but these findings are inconclusive about the signalling effect *per se*.

The implications of signalling effects

Many studies do not necessarily attempt to estimate the size of the signalling effect of different qualifications or types of education but nevertheless highlight the impact of ability on wages (and other returns). If unaccounted for, this may result in biased estimates of the returns to education.

A number of studies comment on potential signalling effects when estimating the returns to education and adjust their analysis in order to account for these. McIntosh (2007) carries out a cost-benefit analysis of Apprenticeships (and other vocational qualifications). He considers the possibility that the estimated wage returns to Apprenticeship reflect both the beneficial, productivity-enhancing effects of the training itself as well as potentially higher innate ability of those selected to do an Apprenticeship. In order to reflect the importance of this issue, McIntosh carries out sensitivity analysis in which the wage return is reduced in order to reflect a less than full productivity-enhancing effect of training. Reducing the return to 75 per cent of the wage return to Apprenticeship (i.e. assuming signalling effects account for 25 per cent of the total wage returns) results in the NPV of Apprenticeship being reduced from £105,000 (when 100 per cent of the wage return is included) to £87,000 for a Level 3 Apprenticeship and from £73,000 to £58,000 for Level 2. Assuming a greater signalling or ability effect, of 50 per cent of the wage gains, results in the estimated return being reduced further to £69,000 for at Level 3 and £44,000 at Level 2.

The NAO (2012a) estimates the wage and employment premiums associated with Apprenticeships using data from the Labour Force Survey (LFS) over the period 2004 to 2010. The NAO does not explicitly account for possible signalling effects of

Apprenticeships on wages. They report on a literature review in the associated Technical Report (NAO, 2012b) where they conclude that there is insufficient evidence on the magnitude of signalling effects¹². Without accounting for possible signalling effects however, the NAO acknowledges that their estimates of the wage premiums may overstate the productivity-enhancing effects of training.

3.1.3 Summary of findings related to signalling versus productivity-enhancing effects

Overall, the results in the literature are mixed – with a few studies indicating a large role of signalling effects of education (e.g. Gibson, 2000) and others finding relatively small effects but acknowledging that there is some impact of the signalling nature of qualifications or education and others finding a statistically insignificant effect. A precise estimate or range of estimates is difficult to extract from the literature due to differences in approach and the problems encountered in some analyses.

Various studies have used different approaches to investigate the existence and size of signalling and sheepskin effects and there seems to be little consensus as to the best approach. Chevalier *et al* (2004) consider various approaches and find little evidence of significant signalling effects using any of these. Their findings suggest much stronger support for the human capital hypothesis than for the signalling hypothesis.

Ideally, proof of the signalling hypothesis can only be obtained through a comparison of individuals' returns obtained over time by two groups of individuals who undertake the same training/education but where one group obtains a qualification and the other does not (thus the former has a signalling device and the latter does not) – even this however can be problematic as individuals who drop out before receiving the final qualification/credential are likely to differ in some other ways from those who do complete. It would be necessary then to have as much information about the characteristics of all individuals as possible in order to control for other factors. It is apparent that such analysis is not readily available; however matched administrative data may present an opportunity for this in future.

A further general problem with the signalling hypothesis is that the variables which analysts use are not perfect measures of ability and motivation and, as such, it would be unwise to infer much about the role of public funding for either HE or FE from the results summarised above. In many respects the screening hypothesis is trying to shed light on who should pay for training. The implication is that employers want some indication of ability in selecting recruits who they will then go on to train and develop. But employers will only train to meet their specific needs and there is little indication over what period they discount training investments, so even if the signalling hypothesis could be unequivocally proven (and the effect quantified) it would not solve all policy issues. Human capital theory, in contrast, is more adept at demonstrating the investments which might be expected from the employer and the individual or the State.

12 They also found little evidence on the value of spillover effects. This topic is discussed in the next section.

The implications of the relative size of the signalling effect in estimating the value added of different forms of learning are not negligible¹³. McIntosh (2007), in estimating the NPV of Apprenticeships and other vocational qualifications, considers the possibility that wage returns reflect the effects of training itself on productivity as well as the innate ability of those who undertake certain types of training. By altering the proportion of the wage gain that is generated through productivity-enhancement, McIntosh finds that the overall NPV of Apprenticeships is noticeably altered. Given the variety of estimates and approaches found in the literature a definitive value for the magnitude of signalling effects of education is not obvious but overall the evidence suggests that the signalling has at least some role in determining the wages associated with different levels/types of education.

It should be kept in mind that whether or not signalling accounts for a significant part of the observed returns to education is immaterial as far as the private returns to individuals are concerned – they receive a return on their investment whatever the source. For any signal (of ability) to be effective though it must be more costly (prohibitively so) for individuals with lower innate ability or lower productivity to acquire it than for those with higher inherent ability to do so. Otherwise, the signal may be obtained by anyone and thus would no longer indicate underlying ability. Signalling may also have some value more widely insofar as it may promote more efficient operation of labour markets as it can facilitate matching between employers and workers and sorting of workers. The question remains however whether this signalling function can be fulfilled in a manner that requires less public funds than current HE and FE programmes do.

3.2 Non-earnings related benefits

The second issue considered in this study is the treatment and extent of non-earnings benefits associated with different forms of learning and education. More specifically, *what benefits arise from learning which are not captured by individuals in the form of higher earnings e.g. increased profits for the learner's employer and other productivity spillovers?* Such wider benefits would be expected to have a significant effect on the total (economic) value of learning. Given the scale of this review, and the priorities to be addressed from a policy perspective, the review has focused mainly on direct productivity benefits. The wider social, non-monetary benefits (e.g. improved health, reduced crime, etc.) are outside the scope of this review but this is not meant to imply that they are not valuable or indeed that there are such benefits. The main emphasis here is on returns to the learner's employer though the additional benefits to other workers (and other employers) is also noted where relevant.

Employers plausibly gain from investments in human capital through enhanced productivity of the company (as indicated by various measures of performance), increased innovation amongst their workforce, and knowledge transfers to other employees. Where employers pay a premium to graduates or to workers holding particular qualifications or where wages are found to increase after a worker

13 The implications for the BIS FE Impact Model (CE/IER, 2011) are explored in Chapter 4.

undertakes training, there is an assumption that the employer has gained (or expects to gain) from the human capital investment and the ensuing productivity increase this provides through the employee. Individuals may not capture all of the benefits from learning as higher earnings as at least part of the productivity gains may be captured by employers as higher profits, or by other individuals due to externalities.

Consideration of not just the private wage (or other) gains to individuals themselves is important in evaluating the overall economic value of HE, FE and Skills interventions. Whilst these non-earnings benefits are not relevant to the private return to different forms of learning they are relevant when considering the social return. Excluding the employers' benefits will most likely result in underestimation of the productivity-enhancing effects of different forms of learning and human capital. The increased wages attracted by individuals after completing various qualifications is an important benefit and in the investment model of human capital it is largely this which motivates private investment in education (who invest through fees, time and foregone earnings). Assuming there are positive benefits for employers, and more widely, stemming from different forms of learning, then focusing only on the private individual returns when making the decision to participate in education / training will lead to underinvestment from a social perspective. Estimates of the benefits to employers too can be useful in supporting the notion that employers can and should invest in the human capital of their workers through education and training. Similarly, returns captured by other workers and other employers may provide impetus for State involvement in promoting different forms of learning to ensure the level of participation is optimal from a social perspective.

This is highlighted by Sianesi and Van Reenen (2003), who consider the wider benefits of education, as captured by indicators of economic performance. They highlight that externalities may arise through: educated workers raising the productivity of less educated co-workers; spillover effects from technical progress or knowledge accumulation which in turn arise from investments in human capital; or, an environment with higher average levels of human capital may involve a higher incidence of learning from others. They find in the relevant literature that the returns to human capital are higher for firms than for individuals suggesting that not all productivity gains are captured by individual workers.

There are a number of aspects related to this issue which are relevant from a policy perspective. Firstly, ensuring that all relevant costs and benefits of different forms of learning are taken into account (particularly those attracting government investment) is important to ensure that the returns are accurate and therefore that decisions regarding public investment and formulation of education and training policy can reflect where the greatest potential gains are to be had. Furthermore, indicating the value of education/training to employers can also help to improve employer engagement and investment in education and training (e.g. providing Apprenticeships, stimulating demand for high level skills, etc.). Changes to funding of education and training may also be justified on the basis of evidence on how the gains from different forms of learning are shared between employees, employers and more widely.

3.2.1 Treatment in BIS estimates

Currently the BIS estimates of the returns to FE and Skills already make an allowance for employer benefits and other productivity spillovers. In the HE estimates however, the focus of analysis tends to be solely on the returns to individuals or alternatively on returns at a macro-level. The current BIS estimates of returns to FE consider the gain in productivity to be equal to twice the observed wage premium but no wider social benefits are included (CE/IER, 2011). In contrast, there are no non-earnings benefits included in the calculation of the returns to HE qualifications set out by London Economics (2011b)

3.2.2 Findings from the literature

The wider, non-earnings benefits that arise from learning which are included in estimates of the returns to education and training varies across FE studies and there is relatively little consideration of the productivity gains to employers in studies of HE. In this review the main interest is in the gains to employers (e.g. increased profits and competitiveness) and productivity spillovers¹⁴ which accrue from training. In this section, analyses which estimate the benefits to employers (and wider) are first considered. Following this, studies which indicate the implications of wider benefits for the overall value of different forms of learning are discussed.

Estimates of benefits for employers and industries

Employers may gain from their employees' human capital stock in a number of ways. For example, the Apprenticeship evaluation survey of employers (Winterbotham et al., 2012) found evidence of the benefits of training for firms. Nearly all employers (96 per cent) reported at least one benefit to their business resulting from employing apprentices. The most commonly cited benefit was improved productivity (reported by 72% of employers), followed by improved staff morale, improved product or service, a more positive image in the sector, improved staff retention, and the introduction of new ideas to the organisation (each of these was mentioned by around two-thirds of employers).

A study by Dearden *et al* (2005) has been used to inform estimates of the returns to different forms of learning, including the BIS estimates for FE and Skills (CE/IER, 2011). Dearden *et al* suggest that the private return to training (through workers' wages) tells only half the story of the impact of training on productivity as this ignores the impact on the employer's productivity. Independent of wage effects, there is a surplus from training obtained by employers. Dearden *et al* cite a small number of empirical papers that consider the relationship between firm productivity and measures of training which generally find a positive correlation between the two but the findings are not easily interpreted as it is difficult to establish a causal relationship using data for one particular point in time.

14 Whilst wider individual and social benefits (e.g. improved health; reduced crime; etc.) are important in assessing the overall value of learning these are not considered in any depth in this review.

Dearden *et al* improve on cross-sectional estimates of employer benefits by using a panel of 14 consecutive years of training data. This allows them to better control for unobserved heterogeneity than in previous studies. They combine estimation of the productivity effects of training with estimation of the wage effects of training - this allows for examination of whether or not workers who receive training are paid the value of their marginal product. Their estimates are provided at industry level. They find a significant impact of training on productivity and also find that the productivity effects are larger than the effects of training on individuals' wages. An increase of one percentage point in the share of employees who are trained is associated with about a 0.3 per cent increase in wages but a 0.6 per cent increase in productivity (value-added per head), at the industry level. It should be noted that this wedge between wages and productivity is found only in low wage industries. In low pay industries, lower paid workers may have less bargaining power and are thus less able to capture the productivity gains they make through training. This finding, that the total productivity gain associated with training is about double the wage gain, is used in the current BIS estimates of the returns to FE. Such productivity gains are not included in estimates for HE.

Kuckulenz (2006) too suggests that employers and employees share the rents associated with training but evidence on how the rent is shared is relatively scarce. Kuckulenz also suggests that employees stand to gain a smaller share of the returns to continuing training where they have less bargaining power. This can occur (*ceteris paribus*) when employees: are less qualified; work in a large firm; have just entered a firm; or are on a fixed term contract. Firms take a relatively smaller share of the rent when they have less bargaining power as a result of: having few workers with comparable human capital; when workers are mobile; or when demand for workers is greater than supply in the labour market (all else equal). Using sector-level data from Germany, Kuckulenz estimates that the increase in productivity arising from training is equal to three times the wage increase. He also finds that higher skilled workers capture a larger share of the rent than do lower skilled workers. The analysis also finds evidence of knowledge spillovers between firms within the same sector.

According to Blundell *et al* (1999) there are returns to different forms of learning for firms as real wage increases (associated with training) must be paid out of productivity gains. The increase in wages therefore should provide a lower bound on the likely total size of the productivity gain to firms. They suggest that in practice the productivity gains for firms are likely to be higher and there may be productivity gains from training that are not passed onto the employee through increased wages but are instead only reflected in direct measures of competitiveness, productivity or profitability. Blundell *et al* note a number of practical difficulties for estimating productivity gains for employers: it is difficult to obtain data on firm productivity, competitiveness and profitability; it is also problematic to identify a suitable counterfactual to general and specific training; and it is difficult to ascertain the costs of training and how much of the costs are borne by employers and employees. It is also challenging to establish causal relationships when considering firm productivity and training. Blundell *et al* cite two studies which suggest that the productivity increase is more than twice as large as the wage increase (Barron, Black and Lowenstein 1989; Blakemore and Hoffman 1988).

Blundell *et al* cite research by the National Institute of Economic and Social Research (NIESR) which looks at the firm-level productivity impacts of training using matched plant data. NIESR's study found that higher average levels of labour productivity are closely related to the greater skills and knowledge amongst the workforce. In the UK, they find that lower skills are associated with lower productivity. They also refer to a number of studies (from outside Britain) which show that training has a positive impact on firm-level productivity - the effects range from 'very large effects to little or no effects,' Other studies have found that bundles of human resource practices, including training, are associated with increases in firm productivity.

Bishop (1994) examined training which took place with workers' previous employers and found that previous on-the-job training increased a worker's initial productivity¹⁵ with the subsequent employer by 9.5 per cent but no lasting or persistent effect was found and no initial wage gain was observed. The same study found a 16 per cent increase in current productivity (and this lasted longer) for off-the-job training.

Black and Lynch (1996) consider the effects of employer provided training on businesses' productivity (as indicated through sales) using data from the US. They argue that human capital is an important determinant of an establishment's productivity and find that a 10 per cent increase in average educational attainment of a firm's workforce increases productivity by between 4.9 and 8.5 per cent in manufacturing firms and by between 5.9 and 12.7 per cent in non-manufacturing. They also find that other training variables such as the proportion of training that takes place outside working hours has a significant effect on firm productivity in manufacturing and provision of computer/IT-related training has a significant effect in non-manufacturing firms. These results illustrate how training and human capital may affect productivity differently in different sectors and in different types of firms.

The London Economics study (commissioned by BIS) into productivity spillovers considers the impact of investments in intangible assets on productivity growth (London Economics, 2012a). Imperfect competition in the labour market or the acquisition of firm-specific skills as opposed to general transferable skills may result in the productivity gains being underestimated by using the wage gain as a proxy. Their study finds that increasing human capital within industries by one percentage increases industry-level productivity by 0.1 to 0.3 per cent. They also find that a one percentage point increase in the volume of training increases labour productivity by as much as 0.6 per cent.

London Economics (2012c) used a new dataset (firm-level data) to estimate the impact of training on productivity (measured as value added per worker). The authors note that data limitations were a barrier to producing robust results.¹⁶ In particular, the number of unobserved factors driving productivity (other than participation in government-funded training) meant that cross-sectional analysis was not feasible. Due

15 Measured as a ratio-scale indicating the relative productivity of two particular workers employed in the same job.

16 See Table 2 in Annex A for details of some of the findings produced by London Economics (2012c) however, as they indicate in their report, these are not robust due to data limitations.

to the relative infancy of the dataset, the longitudinal element was not sufficiently well-developed to produce robust results either. The authors recommended that when four years of data were available this approach was a very promising way of producing more robust estimates of the impact of training on productivity (i.e. beyond that passed onto the worker in the form of higher wages).

London Economics refer to findings from three other studies, including Dearden *et al* (2005) (discussed above), which use a variety of methods and are based on data from different countries. All three show that training has an impact on productivity that is greater than the effect on wages. In addition to Dearden *et al*, Colombo and Stanca (2008) consider firm-level data from Italy and find that a one percentage point increase in the number of employees receiving training results in an increase of 0.07 per cent for value added and 0.04 per cent for wages. They find stronger effects for blue collar (manual workers) than white collar (higher skilled occupations) workers. Finally, Konings and Vanormelingen (2010) consider firm-level data from Belgium and find that when the number of employees undertaking some kind of formal training is increased by one percentage point, value added increases by 0.23 per cent and wages by 0.11 per cent. In each of these studies, the percentage change in value added (productivity) is around twice the wage return – thus the assumption adopted in the current BIS estimates for FE are reasonable in light of evidence based on data from different countries and using various approaches.

In terms of economy-wide benefits stemming from education and training, Blundell *et al* (1999) suggest that benefits could spill over to others so that the gains to the economy as a whole could exceed the returns to individuals and firms. Education and training may provide some positive production externalities for example, through improvements in the performance and productivity of co-workers. A number of other spillover effects have been put forth by others (e.g. Gemmell, 1997 and Redding, 1996).

Martins and Jin (2010) consider the firm-level social returns to education (as measured by average years of schooling within a firm's workforce). They argue that individuals who are highly educated may transfer part of their knowledge and skills to less-educated co-workers. They also find that less educated workers gain from an increase in the average schooling levels found in their firm whereas the same is not observed for their higher-educated counterparts. They conclude that the large gap between firm and individual level returns provides support for the idea that private returns are not irrelevant from the social point of view and that there is considerable spillover effects on top of the private return to education.

Kirby and Riley (2008) consider knowledge spillovers to other workers and estimate the external return to schooling using a repeated cross-section of individuals in the UK between 1994 and 2004 using data from the LFS. They find that increasing the average level of schooling at the industry level is associated with an increase in individual wages of between 2.6 and 3.9 per cent. This is equal to between 43 and 69 per cent of the private return to schooling (i.e. the return to an individual from investing in an additional year of schooling). The sample on which Kirby and Riley present their main results is restricted to white, UK-native, males aged 30 to 49 years however they do present results for a wider sample of employees as well. When they include younger and older groups in the analysis the estimates of the effect of industry level schooling

on wages remains positive but is not then statistically significant. They note that their estimates are somewhat smaller than those found in other studies of industry externalities which mainly use cross-sectional data and do not control for other factors or endogeneity issues. Kirby and Riley suggest that their findings imply that expecting individuals to bear the cost of education may result in significant under-investment relative to the socially optimal level of human capital.

Vedder (2004) considers cross-sectional data to examine the private versus social returns to higher education. He argues that HE has positive externalities and that it enhances economic growth due to human capital formed through university studies and due to technological advances arising from basic university research. In analysis of data from 50 US states over 25 years however, Vedder finds a negative effect of higher education spending (at state level) on economic growth though there is a significant and positive correlation between the proportion of a state's population aged 25 years and older with four or more years of college education and economic growth. Other studies from the US have investigated whether externalities exist at the state level or the city level (Acemoglu and Angrist, 2000 and Moretti, 2004, respectively) but these find little evidence of large external returns. As noted by Blundell *et al*, it is notoriously difficult to establish the direction of causality of spillover effects.

Implications for estimates of returns to learning

In their study of the economic impact of FE (the FE impact or NPV model), CE / IER (2011) include spillover productivity benefits in a relatively straightforward manner. The model assumes that the increase in total productivity is double the increase in wages for the individual undertaking the learning –as found by Dearden *et al*. A factor of two is therefore applied to the wage increase to indicate the total effect. The additional productivity benefits, above the amount of the wage increase, are considered to arise from increased profits or competitiveness for the learner's employer, increased wages for other workers (either directly from transfer of knowledge between individuals or indirectly through R&D or adoption of technology), and increased profits or competitiveness for other businesses, i.e. through the increased productivity of their workers which is not passed on in the form of higher wages.¹⁷

The NAO (2012a/b), when estimating the wage and employment premia associated with Apprenticeships include additional benefits, besides individual wage gains, as well. The study assumes that spillover productivity benefits are equivalent to 25 per cent of the wage premium (less than the gain implied by Dearden *et al*) so that total productivity is assumed to increase by 25 per cent more than the wage premium alone as a result of Apprenticeships. The NAO reason that if training increases productivity such that employers are willing to share gains with employees in the form of wage increases then the total improvement in productivity must be at least enough to cover the non-wage labour costs as well. This 25 per cent figure is considered to be the lower

17 Other benefits which the CE / IER report notes are those to the Exchequer which include increased future tax receipts (income tax, NIC, VAT, and corporation tax) and reduced benefit payments from increased employment. The central estimate of the value of FE to the economy is £75 billion.

bound of the estimate of productivity spillover effect. The report also presents a sensitivity analysis in which the estimated returns to Apprenticeships are recalculated assuming that the productivity gain for employers is 50 per cent of the wage premia, rather than 25 per cent. As a result, the estimated return on each £1 of public funding increases from £21 to £26 for Advanced Apprenticeships, from £16 to £19 for Intermediate (Level 2) Apprenticeships; and from £18 to £22 for all Apprenticeships combined.

3.2.3 Summary of findings related to non-earnings benefits of learning

Consideration of wider returns to learning is important in evaluating the overall economic value of HE, FE and Skills as excluding the benefits to employers (and more widely) will most likely result in underestimation of the productivity-enhancing effects of different forms of education and training.

The wider, non-earnings benefits that arise from learning which are included in estimates of the returns to education and training vary across studies of different programmes and educational systems. The focus in this review has been on the non-earnings related benefits like those explored by Dearden *et al* (2005). Overall there is robust evidence indicating the existence of non-earnings related benefits to the employer (increased productivity) but there is a limited amount of evidence for the UK, beyond Dearden *et al*, which quantifies such effects and how to precisely derive the effects on employers from the observed earnings effect of training/education. The study by Dearden *et al* however has its limitations including that they consider only work-based learning and that their findings of a wedge between productivity gains and wage increases is found only in lower skilled jobs.

Much research has provided evidence of there being important returns captured by employers as a result of the education/training of workers (e.g. Blundell *et al*, 1999; Hogarth *et al*, 2012) and these should be incorporated into estimates of the overall value of HE, FE and Skills (Blundell *et al* conclude that wage gains provide a lower bound on the total productivity gains stemming from training). There has been more difficulty however in quantifying/monetising such gains to employers and a number of estimates of the returns to FE and Skills, for instance, utilise sensitivity analysis to consider the effects of assuming different levels of employer gains as a percentage of the wage effects for employees (e.g. CE and IER, 2011; NAO, 2012). An often adopted assumption regarding this issue is that the overall productivity gain associated with training is equal to twice the observed increase in a worker's wages (Dearden *et al*) – implying that the gain for the employer is equal to the wage gain for the worker (Barron, Black and Lowenstein 1989; Blakemore and Hoffman, 1988). This assumption is particularly common in FE and Skills studies.

3.3 The persistence of benefits

The third issue considered in the present study is the persistence of benefits associated with different forms of learning. In reviewing relevant studies, questions which have been considered include: *For how long do the economic benefits of learning persist? How do the benefits of learning vary over the years following the achievement of a qualification? For example, do the benefits take a period after learning has been*

*completed to be realised?*¹⁸ *Do benefits decline over time as skills depreciate, or as non-learners 'catch up' through learning-by-doing?*

The persistence of the productivity and wage enhancing effects of HE, FE and skills is an important assumption underpinning any estimates of their economic value. Skills (obtained through different forms of learning) may deteriorate over time, particularly with technological development, and refreshing or upgrading of skills might be required just to maintain the earlier benefits afforded by a qualification. The pathway taken by an individual during their working life depends on the characteristics of the individual and the sector and occupation in which they work. Some individuals undertake further training/qualifications which may boost their earnings or allow them to enter higher level occupations. Others in the same sectors/occupations without the same qualifications may 'catch-up' over time as they gain experience and possibly undertake other training/education. Such trajectories are difficult to model but it is possible that some indicators of sector and occupation might enable a more accurate set of assumptions to be adopted regarding the relative premia over time.

3.3.1 Treatment in BIS estimates

In the current BIS estimates for both FE and HE, average wage and employment premia are assumed to persist at a constant level over time (allowing for discounting to present values), that is, there are constant, average wage returns until individuals reach retirement. In their impact of FE study, Cambridge Econometrics and IER (2011) use LFS estimates of wage and employment premia, which are calculated by looking at the earnings and employment rates of people at different ages who took qualifications at different points in the past (i.e. using cross-sectional data to create pseudo-cohorts). They then assume that the benefits of FE qualifications will persist for the rest of an individual's working life (based on a retirement age of 60 years for women and 65 years for men). They apply the same wage premia over the rest of this period and future benefits are discounted. In their study of the HE qualifications, London Economics (2011a) calculate lifetime earnings and employment premia in five-year bands and use these to calculate the lifetime benefits. Whilst these assumptions about persistence are reasonable given the way in which the wage premia are estimated and affords some simplification to calculations of future and lifetime returns, reviewing other approaches might provide further insights.

3.3.2 Findings from the literature

In this section a number of studies are discussed which are relevant for considering the persistence of the returns to different forms of learning. In the first sub-section, research that looks at the timing of returns and how long returns might be expected to persist is considered. In the second sub-section, the assumptions regarding the timing

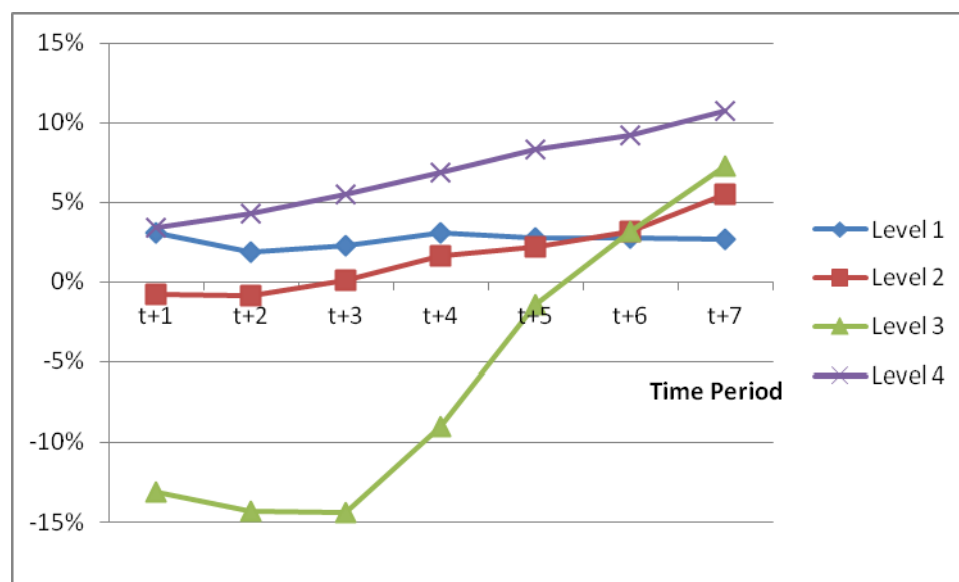
18 Hanushek (2009) reasons that the human capital and investment model indicates that the substantive issues are those related to long term outcomes with the future income of an individual being a function of their past investments in human capital (through education/training) and that their income in whilst studying or in their first job does not capture fully the lifetime benefits. ,'

and persistence of returns that are adopted in estimates of the returns to different forms of learning are discussed.

Studies considering the timing of returns and persistence

A recent BIS-commissioned report provides some useful insights into the issue of persistence of returns to education. London Economics (2011a) use matched administrative data on people's employment and earnings in order to consider the long run impact of vocational qualifications. Earnings premia and employment impacts are estimated for up to seven years after the attainment of the qualification. The authors conclude that the effects of vocational qualifications generally persist throughout the seven year measurement period, with the exception of Apprenticeships – although these decline from a high starting point and remain in excess of 10 per cent at the end of the seven year period. The nature of the returns varies by level of qualification as can be seen in Figures 3.1 and 3.2. For Level 3 and 4 qualifications¹⁹, earnings premia are found to be increasing between two and seven years after attainment whilst for Level 1 and 2 qualifications, the earnings premia are found to be relatively flat but persistent. This study provides more detailed information about the persistence of returns to vocational qualifications than most earlier work and presents an advantage in that the data used are longitudinal rather than pooled cross sections of different individuals at different ages (as used in other estimates, e.g. London Economics, 2011b, 2013).

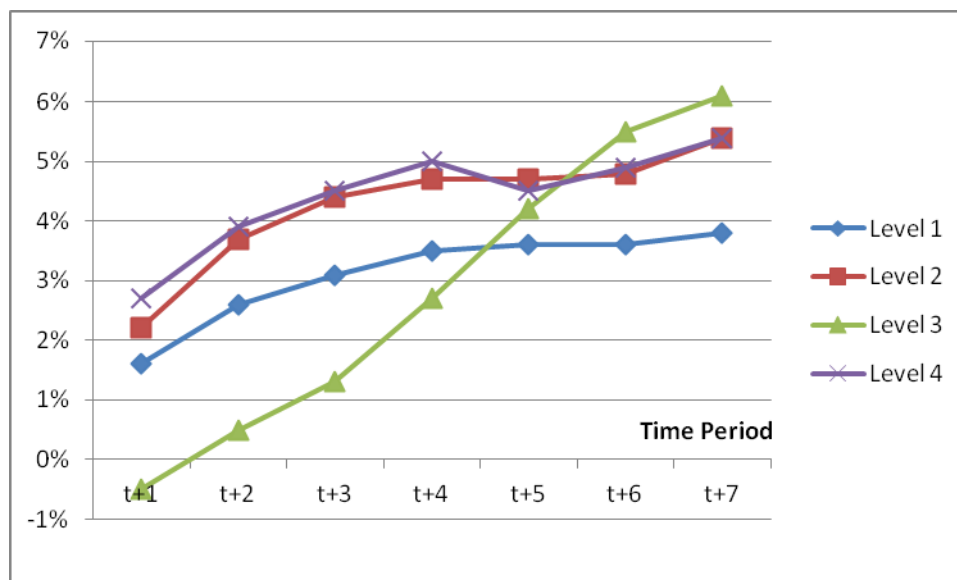
Figure 3.1: Wage returns to education and training in seven years post-completion (completers vs. non-completers – extended specification)



¹⁹ For Level 3, the estimated returns are negative in the years post-achievement. London Economics suggest that this may be because achievers are more likely to progress to further learning – including Higher Education – than non-achievers. The former are therefore more likely to do lower-paid part-time work alongside their studies, whereas the latter are more likely to go into better-paid full-time employment.

Source: London Economics (2011a), The Long Term Effect of Vocational Qualifications on Labour Market Outcomes, BIS Research Paper Number 45. Figure 10, page 49.

Figure 3.2: Employment returns to education and training in seven years post-completion (completers vs. non-completers – only specification)



Source: London Economics (2011a), The Long Term Effect of Vocational Qualifications on Labour Market Outcomes, BIS Research Paper Number 45. Figure 11, page 53.

A number of studies comment on or consider the time it takes for returns to qualifications to arise after their completion. In a review of international evidence on the returns to education, Psacharopoulos (1981) comments on the persistence and timing of returns to graduates. The sometimes observed period of unemployment immediately after graduation is likely to reflect the 'job search' process and thus Psacharopoulos argues that in estimating the age-earnings profile it would be misleading to reduce the entire profile by the average rate of unemployment that mainly refers to young people.

In looking at the benefits of NVQ2 qualifications, De Coulon and Vignoles (2008) also recognise that it may take time for the effects of a qualification to become fully apparent. This may arise because: individuals need to move to a new job in order to realise the full wage benefit of their increased productivity as a result of learning; it may take some time for an individual to improve their wages if they had to take time off or work less in order to undertake the qualification; and, if an employer met the costs of the qualification, then the individual's wages may be kept relatively low for some period in order for the employer to recoup some of the costs. However, they find that there may be a lag in the effect of lifelong learning but only for learning at Level 3 or above. Level 2 or lower qualifications are found to have insignificant effects on wages even when a time lag is included.

A study of the impact of vocational education on productivity in the US argues that the effect on workers' productivity (and wages) is only significant after many years (Uri, 1982). The study finds that correlations between productivity changes (in terms of GDP per worker hour) and vocational education (as measured by total vocational enrolments

in federally aided schools) suggest causality but only after a considerable amount of time, 10 to 20 years.

Blanden *et al* (2012) examine the returns to lifelong learning in the UK and how these arise over time (up to five years after completion of a learning event). They find for men that there are positive and significant returns to hourly wages in the second and fourth years after a lifelong learning event. The cumulative net return to a lifelong learning event becomes statistically significant after two years with the average net return being 3.6 per cent. This cumulative effect increases in each successive year until it reaches 8.9 per cent after 5 years. For women, they find a positive effect of lifelong learning on wages after 4 and 5 years. The cumulative effect after five years is 10.3 per cent.

Evidence of deterioration of returns to skills and education has also been found in some studies, most commonly in relation to vocational education and training. Robinson (1997), for instance, considers the labour market returns to academic routes in education compared to vocational routes. Men with trade Apprenticeships and C&G advanced craft qualifications are found to experience a deterioration in their relative earnings over time. The returns to academic qualifications are found to be greater than for their (notionally equivalent) vocational counterparts over the long run.

In an evidence review of the returns to education and training for individuals, the firm and the economy, Blundell *et al* summarise that several studies have found strong evidence that skills depreciate considerably over time (within about 10 years of acquisition of the skills) – this results in declining returns over time. They argue that vocational training, in particular, needs to be renewed in order to retain its benefits. Within the literature, they find that employer provided training has the largest impact on earnings and its effects are also the longest lasting (13 years versus eight to 10 years for training from other sources, based on US data). The initial effects of managerial and professional or technical training are typically larger but the earnings returns to semi-skilled training persist for longer (15 years versus 12 and 11 years respectively).

McIntosh (2007) cites a study by Ryan (2001) which found a positive employment effect in early working lives of former apprentices in France but also found that the wage effect after five years in employment was actually negative. Dupray (2001) also considers data from France and finds that there are differences in the erosion of returns to qualifications by firm size. He concludes that in large firms there is a gradual weakening of the returns to education for the individual over time as they are provided with other opportunities/advantages such as promotion, internal pay scales, and so on.

Jenkins *et al* (2007) consider how returns to Level 2 and 3 vocational qualifications differ according to when individuals acquired their qualification. Using data from the LFS between 2001 and 2006, they find that for most Level 2 qualifications (except BTEC and City and Guilds) the returns are higher if the qualification was acquired at a younger age. Similarly, for Level 3 qualifications, other than RSA, the returns are higher if acquired earlier in life rather than later.

Elias and Purcell (2004), using data from the Labour Force Survey, find that for men the gap between the earnings of graduates and qualified non-graduates grows over the 15 years after graduation whereas growth tails off for women about 10 years after

graduation. They find growth in graduate earnings in the 6 to 7 year period after graduation.

Migali and Walker (2011) look at the causal effects of education on earnings over the lifecycle. They note that many studies suggest that the effect of schooling is not linear and many more studies have shown that age-earnings profiles are not parallel across education levels (i.e. the pattern of earnings returns after completion varies across different levels of education). Migali and Walker find a convex earnings profile with earnings for men peaking at age 45 years when the college premium is around 40 per cent. For women, the peak is reached at age 26 years and the premium is more than 40 per cent. They also find that the age-earnings profile for NVQ4 is higher than for NVQ3 at all ages and that the higher level curve is steeper than that for NVQ3 at early ages for both men and women, suggesting that returns are greater at younger ages.

Approaches to the issue of persistence in estimates of the returns to learning

In relation to Apprenticeships, the NAO (2012a) also assumes that the higher wages associated with undertaking an Apprenticeship persist over the remainder of an individual's working life, based on the assumption that men retire at age 64.5 years and women at 62 years and that the average age of people finishing Apprenticeships is 32 to 33 years²⁰ (based on data in the Individualised Learner Record (ILR)). Though the NAO adopts the same assumptions regarding the persistence of returns as used in BIS estimates, different retirement ages are used in the two studies (reflecting the different times at which they were published).

In their estimate of the impact of FE learning, London Economics and Ipsos MORI (2013) adopt the assumptions used by London Economics in their 2011 study of the returns to intermediate and low level vocational qualifications that the labour market returns are generated over an individual's entire working lifetime. The lifetime earnings premium is obtained by estimating the returns in five year age bands and by assuming particular starting ages and duration for various levels of qualification. An analogous approach is used by London Economics (2011b) in their study of the returns to HE.

CE/IER (2013a) review the economic benefits of training and qualifications found in previous studies and note several issues relating to the persistence of the benefits of different forms of learning. They suggest that a lifecycle approach may be appropriate for qualifications which are required to access particular professions but for many other qualifications the returns can be expected to diminish rapidly. The latter may hold true particularly so for jobs where the qualification is used mainly as a signal initially but where progression later on is determined mainly by other factors. They caution that when considering the persistence of the returns to education and training, if information

20 Two distinct groups of apprenticeship should be noted: those entering Apprenticeships straight from school; and those who are older experienced workers who are often already employees when they start their Apprenticeships. To merge the two groups (and to rely on the average age of completers) is potentially confusing and will under-estimate the true impact of Apprenticeships for the larger, younger group.

is not available on whether a learner went on to gain subsequent qualifications then the estimated returns may overstate the value of the initial qualification.

3.3.3 Summary of findings related to persistence of returns to learning

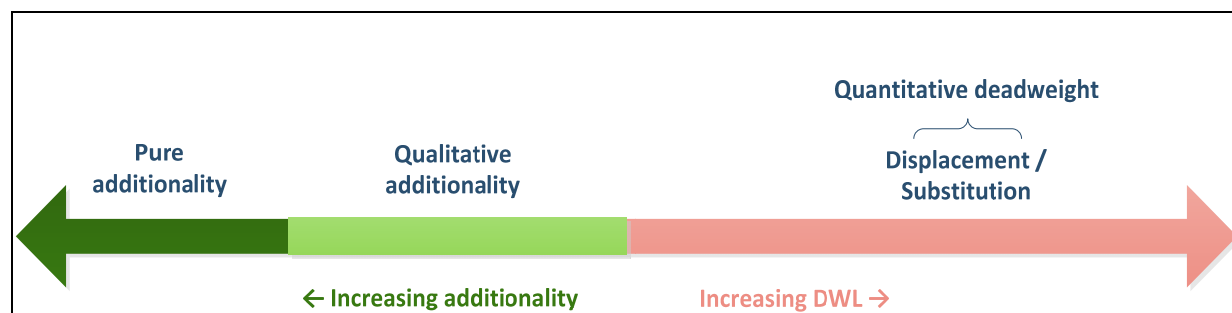
A commonly used assumption in estimating the total value added by different forms of learning has been that the returns to qualifications and different forms of learning persist over an individual's working life (which can be calculated in various ways), however several studies suggest that perhaps it is too simple to assume that gains are achieved by former learners immediately upon completion of a learning event or achievement of a qualification and that returns do not vary significantly over the lifetime. A number of studies indicate that the returns, particularly to FE and vocational education and training, are not obtained immediately upon completion of a qualification (e.g. Hogarth *et al*, 2012) and it may take time for the benefits of learning to become significant (e.g. De Coulon and Vignoles, 2008). Psacharopoulos (1981) also comments on the persistence and timing of returns to graduates noting the importance of considering 'job search' after graduation when estimating the age-learning profile.

Much of the existing evidence finds that returns to different forms of learning do persist over a considerable period, though a number of studies have found evidence of deterioration of returns over time, particularly for vocational training (e.g. Robinson, 1997). A recent BIS report by CE/IER (2013a) suggests that longitudinal data constructed from administrative records – looking at how returns to vocational qualifications vary in each of the seven years after completion – currently provides the best opportunity for estimating the persistence of returns to education and training, and suggests that returns generally persist over the seven year measurement period. Whilst that study refers mainly to analysis of FE, the usefulness of longitudinal data (based on administrative data) is more generally applicable to other forms of learning too. As more data becomes available longer periods of measurement can also be examined.

3.4 Additionality and deadweight loss

The fourth issue considered in this review concerns how deadweight, displacement and substitution associated with public investment are treated in estimates of the economic value added of different forms of learning. The key question is *how should allowances for deadweight, displacement and substitution be factored into the estimates – to demonstrate the additionality of public funding?*

Before considering the evidence related to this issue, it is imperative to first define deadweight loss (DWL) in the context of considering the returns to HE, FE and skills. Deadweight indicates the extent to which the privately funded training/education would have taken place anyway in the absence of the government investment. London Economics (2012b) derived a spectrum for considering deadweight, shown in figure 3.3 below:

Figure 3.3: Spectrum of deadweight loss and additionality

Source: London Economics, 2012b (Figure 1)

At one end of the spectrum, *pure additionality* or *quantitative additionality* refers to training (or other forms of learning) received by individuals that would not otherwise have received any training in the absence of government funding. *Quantitative deadweight* is captured at the opposite end of the spectrum and may take the form of *displacement* (when those individuals that would have received some comparable form of training receive publicly funded training instead) and *substitution* (when there is a change in the profile of the employees that receive training). To illustrate substitution, one can consider the case where without public funding, older workers might be trained by employers but with full State funding for 16 to 18 year olds (and less or no funding for older workers) the employer provides less training to older workers and more of the younger group receive training under the publicly funded programme. In other words, some workers that would have received privately funded training do not receive any training and are replaced by other workers undertaking publicly funded programs (who would not have received any training otherwise). *Quantitative DWL* represents the total crowding-out effect on privately funded training and is equal to the sum of displacement and substitution. Although within quantitative DWL the skills of some individuals increase, in total across all individuals, there is no net increase in the level of skills acquired (although there may still be a rationale for government intervention in these circumstances).

Between the two ends of the spectrum is *partial or qualitative additionality* which refers to the case when publicly and privately funded training are not perfect substitutes for each other. Public training may deliver a higher level of qualification or higher quality training than would otherwise occur. This is captured by qualitative additionality and the training that is replaced is referred to as qualitative deadweight loss.

Given the different emphasis of the analysis of the returns to FE compared to the focus of analysis of HE (with the focus being much more on the individual for the latter) and the different approaches to public funding in each system, such issues are largely not considered in the HE returns literature whilst it is becoming an increasingly common feature in studies of FE and skills interventions. This difference in the consideration of deadweight between the types of learning may have much to do with the greater involvement of employers in FE and skills programmes, most noticeably Apprenticeships. Studies that consider the private returns to education and training are not typically concerned with the level of deadweight loss arising from public funding of different forms of learning. Unsurprisingly, discussion of deadweight loss and associated issues of additionality, displacement and substitution, are most common,

and pertinent, in studies concerned with the returns on public investment in education. It can be argued however that deadweight is equally relevant to HE. If some learners would be willing and able to pay upfront for learning themselves in the absence of government funding and (government-sponsored) student loans, then the economic value added of public investment could possibly be reduced.

A wide range of recent studies are now beginning to reveal a degree of consensus in their findings with regards to the degree of deadweight loss but there are a number of caveats attached to existing estimates, with the main issue being that it is exceedingly difficult to ensure appropriate groups are being compared. CE/IER (2013b) considers various aspects of estimating deadweight and additionality associated with Apprenticeships and makes recommendations about the data required to derive these measures more accurately and to overcome some of the limitations of existing evidence.

3.4.1 Treatment in BIS estimates

Current figures for the overall returns to FE and skills are typically presented gross of deadweight though an estimate of deadweight of 30 per cent (as estimated by London Economics, 2011) is often presented alongside the estimates. Additionality and deadweight are not generally considered in estimates of the returns to HE, with the focus being placed primarily on the value of the educational investment to the graduate.

3.4.2 Findings in the literature

In this section, estimates of deadweight (and related issues such as additionality and substitution) in the literature are first considered. This is then followed by discussion of evidence that illustrates how the overall returns to different forms of learning are affected by deadweight.

Studies estimating deadweight loss and additionality

A number of recent studies sponsored by BIS have considered the level of deadweight loss associated with public funding for different forms of learning. London Economics (2012b) estimate the deadweight loss associated with public investment in FE and skills. They use data from the 2009 National Employer Skills Survey (NESS09) and propensity score matching in order to estimate quantitative deadweight and additionality attributed to Train to Gain and Apprenticeships. In other words, they match firms with Apprentices to similar firms without Apprentices, based on observable characteristics, and assess the privately-funded training undertaken by each. There are a number of limitations on these estimates, which London Economics notes, including: the difficulty in identifying the treatment and comparator groups of firms; and the unrefined nature of their measure of training activity. Despite these limitations, London Economics estimates that deadweight loss is equal to 28 per cent of training undertaken through public funding (and thus additionality is 72 per cent of training through public funding). In other words, in the absence of publically-funded Apprenticeships, 72 per cent of apprentices would not have received any training (excluding induction and Health & Safety training). The remaining 28 per cent received some training, although not necessarily of the same quality – publically-funded Apprenticeship training could still represent qualitative additionality for some of these

learners. The London Economics estimate of DWL is commonly referred to and adopted in other studies of FE and skills in England.

London Economics also found that the extent of deadweight loss increases with apprentice's age. Deadweight loss is found to be 16 per cent in firms that offer Apprenticeship training to only 16 to 18 year olds; 27 per cent where apprentices are only 19 to 24 years old; and, 44 per cent for those aged 25 years and older. This variation by age largely reflects the different levels of funding provided for different age groups. They note that without employer-employee data however, there is likely to be an overstatement of deadweight loss and an underestimate of additionality. Furthermore, the estimates also do not consider the extent to which workers received better quality training as a result of public funding.

CE/IER (2013b) reviewed relevant literature and available data for the analysis of additionality in Apprenticeships. They also used data from EASE2011 and NESS2009 to carry out further analysis, of deadweight loss and additionality by framework and they also used data from NESS2009 (follow-up survey) that includes information on expenditure on training. In adopting the same approach as London Economics, CE/IER arrive at estimates of additionality and deadweight loss for 'all frameworks' that differ slightly from the respective estimates in the LE report. The CE/IER estimate of deadweight loss is higher (36% compared with 28%) but they suggest that the differences are likely due to differences in the two analyses with regards to 'data cleaning.'

Another approach to assessing deadweight is the use of self-reported attitudes and reactions to the costs of learning from the perspectives of learners and employers. London Economics and Ipsos MORI (2013) broadly suggest that the extent of deadweight loss increases as the qualification level increases. Their measure of deadweight is based on responses of 4,000 FE learners to a survey in which they were asked what they would have done if they had to pay for their training themselves or where they had contributed to the cost, how this had impacted on their actions (e.g. in terms of course choice). They estimate deadweight loss to be 60.9 per cent overall (65.3 per cent for men and 57.8 per cent for women). They find that 30.2 per cent of training overall was additional (26.7 per cent for men and 30.3 per cent for women additional). The remaining 9 per cent was considered to represent partial additionality.

In the evaluation of Apprenticeships survey of employers, IFF Research and IER (Winterbotham et al., 2012) also calculate the level of deadweight loss associated with government funding of Apprenticeships on the basis of employer responses about their reactions to having to pay for the programme (fully or partially). In the survey, those employers who had taken on apprentices aged 19 years or over at the start of their training were asked a series of questions about whether they would still have engaged in this form of training, the number of apprentices they would have taken on, and the likely impact on their business of needing to meet increased costs of training. They were asked to assume that 16-18 year-old Apprentices remained fully-funded. In response to bearing the full costs of Apprenticeship, 17 per cent of employers indicated that they would have still taken on apprentices aged 19+. With lower costs (equal to 50 per cent of the fees), 29 per cent would have continued training apprentices aged 19 plus. It is the Apprenticeships provided by these employers that accounts for the

deadweight loss arising from Government funding of the programme as this training (or at least some of it) would have taken place without any funding or with less than current levels of funding. With employers bearing full costs of Apprenticeships, the number of apprentices aged 19 years and older would be (according to the employers' responses) 85 per cent lower whilst with half fees the reduction would be 73 per cent.

In the Fifth Net Benefits of training study (Hogarth et al, 2012) which considered Apprenticeships and other forms of workplace learning, employers were also asked about their likely responses to reductions in state funding for training. Given the small number of employers involved in this study, the findings on additionality and deadweight are more qualitative in nature than those found in larger surveys. At one end of the spectrum, some employers indicated that in the face of increased costs (as a result of less government funding) they would continue to train much the same as currently but they would look for efficiency savings in delivery of training. Employers in engineering and construction tended to report such views. At the other end of the spectrum, where employers were less committed to training and mainly did so to boost morale, reward employees, and improve staff retention, employers were more likely to suggest that they would greatly reduce or completely disengage from such training if there were less or no funding from government. This type of engagement was more prominent in transport, retail and hospitality.

In the evaluation of Train to Gain (IFF/IER, 2010), the additionality effects associated with funding of the programme and the Train to Gain skills brokerage service amongst employers were considered. In the Sweep 1 evaluation it was found that amongst provider-led employers, 33 per cent of employees who undertook Level 2 qualifications within the programme would have been provided with such training even in the absence of public funding. In the Sweep 5 results, the study (based on a survey of employers) found that for broker-led employers 24 per cent of employees who studied at Level 2 would have done so even in the absence of public funding.

Whilst providing some insight into individuals' education investment decisions, such self-reported data has some limitations. Individuals' reported willingness to pay will likely differ if asked after their training has taken place compared to if they were asked before participating. After completing learning they would be aware of at least some of the benefits resulting from obtaining their qualification thus they may reflect this in higher levels of willingness to pay than if they were asked beforehand. As with all self-reported, subjective measures, these indications of willingness to pay for FE are based on individuals' perceptions rather than observed behaviour – learners indicate what they would like to do which may differ from their actual behaviour if required to pay for education or training. Additionally, in the survey of FE learners, when considering willingness to pay for education, the level of payment that may be required varied across individuals. In the main, they were asked about responses to relative levels of costs (i.e. 10 per cent increase in what they already pay) but the starting level of what they pay currently varied within the sample – a 10 per cent increase for some respondents would be much greater than for others in absolute terms). The responses of learners to increased costs of FE were also only garnered from those who paid at least some fees already (around 30 per cent of the eligible sample).

The evidence provided by the above studies is limited as it is based on employers' and individuals' perceptions rather than more objective indicators of costs and training numbers, such as the NESS analysis which is based on observed behaviour. The views of individuals (learners and employers) are naturally subjective. Respondents, particularly employers, may feel it is in their interests to say that they would not undertake learning in the absence of government funding for fear of losing what is already provided. Conversely, they may also indicate a willingness to pay where they have previously undertaken training and have experienced the benefits – as a result they may overestimate their real willingness to pay as it based on retrospective views. Despite the limitations, surveying employers and individuals to gauge the level of deadweight associated with government spending on different forms of training can provide a practical means of collecting such evidence and in some cases it is the only means available. Such results can offer useful insight into employers' likely responses in different scenarios but these cannot be regarded as a definitive guide to what the results would be in practice were such scenarios to be realised.

CE/IER (2013b) consider evidence from outside the UK regarding additionality of Apprenticeships. They find relatively little evaluation evidence from abroad. In studies from other countries, where employers are engaged in training, much of the effort has focussed on identifying the costs incurred by employers and the extent of recovery of these costs. CE/IER suggest that one reason for this apparent lack of estimates of the DWL and additionality of Apprenticeships and training in countries such as the Netherlands, Germany, and Switzerland is that these programmes are deeply embedded within the social contract so that there is not a great deal of interest in testing what would occur if there were less public funding or none at all.

3.4.3 Summary of findings related to additionality and deadweight

Studies that consider the private returns to education and training are not particularly concerned with the level of deadweight loss. Unsurprisingly, discussion of deadweight loss and associated issues of additionality, displacement and substitution, are most common, and pertinent, in studies concerned with the returns on public investment in education.

A wide range of recent studies are now beginning to reveal a degree of consensus in their findings with regards to the degree of deadweight loss but there are a number of limitations associated with existing estimates of additionality and deadweight - the main issue being that it is difficult to use the appropriate comparator groups in practice. The level of deadweight loss utilised in a number of UK studies is that obtained by London Economics (2012b) – deadweight loss is found to be equal to 28 per cent of training (Apprenticeships). A study by CE/IER (2013b) considers various aspects of estimating deadweight and additionality associated with Apprenticeships and makes recommendations about the data required to more accurately estimate deadweight and to overcome some of the limitations of existing evidence.

3.5 Option value of progression to further learning

A further methodological issue considered in this review is the option value of learning and how this should be factored into the estimates of the economic value added of

different types of learning. In this context, the option value of learning refers to the extent to which learning facilitates progression to further learning and to the associated benefits. When considering this issue, it should be noted that further learning could be formal (i.e. resulting in acquisition of a qualification) or informal in nature and also progression may not be linear but individuals may move into further learning through vertical (to a higher level of learning) or horizontal (learning at the same level but in a different field) pathways.

To illustrate this concept, one can consider English and maths training for adults where the training/qualifications received through the programme are considered to have enabled individuals to undertake other qualifications and training which they otherwise would not have been able to access. Without this training, individuals would not have been in the position to benefit from the subsequent qualifications they obtained. If considering just the returns to these subsequent qualifications then these would also incorporate the value of the English and maths training.

Attributing all of the gains arising from further learning and progression to a particular qualification overestimates the effect of that initial qualification. Where this progression is only possible due to the earlier qualification however then at least some of the ensuing benefits should be ascribed to it. From a slightly different perspective, if one considers only the highest qualification held by a person when estimating a wage equation then the value generated by earlier, lower level qualifications will be attributed only to the highest qualification and thus the returns to this qualification are likely overstated. The treatment of this issue affects in the econometric specification of the wage equation.²¹ If the option value of different qualifications are not considered to be of interest then including only a person's highest level of attainment in the earnings function might suffice as this will capture the effect of education on earnings but the estimated effect of this highest qualification will capture the effects of all previous levels including their effects on permitting progression to higher levels and their impacts on wages more directly. If the option value and the individual contributions of all (or at least some other) levels of education are considered to be of interest then the wage equation can be expanded to include indicators for each qualification held by an individual. The coefficient on each of the qualification variables will then reflect the additional returns specifically associated with each qualification and these returns will be cumulative across a combination of qualifications held by an individual.

The concern is that if one considers only 'marginal' returns²² (i.e. those obtained when a qualification is the person's highest held) then this would overstate the returns to higher qualifications and understate the returns to lower qualifications that are held. If looking to maximise the return on public investment in education by investing in those

21 Within earnings equations, other control variables such as tenure, age, indicators for off-the-job and on-the-job training participation, and other factors help to isolate the effects of education/qualifications on earnings.

22 In this section, marginal returns refer to the returns where a qualification is the highest held by an individual. In this report, 'marginal learners' are discussed where the returns refer to a different concept – they are the returns to different types of learner or to the learner who is different between undertaking studies or not.

qualifications which generate the greater returns then there is a risk that there would be under-investment in lower level qualifications which could inhibit participation in the 'high-return' higher ones.

Progression as a benefit in and of itself is also relevant in assessing the value of qualifications. Policy related to Apprenticeships, for instance, considers the possibilities for progression onto Higher Education and further learning as well as career progression pathways for former apprentices as one of the indicators of value. English and maths can also open up opportunities for further training and education which can lead to greater employment and earnings opportunities. The question arises then as to how the overall benefit should be ascribed to the highest qualification versus to intermediate qualifications which allowed entry into higher ones. Here we consider how existing studies have dealt with this 'option value' and where the impact of progression to further learning is noted.

3.5.1 Treatment in BIS estimates

To date, the estimates of the value of HE, FE and Skills do not incorporate estimates of this 'option value.' The FE Economic Impact model does offer the option to include progression benefits (i.e. the expected value of an achiever using his qualification to continue onto another qualification), but at present, any assumptions about the magnitude of this factor would be relatively arbitrary. This could account for instance, for the benefit accrued due to the fact that a learner achieving a Level 2 qualification can then progress to, and gain the benefits from, a Level 3 qualification. A 'progression factor' is a ratio applied to the NPV per achiever of a particular qualification which takes account of the additional value of progression. This factor is calculated based on the assumed probability of continuing to a higher qualification level, the maximum time horizon after qualifying up to which an achiever is assumed to have made the decision to progress to the higher level qualification or not, the assumed type of probability distribution and the discount factors for each year. A number of arbitrary assumptions would currently be required to populate these, given the gaps in the evidence base.

There has been more consideration of progression to higher qualifications or further learning and training as an outcome or benefit for individuals in itself. Studies indicate that previous learning/training and qualifications tend to have a positive impact on the likelihood of progression onto further learning. There is also evidence of individuals with higher educational backgrounds having more opportunities for future human capital investments, particularly work-related training. The importance of this issue depends largely on the purpose for which estimates of the value of learning are being used.

3.5.2 Findings from the literature

In this section the discussion of findings in the literature is divided into two sub-sections. In the first, studies which consider the incidence of progression to further learning and this progression as an outcome are explored. In the second sub-section, the discussion turns to literature which explores the 'option value' of progression more directly (though in a limited way), as discussed above.

Progression as an outcome

A number of studies have considered progression onto further learning as an outcome in its own right and indeed there is interest in promoting progression of individuals to higher qualifications. In their review of macroeconomic studies of the returns to education, Sianesi and Van Reenen (2003) note that the role of training in economic growth and the connected relationships between the level of education and subsequent investments in human capital on the job are largely ignored. The microeconomics literature however does provide a significant amount of empirical evidence in favour of the predication that more highly educated individuals also enjoy enhanced work-related training later on in working life. Human capital theory predicts that individuals with higher levels of education have greater incentive and are afforded more opportunities to accumulate further human capital through on-the-job training.

Sabates *et al* (2007) consider various progression pathways using data from the National Child Development Survey (NCDS) and the British Household Panel Survey (BHPS). They find that 15 per cent of adults who had no qualifications or Level 1 qualifications in 1991 progressed to qualifications at Level 2 or above by 2003. Amongst those who had a Level 2 qualification in 1991, around 18 per cent went onto achieve a subsequent higher qualification (half at Level 3 and half at Level 4 or higher). Overall they found that prior learning and learning in both childhood and adulthood are important predictors of progression to Level 2 qualifications (for those with Level 1 or less qualifications).

De Coulon and Vignoles (2008), in considering the benefits of NVQ Level 2 qualifications, find that individuals who undertook accredited learning in the 1996-2000 period were more likely to undertake subsequent learning in the later period of 2000-2004. This was found for all levels up to Level 4. Those who gained a qualification in the early period at Levels 2 and 3 (excluding NVQ2) were also more likely to undertake non-accredited learning in the subsequent period. For those who obtained an NVQ2 qualification in the period 1996 to 2000, they were 40 percentage points more likely to acquire another qualification in the second period. In comparison, other qualifications at Level 2 were associated with probability of gaining a subsequent qualification that was only 17 percentage points higher.

London Economics & Ipsos MORI (2013) do not directly account for progression effects, or for the benefits arising from progression possibilities presented by particular qualifications but in their literature review they find that individuals in possession of qualifications were more likely to undertake additional learning compared to those who did not possess formally recognised qualification and that the effect increases with qualification level. Individuals in possession of academic qualifications were found in the literature to be increasingly likely to go on and attain additional academic qualifications (compared to individuals in possession of no formal qualifications), and less likely to complete vocational qualifications. Their review also indicated that individuals with low level vocational qualifications are less likely to undertake academic qualifications (compared to those with no formal qualifications).

Studies discussing the 'option value'

Dickson and Harmon (2011) cite studies by Melnik *et al* (1973) and Heckman *et al* (2008) which consider the option value of education. They do not present empirical

evidence on this issue but rather discuss how it might arise. They consider this option value to arise due to 1) the non-linearity of returns to education whereby an additional year of education gives the option to progress onto a further level of education which may attract higher returns; and 2) the additional year of education permits an individual to observe more about the returns available in the labour market and about their own ability – this information reduces their uncertainty about returns to future levels of education.

Beyond studies which consider the effects of education on subsequent training and education participation, there are some studies which consider the separate effects of qualifications held by individuals and (indirectly, most often) the ‘option value’ of different forms of learning. They focus on the *benefits of progression* rather than the impact of learning on progression. Robinson (1997) compares labour market returns to academic routes in education compared to vocational routes and estimates the extra pay obtained from progression onto the next level of qualification in vocational and academic routes. He finds that in VET, men who progress to a HND/HNC from holding an OND/ONC experience an 11 percentage point increase in pay (compared to those who do not progress). A notionally equivalent progression in an academic route, from holding two A-Levels to obtaining a first degree results in a 16 percentage point increase in pay. Dickerson (2005) similarly considers each level of qualification held by individuals (using LFS data to study rates of return to investment in Level 3 and higher qualifications). He expresses some concern regarding the labour market value of lower level qualifications, especially vocational ones suggesting that low level qualifications should be used as stepping stones onto higher qualifications rather than as end points in learning. The main value then attributable to lower level qualifications is likely to be in the options which they present for progression onto further qualifications and learning more generally.

McIntosh (2004, 2007) also notes that it is important to consider the relative likelihood of apprentices having other qualifications. If an apprentice is more likely to hold particular other qualifications then the higher wages of former apprentices could be due to the impact of those other qualifications and not to the Apprenticeship itself. As a result, McIntosh argues that it is important to control for all other qualifications held, which is possible using LFS data. When all qualifications held by an individual are included in the specification of the wage equation, rather than just the highest qualification held, the coefficients on each qualification represent the additional returns that are acquired by possession of each respective qualification and the effects are cumulative across any combination of qualifications held by an individual.

London Economics (2011b) present estimates of both marginal and average returns²³ to HE qualifications. The marginal earnings estimates indicate the returns associated with a particular qualification when it is the highest held by an individual. The average return associated with qualifications indicates the return associated with the qualification for anyone in possession of that qualification (irrespective of whether it is their highest level of qualification). They report the marginal earnings return to an

23 See previous footnote.

undergraduate degree (compared to 2 or more GCE 'A' Levels) to be around 27 per cent. The average return to an undergraduate degree is estimated to be 22 per cent (across the entire sample). In a review of previous BIS-commissioned studies of the economic benefits of training and qualifications, CE/IER (2013a) discuss how qualifications which enable progression to further learning are likely to be associated with a particular pattern of future earnings – i.e. negative or lower returns whilst individuals progress to the next qualification level and positive or increasing returns thereafter. They also note that attempting to incorporate variable returns to education over an individual's working lifetime adds considerable complexity to the model framework and increases data demands. The CE/IER FE impact model however does factor in at least some element of progression (as discussed above).

3.5.3 Summary of findings related to 'option value'

There is little explicit accounting for the 'option value' of particular qualifications, as conceptualised here, in the literature. Some studies consider marginal returns to qualifications - the returns are estimated where a particular qualification is the highest held by a person. Other studies consider the returns to a particular qualification irrespective of the other qualifications held by the individual. A number of studies account for all levels / types of qualifications held in order to recognise the separate contributions of each qualification to overall returns (e.g. Dearden *et al*, 2002; McIntosh, 2004; Blundell *et al*, 2005) and some have considered the incremental increases in wages arising from progression to the next level of learning (e.g. Robinson, 1997).

A number of studies comment on the implications of particular qualifications for progression onto subsequent learning and on how this has a value in itself (e.g. Dickson and Harmon, 2011). There has been more consideration of progression to higher qualifications or further learning and training as an outcome or benefit for individuals rather than considering how the value of progression can be factored into the overall impact of particular types of learning or education. Studies indicate that previous learning/training and qualifications tend to have a positive impact on the likelihood of progression onto further learning (e.g. De Coulon and Vignoles, 2008; London Economics and Ipsos Mori, 2013). There is also evidence of individuals with higher educational backgrounds having more opportunities for future human capital investments, particularly work-related training. Considering the more qualitative aspects of progression (e.g. common pathways, directions) as well as the interest of learners to undertake further learning is important.

3.6 Past benefits as a measure of future benefits and the difference between returns to marginal and average learners

Whether the benefits of qualifications undertaken in the past provide a reasonable indication of the likely benefits of those currently being undertaken and those obtained in the future is another issue considered in this review. Whether there have been changes in the returns to education over time and whether the returns to specific qualifications can be assumed to be the same in the future as they have been in the past and are currently is also an important question, particularly in light of expansion in HE and FE (particularly in Apprenticeships) in recent years. Given the substantial expansion of participation in HE and FE and the substantial public investment entailed

in this expansion, there is, unsurprisingly, a need to ensure that the returns to HE/FE are holding up as this helps to reflect whether supply is in sync with demand for skills.

Though there is some scepticism about recent cohorts compared to earlier graduates, most of the evidence reviewed suggests that the returns are standing up despite massive expansion and, though this should be interpreted carefully, demand is keeping up with supply. Sustaining the return to HE in future is then contingent on the demand for workers with HE qualifications keeping pace with the supply of graduates – the same is required for FE learning and other Skills programmes. When considering expansion, it is important to distinguish between growth in numbers *per se* and the nature of any growth e.g. could any change in returns simply be driven by the subjects in which that growth occurs, and the fact that the growth areas change the composition of the cohort of learners?

It would be of much value to continue to monitor more recent and future cohorts of graduates and other learners to evaluate whether returns look set to fall with changes to the scale of educational programmes and with changes to the economy itself. Future studies should ensure that the latest evidence on returns for recent graduates/learners is considered, particularly when examining the possible future returns.

Related to this issue, is the question of the value of education/training for the *marginal learner* versus the *average learner*²⁴. The returns to the marginal learner (i.e. the next individual who undertakes a particular qualification) may be different from the returns to the average learner (i.e. average person who has undertaken the qualification in the past). Different returns may accrue to such different learners as well as to learners from different groups. Average returns tend to be most commonly reported but many studies highlight possible differences in the returns to learning for different groups or types of individual. Many note the importance of considering the returns to different types of individuals (in terms of their human capital investment choices) and how the comparisons between groups matter for policy design. Where analysis has considered returns to both the average learner and the marginal learner (however defined), it is often the case that there are significant differences between the two. Significant differences in returns and outcomes which are important to consider particularly in formulation of policy aimed at improving the returns for certain groups or with increasing participation in learning by different groups.

3.6.1 Treatment in BIS estimates

In the current BIS estimates of the economic value added by FE, it is assumed that the benefits stemming from current qualifications are an average of those taken in the past and the benefits for the marginal learner are assumed to be the same as for the average learner (CE/IER, 2011). The estimates for HE adopt the same assumptions in relation to these issues (London Economics, 2011). With increased supply of graduates and apprentices, is it reasonable to continue to make such assumptions? Given significant increases in the supply of qualifications, it is plausible that the returns have

24 Not to be confused with marginal returns and average returns (as discussed in the previous section).

decreased or will do so in the future. A number of studies suggest however that the graduate premium has been holding up despite rapid expansion of the HE system.²⁵ Concerns over the quality of qualifications with such high learner volumes, particularly for Apprenticeships with expansion having been concentrated amongst older apprentices and in non-traditional Apprenticeship sectors, may also add weight to the argument that the returns are no longer the same as say, 10 years ago. If employers perceive recent qualifications to be lower quality then they might reduce the wage premia they are willing to pay for these qualifications.

3.6.2 Findings in the literature

The two issues explored in this section are discussed in turn below. Firstly, findings from the literature on changes in returns to different forms of learning over time are presented. One particular area of interest in this section of the literature is the graduate earnings premium and how this has fared in the fact of HE expansion. Studies considering the second issue, the returns to marginal learners and average learners and how these compare, are then discussed. The discussion of this issue highlights the importance of accounting for heterogeneity when considering the returns to different forms of learning.

Returns over time – are earnings premia holding up?

All else equal, the wage returns to different qualifications or types of learning are determined by supply and demand. The number of people in the labour market holding a particular qualification and the prevalence of jobs which require this qualification both affect the returns observed in practice. Over time, the returns to qualifications may change as a result of changes in either or both demand and supply. Whether the returns have changed over time can thus indicate something about the balance between the supply of and demand for particular qualifications. In England over recent history, the supply of some types of learning such as NVQs and Higher Education has increased. If demand has remained unchanged, this increase in supply, all else equal, would be expected to result in lower returns to such qualifications. Similarly, if technological change results in low skill jobs becoming obsolete then the returns to individuals with such qualifications required by these jobs would be expected to decline, all else equal.

In relation to the past reflecting current and future returns, Keep *et al* (2002) highlight the limitation that all rates of return analysis necessarily rely on data from the past and therefore show the rate of return that has been obtained after completing a qualification but not in the current period (as data are not available for the present). They note that as with all financial investments, past performance may not necessarily be a good prediction of paybacks in the future and changes such as the underlying market conditions may alter the rate of return markedly over time. The use of past data

25 Analysis by Elias and Purcell (2004, 2005) suggests that whilst the graduate earnings premium seems to have held up over time, there are indications that this is not necessarily continuing for more recent cohorts. Chevalier *et al* (2004) also suggests that returns have fallen for a recent cohort of graduates. Walker and Zhu (2013) find no significant difference in graduate earnings differentials associated with expansion of HE.

however is not something that can practically be resolved and so the best approach to account for this shortcoming is to consider how returns to education might change over time.

There is some evidence which suggests that returns to education (university, in particular) may be falling over time. An international review of evidence carried out by Psacharopoulos (1981) suggests that as countries develop and expand their educational systems, the returns to education are falling, though not to a large extent. He notes that the evidence shows that the returns to education do fall as a country passes from one stage of development to the next (and the associated expansion in the educational system this entails). He cites evidence that in the US the returns to education fell between 1939 and 1976 to only a limited extent. He suggests that the demand for educated labour has tended to keep pace with the rapidly expanding supply of such workers resulting in the returns to education holding near constant. Psacharopoulos' findings however need to be viewed in the light of the technical issues faced in most macro-level analyses which include differences in data quality, measurement and institutes across countries and over time.

Hansen (2006) finds a decrease in the returns to university graduates versus college graduates in Canada between 1992 and 2002. Migali and Walker (2011) estimate the returns to different NVQ levels and consider cohort effects using data from the UK. They find that the premia associated with NVQ4 versus NVQ3 qualifications (i.e. the college premium) are greater for the older cohort (1950-55 compared to 1960-65 cohort). The difference in the college premium for men and women also changes between the cohorts with the premium being higher for men in the older cohort but larger for women in the younger cohort.

In reviewing evidence on the returns to academic and vocational qualifications in Britain, Blundell *et al* (1999) note that the rates of return to education in the UK were higher than they had ever previously been just prior to the second world war. The returns then declined over the 1970s and rose again in the 1980s. These changes over time are attributed to the ever-changing interaction between the demand for and supply of workers of each qualification level.

Overall however the literature lends more support to the idea that the wage premium has been holding up over time. Considering evidence from the UK, Elias and Purcell (2004) compare survey data on 1995 university graduates to 1980 graduates. They find that the growth of earning for female graduates in the 6 to 7 years after graduation was higher in the more recent cohort whilst growth was similar for men in both cohorts. Vedder (2004), in a US study, also finds that returns to higher education have grown over time. He finds that median earnings of full-time male workers with four or more years of college increased from being 44.99 per cent higher than earnings for high school graduates in 1970 to 83.26 per cent in 2001. The increase has been smaller for women (from 56.16 to 73.62 per cent).

Most recently, Walker and Zhu (2013) employ data from the British Household Panel Survey (BHPS) and the LFS to consider the returns to university degrees. Whilst the authors indicate concern that expansion of the number of graduates in the 1990s may have resulted in a reduction in the graduate premium, they do not find statistically

significant differences between pre- and post-expansion cohorts. They note that the effect may be confounded with the effects of the recession which may have affected non-graduate earnings and so masked a possible reduction in the graduate premium.

In considering returns to academic and vocational qualifications, McIntosh (2004) also finds (remarkably) little variation in the return to qualifications over time – the returns obtained in 2002 are similar to those in 1996. McIntosh concludes that the increase in the proportion of the working age population holding some higher level, particularly academic, qualifications does not seem to have had a dampening effect on the returns to these qualifications. The main exceptions found in his study are the return to low grade GCSEs for women (declined from just under 10 per cent to zero over the 1990s) and the returns to the lowest C&G qualifications for men (fell to being insignificant by the end of the 1990s though they provided a small positive return in the early 1990s). McIntosh concludes that his findings suggest that the point where there are too many young people going into HE has not yet been met. Similarly, Dickerson (2005) finds no evidence to suggest that there is an excess supply of individuals qualified at Level 3 and above in the labour market in the UK but he does raise some concerns regarding the labour market value of lower level qualifications (which are insignificant or have fallen over time).

Jenkins *et al* (2007) consider the returns to vocational Level 2 and 3 vocational qualifications in England using data from the LFS between 1997 and 2006. They note that there are substantial year on year fluctuations in the returns which they attribute at least in part to the relatively small sample sizes available for many qualifications. They find that a number of patterns in the wage returns to certain qualifications are evident in the data and in particular, the returns to Level 3 qualifications appear stable over time. Despite the increase in NVQ qualifications over the period of their analysis, Jenkins *et al* note that no major decrease in the average returns to higher level vocational qualifications are apparent. They only observe a significant change in returns over time for two Level 3 qualifications – the BTEC and RSA – for which a decline in returns is observed. For the BTEC Level 3, they suggest that the decline in the marginal return could be linked to increasing use of the qualification as an intermediate step to higher levels of qualification – thus drawing out the most able individuals with this qualification and therefore reducing the overall returns.

Psacharopoulos (2009) considers evidence on the returns to HE in Europe and concludes that across 16 countries with evidence for more than one point in time, the returns to HE have been rising. Pereira and Martins (2004) carry out a meta-analysis of studies of the returns to education in Portugal and find that there is a positive relationship between the year of the data used in estimating wage returns and the size of the coefficient of education, which also suggests increasing returns over time. They conclude that this reflects an increasing trend in the returns to education and estimate that the return to education increased by about 1 per cent over ten years. This increase has occurred at the same time as a large increase in the average education of new workers in the labour market which Pereira and Martins suggest reflects that there has been a larger increase in demand for skills than in supply.

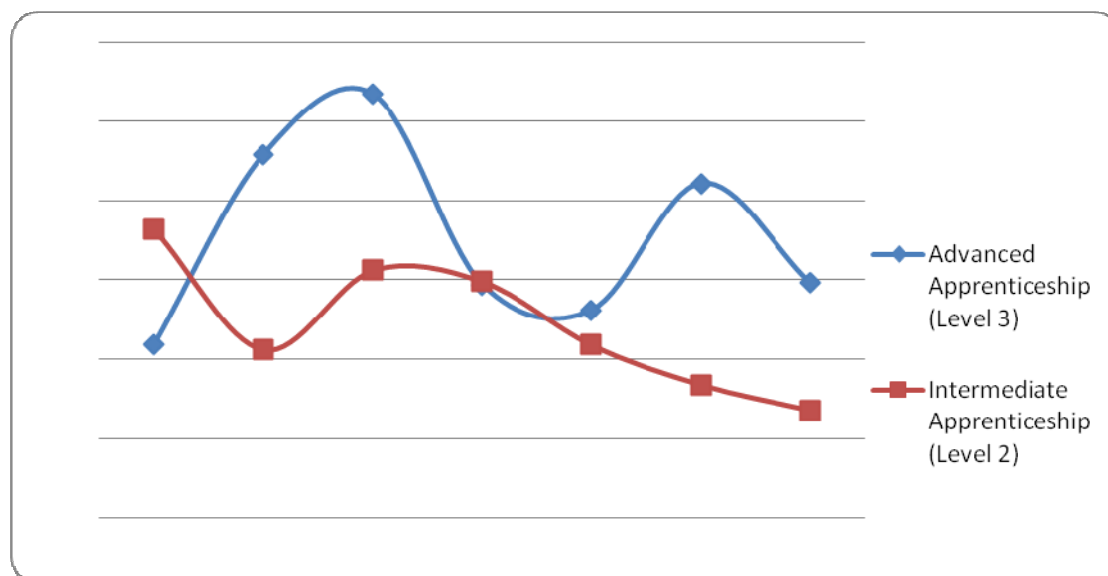
Using data from the National Child Development and British Cohort Studies (NCDS and BCS), Vignoles *et al* (2011) find that the value of basic skills in the labour market

appears to have remained remarkably stable since the 1990s despite the large increase in educational achievement. They suggest that this reflects that supply of skills/education is at least matched by demand. De Coulon and Vignoles (2008) find that individuals who undertook lifelong learning between 1996 and 2000 had 20 per cent higher wages than those who did not whilst Jenkins *et al* (2003) do not find this effect for lifelong learning. De Coulon and Vignoles attribute the difference in the studies to better data and methods in their own study but also due to genuine differences in the labour market in the early 1990s and 2004, implying that returns have increased over time.

London Economics (2011b) report some evidence that the average return to post-graduate qualifications has actually increased over time – compared to an average earnings premium to doctorate degrees of between 4.9 and 13.9 per cent between 1996 and 1999, the average earnings premium associated with this level of qualification has increased by approximately 10 percentage points to between 14.1 and 23.6 per cent between 2006 and 2009.

The issue of educational expansion is considered by Sianesi and Van Reenen (2003) who ask whether sustained improvements in educational attainment are guaranteed to lead to increased macroeconomic growth and whether there are decreasing returns to the expansion of education. Such decreasing returns, they suggest might arise through declining average ability due to the expansion of schooling to include, perhaps, less able individuals. They also cite Krueger and Lindahl (1998) who consider the impact of relaxing the constant-education-slope assumption that is commonly adopted in macroeconomic growth regressions. This assumption is found to be strongly rejected by Krueger and Lindahl and the average effect of education is not found to be statistically significant. This finding, they argue, casts 'doubt on the interpretation of education in the constrained macro growth equation' as education does not necessarily have a homogeneous impact on growth.

NAO (2012) estimates the additional wages that an individual is likely to receive having achieved an Apprenticeship, compared to what they would have received given their previous highest qualification. The results of the NAO study also suggest that while there is no obvious pattern over time for Level 3 Apprenticeships, the returns at Level 2 may be declining, as depicted in Figure 3.4.

Figure 3.4: Wage premium for Apprenticeships over time, NAO results

Source: NAO (2011) Adult Apprenticeships: Estimating economic benefits from Apprenticeships – Technical paper, Figure 6, p. 18

In reviewing previous studies of the economic benefits of training and qualifications (commissioned by BIS), CE/IER (2013a) highlight that comparing the estimated returns to qualifications with estimates obtained at different points in time requires accounting for differences in macroeconomic conditions over time. This is especially important for considering the relative returns between different qualifications levels or subjects, for example during a period of weak consumer demand there may be much less demand for those with qualifications in retail and much greater demand for qualifications in construction where infrastructure projects are often used to boost economic growth. CE/IER suggest that research into the impact of the macroeconomic context on microeconomic studies of the returns to qualifications is lacking which may mainly reflect data limitations (i.e. traditionally rates of return have been estimated using cross-sectional analysis or pooled cross-sectional data over relatively short periods of time).

Returns to the marginal versus average learner

Also considered to be a key issue in estimating the economic value added by different forms of learning is the difference (or not) between the returns for marginal learners and for average learners. This review has looked at analyses which have considered not just the average learner but also different sub-sets of learners or the marginal learner. In this context, the 'marginal returns' or 'returns for the marginal learner' refer to the returns to any particular type of learning (e.g. a degree) which are obtained by a learner with particular characteristics rather than the returns to any learner on average. One way of defining the marginal learner is as the next individual who would undertake learning if the programme were to be expanded. In practice however, identifying this individual is difficult. The main approach in the literature used to consider the returns to marginal learners is to consider different sub-sets of the learner population which are of interest, mainly from a policy perspective. The concern is that the returns for individuals with certain characteristics may be masked by the overall average returns thus policies

designed for promoting participation, for instance, may not be adequately targeted to achieve the optimal outcomes.

Dearden *et al* (2004) argue that 'to help guide and direct policy, it is the marginal rather than the average returns to education that matter most,' They suggest that the average return for individuals at the margin in the educational decision is of interest and the 'margin' can be defined in a number of ways and this definition affects the size of the difference between the returns on average and the returns to the marginal learner. Depending on the policy instrument being considered or designed, Dearden *et al* suggest a number of different 'characterisations of the marginal learner' for a given educational level. These concepts or operational definitions of the marginal learner include:

1. individuals who have achieved the level of education being considered – the corresponding return is the Average Effect of Treatment on the Treated (ATT);
2. individuals who could have but did not achieve this level of education – the corresponding return is the Average Effect of Treatment on the Non-Treated (ATNT);
3. individuals eligible to undertake the qualification, irrespective of whether they actually achieved it or not – the corresponding return is the Average Treatment Effect (ATE);
4. individuals with low (medium or high) probability of achieving that educational outcome – the corresponding return is the Average Treatment Effect for individuals whose probability of achieving education falls within a given interval;
5. individuals defined as marginal entrants on a policy basis, in particular groups defined in terms of their ability, socio-economic background or family income – the corresponding return, depending on how it is calculated, is the ATT, the ATNT or the ATE for the target individuals.

Dearden *et al* use data from the 1970 British Cohort Study (BCS70) at a time when individuals in the data would have been making their decision of whether or not to 'stay on' in education (in 1986) and their decision about participation in HE (in 1989). The authors note that the marginal student in this cohort would be different in profile to the marginal learner in more recent times, particularly given the massive expansion in HE participation that has taken place since the 1980s. They also suggest that educational qualifications are likely to be rewarded differently in times of recession compared to times of growth (time effects) and also that comparing the BCS70 findings to those for an earlier cohort (e.g. NCDS (1958)) would conflate time effects, age effects and cohort effects.

Dearden *et al* consider a number of different definitions of the marginal learner in their analysis for a given level of educational attainment. They find that for men, those who stay on (in post-compulsory schooling) earn 11 to 12 per cent more than if they had dropped out – equivalent to the average effect of treatment on the treated (ATT) (i.e. the effect of staying on for those who did so). The effect that staying on in post-compulsory schooling would have had on those who did not do so (i.e. the average effect of treatment on the non-treated (ATNT)) is also within this range. For women, the returns found are higher at about 18 per cent and again the ATT and ATNT are virtually the same. This suggests that where the marginal learner is defined as anyone who did

not stay on then there is little difference between the returns to the marginal learner and the returns to the average learner. When the marginal learner is defined in terms of the probability of a person undertaking HE then the results suggest that there is a difference compared to the returns for the average learner. They find that the returns to HE are greatest for men who are indifferent between undertaking HE and remaining at Level 2 or Level 3 (i.e. those with a probability of participating in HE of 25 to 50 per cent, who could be categorised as *marginal learners*). For these 'indifferent' men, the return to HE (relative to Level 2 or 3 attainment) was 23 per cent compared to 18 per cent for those with higher probability of undertaking HE (0.50 to 0.75). They also find substantially higher returns to HE for more disadvantaged groups of men (in terms of socioeconomic status and income).

In analysis of the LFS, McIntosh (2004) considers not only the average return to qualifications but also differentiates between individuals according to their level of school qualification. This analysis aims to 'get a feel' for the returns for the marginal student (i.e. the last student to decide to undertake a qualification). McIntosh notes that it is difficult to get a true idea of the marginal student using LFS data as there is little information available within the survey which would help to distinguish whether individuals were indifferent about their participation in any particular programme of study. In comparing the returns for 'marginal learners' to the returns on average, a few examples of McIntosh's results can be useful to highlight potential differences. Looking at the returns to a first degree, the average return in 2002 is around 28 per cent whilst the return to a first degree for someone with 5 or more GCSEs at A*-C was 17 per cent and the same for someone with 1 to 4 GCSEs at A*-C. For someone with no qualifications the return to a first degree is estimated to be 54 per cent (though the likelihood of someone moving from no qualifications to a degree is low). For Level 3 to 5 NVQs, the average return in 2002 is estimated to be 2 per cent. The return for someone with no qualifications obtaining NVQ Level 3-5 however is higher at 8 per cent and similarly the returns are higher for someone with 1 to 4 GCSEs (6 per cent) or 5 or more GCSEs (4 per cent).

The differences in returns to different types or groups of learners are important for policy if access to certain qualifications is being considered for expansion or additional encouragement. The desire is to know what the returns are for the additional students who move into the expanded programme rather than the returns to students who would have undertaken a course without expansion. Dickson and Smith (2011) review a number of studies to provide thoughts on current directions in the literature on the economic returns to education. They suggest that a single rate of return is not informative if returns differ by education level or across populations. This issue, they note, may be particularly important for policy but often gets masked by methodological debate in the literature. Migali and Walker (2011), similar to Dearden *et al* (2004), draw a distinction between different effects of education for different groups which highlights the difference between returns to the average learner and returns to the learner on the margin (however defined). They highlight the need to understand the effects which are of most interest and which are most relevant in different situations, particularly when looking at policy.

In looking at the wage effects of an extra year of basic vocational education, brought about through extension of some vocational programmes from three to four years in the

Netherlands, Oostereek and Webbink (2007) find that there was an increase in wages of 3 to 4 per cent for males overall, however when considering some subsamples the extra year was found to give rise to negative returns such that individuals would have gained as much from an extra year of work experience as they did from the extra year of education. Again, this highlights the importance of considering heterogeneity and variation in returns when assessing the impact of any expansion or extension to education or training programmes.

Differences in the effects for different groups can indicate something about the effectiveness of education policies. Meghir and Palmer (2005) found that increasing the duration of compulsory schooling in Sweden in the late 1940s led to a 3.4 per cent increase in the average earnings of individuals with unskilled fathers but only had a small and insignificant effect (of 1.4 per cent) on overall average earnings. This, Grenet (2010) suggests, indicates that compulsory schooling laws do not systematically improve the labour market prospects of early school leavers and that there is heterogeneity in returns across individuals.

Carneiro *et al* (2011) consider data on males in the US to estimate the marginal returns to alternative ways of increasing college attendance. They find that expansions in college attendance (through tuition changes) attract students with lower returns to education than those already attending. They note that for other policies that are associated with expansions of participation, the marginal returns are substantial. This illustrates again that accounting for heterogeneity in the returns to education and different forms of learning is important, particularly when considering policy interventions.

In reviewing a number of microeconomic studies of the returns to education, Cattan and Crawford note that returns are heterogeneous across types of educational qualification as well as within each type. They note that the LFS is limited in how it can control for heterogeneity, however they recommend that the Department for Education can revise and improve their estimates of the returns to education by considering returns by occupation, sector, subject and degree class as these variables are available within the LFS.

3.6.3 Summary of findings related to the relationship between past and future benefits and differences in marginal and average learners

Though there is some scepticism about recent cohorts compared to earlier graduates, most of the evidence reviewed suggests that the returns are standing up despite considerable expansion and, though this should be interpreted carefully, demand is keeping up with supply. A number of studies indicate the graduate premium has held up pretty well despite expansion of education systems (e.g. Psacharopoulos, 1981; Elias and Purcell, 2004) but this is contingent on the demand for workers with HE qualifications keeping pace with the supply of graduates – the same is required for FE learning and other Skills programmes. Changes in the returns to qualifications over time can also reflect the different composition of groups of learners over time (Dearden *et al*, 2004). There is a need to monitor the returns to different forms of learning over time in order to consider the balance between supply and demand.

There is also a need to recognise the difference between average learners and marginal learners when considering the returns to different forms of learning. Within the literature, returns on average (across all learners) tend to be most commonly reported but many studies note the importance of considering the returns to different types of individuals and how the comparisons between groups matter for policy design (e.g. Dearden *et al*, 2004; Migali and Walker, 2011; London Economics, 2011). Whether the marginal and average returns, in this context, differ substantially depends largely on the definition of marginal learner. The review in this regard highlights the need to acknowledge heterogeneity in the returns to different forms of learning across individuals.

3.7 Aggregation of returns

The final methodological issue examined in this review concerns the aggregation of the benefits to individual learners in order to determine total economic value added by different types of learning. *How should benefits to individual learners be aggregated to derive total benefits to the economy?*

The treatment of this issue is not entirely straightforward and is certainly affected by issues discussed in the preceding sections insofar as the reliability and robustness of any aggregation of individual level estimates depends heavily on the quality of those lower level estimates and the methodology used to obtain them. In the literature reviewed here, the approaches to determining total benefits to the economy include: estimating the returns to individuals and then aggregating up to the firm and / or economy level (with various assumptions underlying the process of aggregation); carrying out cost-benefit analysis at the economy (or some other aggregate) level; and macroeconomic analysis in which the economy-wide return to education (e.g. effect on growth) is estimated more directly.

3.7.1 Treatment in BIS estimates

In current BIS FE estimates, the benefits to the economy as a whole are derived by multiplying the net benefit to the average qualification by the total number of qualifications²⁶. The aggregate effects of HE have typically been considered in separate macro studies (see for example, Sianesi and Van Reenen (2000) for a review of macro-econometric studies considering the effect of education on productivity and growth, with a focus on UK policy).

In their BIS-commissioned study, CE/IER (2011) multiply the net benefits of a qualification by the number of qualifications undertaken within a particular learning stream. This provides an estimate of the net benefits of that learning stream to the economy. The benefits of all publicly-funded FE learning streams are then summed to provide an estimate of the economic benefits of the system as a whole. The CE/IER model does not however account for diminishing returns or labour market displacement.

26 Benefits to employers are also included in the estimates of the total returns to FE produced by CE/IER (2011).

Despite difficulties of achieving an appropriate aggregation of benefits, there tends to be emphasis on 'quantifying' the effects, particularly those attached to public investment in education. There is a need to make decisions regarding investments in education (and other areas) in the context of a limited public budget and trade-offs need to be made between different areas of public investment. Estimates of the returns on investment which can be compared across different forms of learning and / or different areas of public programmes are required to facilitate this decision-making.

3.7.2 Findings in the literature

Two main approaches to estimating the total benefits of learning to the economy are observed in the literature: 1) studies that estimate the returns to individuals and then aggregate these to arrive at estimates of the overall return (with various assumptions underlying the process of aggregation); and 2) macroeconomic studies where the economy-wide return to education is estimated more directly. In the remainder of this section, these two types of approach are considered in turn.

Aggregation of individual level returns

There is limited evidence in the literature regarding the approach to aggregating the returns to education for the purposes considered here. Keep *et al* (2002) note that the social returns to employer investments in training would be the private returns (value of extra output produced) adjusted for any product market imperfections – so not just a simple aggregation.

In the recent report from CEBR (2013), a number of assumptions regarding the future trend in Apprenticeship completions, the share of former apprentices who are always employed (85%) and the returns to Apprenticeship programmes are used to arrive at an estimate of the productivity impact of Apprenticeships on the UK economy. Essentially, they multiply the returns to a qualification, namely Apprenticeship, by the total number of qualifications. They also assume that there is deadweight of 15 per cent.

Martins and Jin (2010) discuss the difficulty in estimating the social returns to education. The main difficulties arise from the need for appropriate counterfactuals as well as exogenous variation in education. They also note the need to deal with possible general equilibrium effects. In their study, Martins and Jin aggregate individual-level Mincer equations to the firm-level and find a return of about 10 per cent (compared to 14.2 per cent found in a comparable study).

In studies that attempt to provide a cost-benefit analysis of the returns to education at the economy-level, a commonly encountered difficulty is the absence of or limited information on costs incurred by the state, employers and / or individuals. Card *et al* (2009) carry out a meta-analysis of microeconomic evaluations of Active Labour Market Policies (ALMPs) and find that few studies include sufficient information to perform even a crude cost-benefit analysis – most often programme costs are unknown or unreported. Jespersen *et al* (2008) do make use of cost data for programmes. They consider the costs and benefits of ALMPs in Denmark, estimating the net social return using a cost-benefit approach. They account for direct operational costs of the programme and multiply the cost per full time equivalent for each year of the programme. To calculate the economic value they take the earnings effects

(aggregated across individuals) plus any transfers less unit costs less subsidies during the programme and find the net benefit to be positive for private job training and public job training. Net costs are found for classroom training and residual programmes. Jespersen *et al* however omit general equilibrium effects such as the displacement effect of subsidised job training programmes and they acknowledge that this omission probably biases the results in favour of public and private job training.

As also recently noted by Cattan and Crawford (2013), the main limitation of the microeconomic literature which examines the private monetary returns to education is that it does not account for general equilibrium effects thus it is limited in the extent to which the estimates may be used to predict the impact of large-scale national policies. Considering the general equilibrium effects of policies within a microeconomic approach is demanding in terms of data, computing power and modelling requirements, however they review a few papers which imbed microeconomic models of human capital accumulation and private returns to education within general equilibrium frameworks.

Macroeconomic approaches

A further way of considering the impact of different forms of learning on the economy as a whole is through macroeconomic analysis such as considering the impact on economic growth. The review of macroeconomic studies of the returns to education by Sianesi and Van Reenen (2003) compares the results of new growth theory (where the stock of education affects the long-run growth rate of the economy) and the results from studies based on the neo-classical model rooted in human capital theory (where the production function is estimated at the economy level and human capital is assumed to affect the level of output of an economy. The endogenous growth approach however argues that human capital has an additional effect on the growth rate of productivity. The estimates based on new growth theory indicate a much larger effect of investment in education on economic welfare than do those based on the neo-classical approach.

Blundell *et al* (1999) also undertake a review of evidence on the returns to education. They cite a summary of the main findings from growth accounting research which concludes that the changing education of the labour force over the past 50 years has accounted for a significant proportion (around 1/3) of overall productivity growth in the US. They also cite Jenkins (1995) who found that for the period 1971 to 1992, a 1 percentage point in the proportion of workers with higher qualifications increased annual output by between 0.42 and 0.63 per cent, however they caution that the results are sensitive to the measure of educational quality used in the study. Finally, they cite evidence from OECD countries that suggest that those that expanded their higher education systems more rapidly in the 1960s had faster growth than those who did not.

More recently, Holland *et al* (2013) use growth accounting with data from the EUKLEMS projects for 15 countries for the period 1982 to 2005 and find that over this entire period and for all countries, growth in aggregate skills contributed less to output growth than did growth in capital per hour worked. In the UK, they find that capital deepening (growth in capital per hour worked) is the main contributing factor to growth in GDP per hour worked. They also find that graduate skills accumulation contributed around 20 per cent of growth in GDP in the UK from 1982 to 2005. They note that the growth accounting approach does not account for any externalities to HE which might

raise the productivity of the rest of the country. Using econometric analysis (which does address externality issues), Holland *et al* find that increasing the share of the workforce with a university degree by one per cent is associated with an increase of 0.2 to 0.5 per cent in the level of long-run productivity. For the UK then the 57 per cent increase in the share of the workforce with a university education that was evident between 1994 and 2005 resulted in an increase in long-run productivity of 11 to 28 per cent.

In a study for the Department for Education, Cattan and Crawford (2013) reviewed a number of papers considering the effect of education on productivity using both micro and macroeconomic approaches. They note a number of reasons why macro growth regression approaches may be limited in the extent to which they can identify the causal social impact of education on growth. These include:

- Measurement error – using cross-country data presents problems due to data quality (especially for developing countries and for earlier years); difficulty constructing measures of education or human capital that are temporally and internationally comparable; and cross-country heterogeneity in education systems;
- Endogeneity bias due to omitted variables and/or reverse causality – this bias may occur if a country's education level was correlated with unobserved determinants of output; bias could arise due to reverse causality if the demand for education is income-elastic thus growth likely leads to higher demand for education;
- Model specification – most studies of this type estimate the association between education and economic growth by pooling data on GDP and suspected determinants of GDP such as education, initial GDP and institutional structures from a number of countries over time. Within this approach they assume that the effect of education on growth is homogeneous across time and across countries. This assumption may not hold true but the sample size of macroeconomic data typically limits how far analysis can go in addressing heterogeneity.

They conclude that in theory, the macroeconomic approach offers the potential to estimate the total benefits of education, including both private and social returns but in practice, the limits of existing data affects the degree to which this approach can estimate a true causal relationship between education and economic growth. They conclude that the macroeconomic approach is most likely to produce an upper bound for the estimated effects. They see perhaps more promise in using more robust microeconomic strategies to estimate the external benefits of education and/or to estimate and aggregate the non-pecuniary private and external benefits of education.

3.7.3 Summary of findings related to the aggregation of the returns to learning

The aggregation of individual level benefits to a macro, economy-wide benefit is not a straightforward issue. In current FE estimates the benefits are aggregated by multiplying the net benefit to the average qualification by the number of qualifications. The same approach is sometimes taken for HE though the aggregate effects of HE are

often considered in separate macro studies (see for example, Sianesi and Van Reenen (2000)²⁷ for a review of macro-econometric studies considering the effect of education on productivity and growth with a focus on UK policy).

A relatively simple aggregation of individual benefits does not take into account any displacement of non-learners or general equilibrium effects (e.g. the effect an increased supply of certain qualifications may have on the average level of wages). The inclusion of such issues or the use of different aggregation approaches will have an impact on the final estimate of overall benefits. The main problem with aggregating individual level benefits to achieve an estimate for the overall economy-wide return to a form of learning is that there are interactions between different types of returns which do not directly multiply or add up. There are, for example, externalities associated with different forms of learning that may be positive or negative. As a result, the aggregate benefits of education can be bigger or smaller than the sum of the benefits to individuals (and similarly for employer benefits even where expressed as a proportion or multiple of individual wage gains).

Another note of caution is that many studies where individual level effects are aggregated to derive total benefits of learning, the possibility of displacement effects are noted but are often not accounted for in any direct manner. Whilst displacement of other learners is a particularly important issue when considering the total returns to publicly funded education and training, of the studies reviewed this issue has largely been overlooked or at least not fully addressed.

Despite difficulties with achieving an appropriate aggregation of benefits, there tends to be emphasis on 'quantifying' the effects, particularly those attached to public investment in education. There is a need to make decisions regarding investments in education (and other areas) in the context of a limited public budget and trade-offs need to be made between different areas of public investment. Estimates of the returns on investment which can be compared across different forms of learning and / or different areas of public programmes are required to facilitate this decision-making.

In the face of possible pitfalls associated with aggregation of individual level benefits to produce an overall estimate of returns to different forms of learning, if all calculations of the net benefits at the lower level are robust (i.e. they account for all interactions and externalities) then in theory it should be reasonable to sum up individual level effects. If building a model up from individual level returns to education then one can build in features and assumptions but there are limits in terms of the assumptions and relationships that can be modelled feasibly (as will be discussed in Chapter 4). Micro-simulation is however becoming more feasible over time and such an approach can permit exploration of 'what ifs' and allow tests of different policies to be built into the models.

27 The returns to education: a review of the macro-economic literature. CEEDP0006. London: Centre for the Economics of Education, London School of Economics and Political Science.

There are macroeconomic approaches which can be used to estimate the effects of education on growth in GDP however these are not without their limitations. Nevertheless, as Cattan and Crawford suggest, macroeconomic approaches are likely to represent an upper bound for the effects of education on growth. Such estimates should be treated primarily as indicative and they recommend that the macro estimates should not be used in isolation from microeconomic approaches.

4. Implications for the FE Impact Model

In this section, the potential implications of findings from the literature are considered within the FE Impact model. In 2010, CE in collaboration with IER (CE/IER, 2011) developed an Excel-based modelling tool for BIS to measure the economic impact of Further Education, where Net Present Value (NPV) is used as the primary measure of economic impact. Here the findings from the literature that were summarised in the previous chapter are considered in the context of the FE Impact Model. The implications for the model are explored and for each of the issues reviewed the following points are considered:

- Does the existing model provide a suitable framework for analysis?
- If not, how might the model be further developed, and would the payback be worthwhile given the investment required?
- Is the model using the best evidence to inform the underlying assumptions?

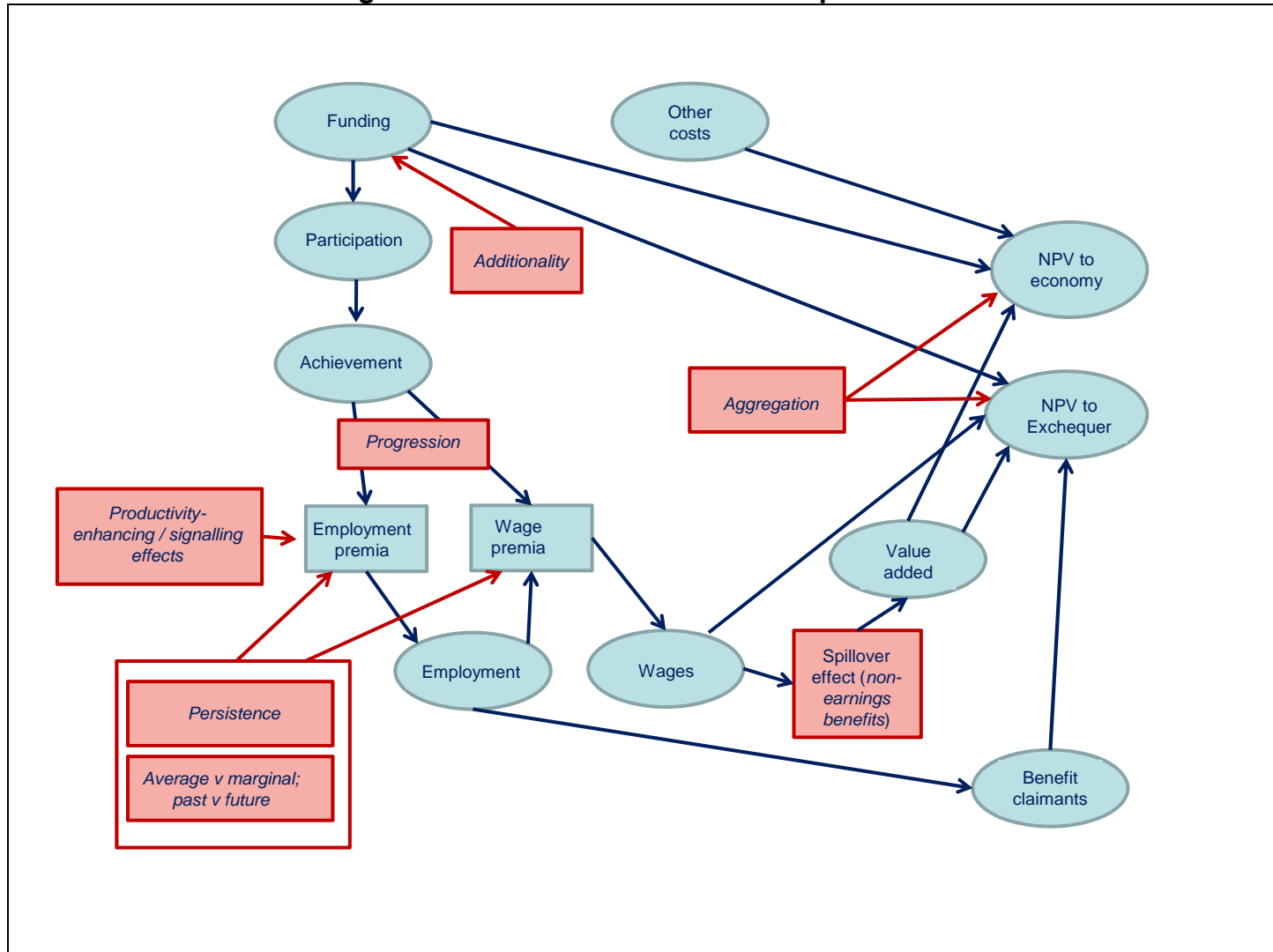
4.1 An overview of the model

The model measures the costs and the supply-side benefits to the economy of the service that is provided by the FE sector – i.e. the benefits and costs that come from improving the skills of the workforce. FE provision, by improving skill levels, is assumed primarily to raise productivity and the employment rate (the economic activity of the working-age population, and success in matching workers to jobs). The model identifies:

- the relationship between the scale and nature of FE provision (measured as spending, categorised into different types of provision) and the scale of improved qualifications, appropriately categorised;
- the appropriate categories of qualifications to distinguish, helpful in relation both to tracing the effect of FE provision and in relation to the subsequent impacts in the model; and
- the scale of the effect of improved qualifications on wages, employment and productivity.

Figure 4.1 provides an overview of the model, setting out the sequence of cause and effect and highlighting (in the red rectangles) where each of the seven issues reviewed take effect.

Figure 4.1: An overview of the FE Impact Model



A key feature of the model is its high degree of disaggregation and detail, with 15 provision types, 7 prior qualifications, gender, and two age bands identified separately in many of the calculations. The intention of using such detail is to make the model more flexible in terms of the analysis that can be undertaken, with a view taken that data availability and research results will improve over time and so be used to improve the assumptions and parameters in the model.

4.2 Implications of the findings of the literature review

Table 4.1 summarises the current assumptions incorporated in the model with respect to each of the methodological issues reviewed. In this section, we consider each of these issues in turn.

Table 4.1: Current assumptions of the FE Impact Model (CE/IER, 2011)

Issue		Assumption
1	Productivity-enhancing / signalling effects	Higher earnings reflect higher productivity as a result of learning (i.e. there is effectively no signalling effect).
2	Non-earnings benefits	The productivity gain is double the wage gain. No wider/social benefits are included.
3	Persistence	Constant average wage and employment premia persist until retirement age.
4	Additionality	Not modelled. The model results are gross of any deadweight.
5	Progression to further learning	The current estimates do not include any benefits stemming from progression to further learning, although the model has the capacity to include this when more robust evidence becomes available.
6	Past benefits as a guide to future benefits / benefits for the marginal learner	Benefits to current qualifications are an average of those taken in the past. Benefits to the marginal learner are equal to benefits to the average learner.
7	Aggregation	Multiply net benefits to the average qualification by the number of qualifications.

4.2.1 Productivity-enhancing / signalling effects

This issue takes effect in the model through the *wage* premia (see Figure 4.1). The wage premia adopted in the model implicitly assume that higher earnings reflect higher productivity as a result of learning (i.e. there is effectively no signalling effect).

The review of literature set out in Chapter 3 yields no consensus regarding the size of the signalling effect but evidence tends to support the idea that there is at least some effect. The existing FE model may therefore overstate the returns to those particular qualifications where a signalling effect is thought to exist.

By varying the assumptions for the wage premia, the impact of the uncertainties associated with the potential signalling effect on the model's results can be investigated:

- Input: reduce the wage premia by 10 per cent (in other words, assume that 10% of the observed wage effects are explained by signalling, and the remaining 90% reflect increased productivity).
- Results: NPV to economy is reduced by 9 per cent. So, for example, the NPV per government £ for an Advanced Apprenticeship falls from £24 to £22.

It is evident that the wage premia are the key driver of the model's results and the NPV results respond almost linearly to adjustments in these premia²⁸. If more robust evidence becomes available about the size of the signalling effect this could readily be incorporated into the model.

4.2.2 Non-earnings benefits

This issue takes effect in the model through the *spillover effect* (see Figure 4.1) from the wages earned by the individuals that undertook learning to the total productivity, including productivity benefits captured by the learner's employer, wage benefits captured by other workers and productivity benefits captured by other employers. The current BIS estimates of returns to FE consider the gain in overall productivity to be equal to twice the observed wage uplift to the learners; this is based upon evidence presented by Dearden *et al* (2005).

By varying the assumptions for the spillover effect, the impact on the model's results of the uncertainties associated with the scale of non-earnings productivity benefits can be explored. In its value for money assessment of Adult Apprenticeships, the NAO (2012a/b) assumed that total productivity increased by 25 per cent more than the wage premium alone as a result of Apprenticeships. This was taken as a lower bound estimate with the rationale being that if an employer is prepared to increase the worker's wages, then their productivity must have increased sufficiently to cover the associated non-wage labour costs as well. However, the NAO acknowledge that this does not include benefits captured by other individuals and employers. This assumption was applied in the model:

- Input: reduce the spillover productivity gain from 2.00 times to 1.25 times the wage gain.
- Results: NPV to economy from Apprenticeship learners is reduced by 37 per cent - from £28 to £18 per government pound.

The spillover effect is explicitly identified in the model and can readily be varied to undertake sensitivity analysis; or updated when more evidence on the appropriate magnitude of this effect becomes available.

28 These findings are consistent with BIS' sensitivity analyses presented in the BIS Research Paper number 38 (CE/IER, 2011).

4.2.3 Persistence

This issue takes effect in the model through the *wage* and *employment* premia (see Figure 4.1). Average wage and employment premia are assumed to persist at a constant level over time (allowing for discounting to present values). This assumption is consistent with the manner in which the premia have been derived using LFS data. Longitudinal data constructed from administrative records appear to provide an opportunity to better estimate the time profile of returns to education and training.

There is a fairly simple treatment of the time dimension within the FE Impact Model. To introduce variation in the profile of returns over time would require quite substantial development to the model²⁹. Undertaking such development is not recommended however until a better evidence base on the nature and scale of persistence has been established - the specification of the model development could then be designed to make best use of the kind of evidence that is established. The model in its current form does enable stylised analysis of the impact of persistence by the variation of the *average constant* wage and employment premia, or by adjusting the time period (i.e. the number of years) over which these average premia apply.

4.2.4 Additionality

This issue is represented in the model at *funding provision* (see Figure 4.1). The model does not explicitly take any account of deadweight, displacement or substitution. The results presented are the returns to *all spending* on provision, whether spending is funded entirely by the public purse or by the public and other means³⁰. It is recommended that when presenting the model results, it be made clear that they are gross of additionality. A net figure could be presented by simply applying an estimate of the proportion of additionality (e.g. 30 per cent was suggested earlier in this report).

4.2.5 Option value of progression to further learning

This issue takes effect in the model through qualifications gained (see *achievement* in Figure 4.1). The FE Impact Model includes an option through which the impact of progression can be factored into estimates. The 'progression factor' is a ratio that can be applied to the NPV per achiever of a particular qualification which takes account of the additional value of progression. It would be arbitrary however to assign a value as current evidence does not point to an agreed 'option value' in this sense.

The impact on the model's results of including this progression factor was investigated:

- Input: include the progression factor for all qualifications achieved - 10% probability (with uniform distribution) of continuing to the higher qualification level during the five years following initial achievement.

29 Programmed in Excel, the model is already at the limit of what can be handled with regards to the many dimensions that are disaggregated. To introduce a more sophisticated treatment of the time dimension would likely become unmanageable in Excel.

30 Note that the model does distinguish the source of funding - employers, cofounding or SFA.

- Results: NPV to economy is increased by 26 per cent e.g. the NPV per government pound for Intermediate Apprenticeships increases from £35 to £44.

Within the FE Impact Model, progression can make a large contribution to the estimated returns. The assumptions that underpin the 'progression factor' however are not currently based on robust evidence. The model can present summary results with or without the progression effect; it should be made clear that there is much uncertainty associated with the estimates of the progression effect.

4.2.6 Average versus marginal learners; past versus future returns

This issue takes effect in the model through the *wage* and *employment* premia (see Figure 4.1). The FE Impact Model assumes that: benefits to the marginal learner are equal to benefits to the average learner; and benefits to current qualifications are an average of those taken in the past.

The structure of the existing model and its approach to aggregating returns (see below) is built on the assumption that the benefits to the marginal learner are equal to the benefits to the average learner – to seek to amend this would challenge the whole approach of the existing model. When presenting and interpreting the results, it should be made clear that the results might overstate the returns because of this underlying assumption (no account taken of e.g. the potential for diminishing returns).

With regards to past versus future returns, the model in its current form enables the variation of the wage and employment premia and so these can be readily updated to incorporate revised assumptions as and when the evidence becomes available.

4.2.7 Aggregation

The issue of aggregation features throughout the model because the overall modelling approach is built on the assumption that the returns to individual qualifications can be summed to estimate the returns to the economy as a whole i.e. the NPV for each qualification can be multiplied by the number of qualifications undertaken to derive the NPV to the economy as a whole. However, when presenting and interpreting the results of the model, it should be made clear that the results might overstate the returns because of the underlying assumptions of this approach (e.g. no account taken of labour market displacement).

4.3.8 Summary

The model provides a systematic framework to investigate the uncertainties associated with many of the issues reviewed and sensitivity analyses have been undertaken to illustrate this for productivity-enhancing / signalling effects, non-earnings benefits (productivity spillovers) and progression to further learning. The analyses show that the wage premia and consequent productivity spillovers are the key drivers of the estimated returns. The model has been designed so as to be able to take account of variation of premia across provision types, gender and age bands, and these assumptions can be readily updated to incorporate new evidence when it becomes available.

Those issues for which it is less feasible to adapt the underlying assumptions and consequent structure of the FE Impact Model are: persistence; additionality; and the associated issues of aggregation and marginal versus average returns.

5. Summary and Recommendations

This chapter draws together the key findings of the evidence review carried out in this study and discussed in the preceding chapters. These findings are summarised under each of the seven methodological issues considered.

5.1 Productivity-enhancing and signalling effects

In the wider literature, there is a wealth of studies which consider the possibility of signalling, and not just productivity-enhancement, contributing to the wage returns of education – much of this literature is focused on studies in HE. Whilst there is much consideration of the issue of signalling effects in the literature there is little consensus on the size of these effects relative to the productivity-enhancing effects of different forms of learning – estimates (often qualitatively stated) range from no signalling effects to small effects to large effects (even outweighing the productivity gain in rare instances). Though there is no consensus on the magnitude of signalling, evidence tends to support the idea that there is at least some effect.

One shortcoming in the literature is the approaches taken to testing or accounting for signalling effects. A number of these approaches (e.g. comparing self-employed to employees; including measures of ability / motivation / intelligence) are problematic and it is often not clear that the signalling effect is truly being accounted for and the effects can be confounded with other issues.

Within the current BIS estimates of the returns to FE and Skills and to HE, the potential signalling effects are not accounted for which may result in overstatement of the productivity returns to different forms of learning. It should be noted however that even if qualifications provide a signal to employers (and therefore are not total productivity-enhancing) this does not necessarily mean that this part of the wage effect is not of value from a social or policy perspective – the signal may enable a better match of individuals to jobs and thus more efficient use of skills/resources which is beneficial in itself. Some evidence also suggests that the signalling effect is only temporary in any case and that after some time in work the wage effects that are observed are due to productivity differences and not just innate ability.

Overall, the literature indicates that there is likely merit in exploring the signalling effects of education though the exact approach to take is not clearly prescribed and depends much on the data that are available for considering this issue. One approach in future estimates could be to incorporate a range for the size of signalling effects, e.g. from 10 per cent of the wage returns to 30 per cent of the wage returns attributed to education, but any assumption would be largely arbitrary. This range cannot be prescribed here as precise estimates are difficult to ascertain across studies given the variety of approaches and definitions used.

Recommendations

1. In future estimates of the economic value added of HE, FE and skills, it is recommended on the basis of this review that potential signalling effects be

acknowledged (i.e. state that some of the observed returns to learning may be in part due to such effects) but it should also be noted that signalling can still provide economic value because it sorts people into jobs (related to this, signalling is likely to play a role mainly in getting people into a job, rather than thereafter).

2. There is a role for sensitivity analysis in presenting estimates in the light of potential signalling effects but it would be highly arbitrary to simply reduce central estimates by any given percentage.
3. With the development of information-rich linked administrative data sets there is potential to carry out a more comprehensive analysis of the size of signalling effects in the UK context.

5.2 Non-earnings benefits

The focus in the review has been mainly on the employer returns to different forms of learning however there are also wider productivity spillovers e.g. in the form of increased wages for co-workers, as well as returns for other employers. The authors also acknowledge the importance of wider benefits (e.g. improved health, reduced crime, etc.), but there are beyond the scope of this review.

The literature supports the *existence* of returns to employers in various forms (e.g. enhanced profitability, productivity improvement) but there is not a great deal of consensus on the size of such gains or the best way to measure them.

Whilst there are problems associated with trying to estimate the returns to employers as a share (or multiple) of the wage returns to workers which are associated with different forms of learning, there is value in adopting a relatively simple approach. The current BIS estimates of the returns to FE adopt such an approach based on findings by Dearden *et al* (2005) where the overall productivity gain associated with training is equal to twice the observed increase in a worker's wages – implying that the gain for the employer is equal to the wage gain to the worker. Other studies too use this approach and reason that wage gains must reflect something about the productivity gain to employers as wage increases are likely paid out of the overall gain to employers.

Recommendations

1. Beyond the study by Dearden *et al* there are a limited number of precise estimates of the total productivity gains and benefits to employers (as a percentage of wage returns to workers). Their study is often used in BIS estimates and other official estimates of the returns to training, as such there is a need to update the Dearden *et al* (2005) study;
2. Extending the assumption generated by Dearden *et al* as currently used in estimates for FE and skills to analysis of HE is questionable. Dearden *et al* focus on work-based learning and the study's finding of a 'wedge' between wage and productivity effects is only found in lower skilled jobs. Further consideration needs to be given to the approach which would be most sensible for HE as in this area analysis most often concerns just the individual. Typically studies concerned with HE do not focus on this issue thus there is a need for further analysis to consider

how, or if, some sort of reasonable figure might be used which is analogous to that adopted in FE studies. It may be that this approach is not as applicable for HE studies where employers are usually outside the education investment decision-making process and do not commonly fund participation in HE.

3. Again, there is a role for sensitivity analysis. It is advised that a *lower bound* for such analyses be based on the NAO assumption of the productivity gains to employers being equal to 25 per cent of the wage uplift for workers (if employers are prepared to increase wages, then the productivity uplift needs to be at least sufficient to cover non-wage labour costs as well). A prudent approach to accounting for employer returns to different forms of learning may be to continue to assume these gains can be inferred from wage returns to individuals but to consider a range of figures for the relative effect beyond just the 'two times' estimate.

5.3 Persistence of benefits

A number of practical issues are raised in the literature in relation to the persistence of the benefits of learning. One of these is that the benefits are often not realised immediately after completion of study though many studies have assumed this to be the case. There is also some evidence of deterioration of the returns to qualifications, particularly vocational education and training.

From reviewing a number of studies, the issue of persistence is one that might differ between different forms of learning, particularly between HE and FE & Skills. This idea requires further consideration but it is likely that whilst it may be relatively reasonable to assume that the returns to HE persist over the long term, based on the evidence available in Chapter 3 a shorter period of persistence might be more appropriate for vocational education and training, particularly if one considers evidence of skills deterioration at some levels.

The way in which the LFS estimates of wage returns are calculated means it is not unreasonable to assume persistence of returns to learning over the working life. In FE, these estimates are typically obtained by taking the average return for people at different points of their working lives who did qualifications different lengths of time ago. For HE, the estimates are obtained by examining the returns in different age bands. The matched data analysis suggests that there are constant or increasing returns to education in the seven years post-completion (with the exception of Apprenticeships which decline, albeit from a high starting point).

Recommendations

1. The use of longitudinal data can provide useful insights into the persistence of benefits for individuals as the returns can be tracked year by year as can subsequent participation in training/education and changes in employment. Longitudinal data constructed from matched administrative records perhaps offer the best opportunity for estimating the persistence of returns to education and training presently.

2. Currently, estimates for vocational qualifications based on longitudinal data indicate that the returns persist for the seven year measurement period currently possible given available data and in some instances are increasing over this period. With a greater amount of matched data it may be possible to ascertain whether returns persist beyond this period. Further analysis could also usefully include information on attainment of subsequent qualifications and learning.
3. Incorporating flexibility in the FE impact model to capture variation in returns over time would add an additional layer of complexity to the model. The value in doing this should be investigated as the current assumption of constant returns does not seem unreasonable given the way in which the premia are calculated.
4. Average annual returns to different forms of learning could be usefully presented alongside NPV figures. The annual returns are more easily understood intuitively, and do not appear as alarmingly large as overall estimates of the NPV of different forms of learning. Additionally, estimates of the internal rate of return (IRR) may also be more palatable to some audiences and may result in greater understanding and appreciation of the returns.

5.4 Additionality and deadweight loss

Discussion of deadweight loss and associated issues of additionality, displacement and substitution, are most common in studies concerned with the returns on public investment in education. There is however some uncertainty over the appropriate figure to include in revising estimates of returns for deadweight. There are also a number of different ways of approaching the estimation of deadweight and associated concepts. Survey responses have been used to estimate the level of deadweight and additionality in a number of studies (including studies of Apprenticeships and other forms of training). Whilst this type of evidence is limited as it is prone to bias in responses, it is useful in providing insights into employer behaviour. There is little evidence at all on this matter in relation to HE.

The current BIS estimates of the returns to FE and skills are presented gross of deadweight and a figure for deadweight loss is presented alongside the central estimate – this deadweight figure is typically around 30 per cent and is based on work by London Economics (2012b), which compares the privately-funded training in firms which do and do not engage in Apprenticeships. If this figure is considered to be an overestimate (or high compared to other programme estimates (e.g. DWP)) it should be noted that the NPV estimates are still substantial even after accounting for deadweight. A review of existing estimates of additionality and deadweight associated with Apprenticeships has highlighted that there is an emerging consensus in recent findings on deadweight, however CE/IER (2013b) also note a number of concerns with the approach taken in the existing BIS estimates that are presented largely by data constraints.

Recommendations

1. Deadweight, additionality, etc. are issues which are not explored to any great extent in relation to HE and given the increase in tuition fees and the greater burden of

costs shifting to learners relative to the State, there is probably less rationale for investing significant research resources into this issue for HE explicitly.

2. One possible way to consider this issue in HE and to obtain estimates of deadweight would be to survey learners asking whether or not they would have still participated in HE if there were no government funding or student loan provision and they themselves had to bear greater costs of education. This approach would of course have the limitations of other retrospective and self-reported measures of willingness to pay in that individuals are already aware of the costs/benefits of their learning and they may not reveal their true preferences due to certain biases.
3. The currently adopted estimate of 30 per cent deadweight (for FE and skills) does not seem an unreasonable holding assumption across the board, although it may overstate the amount of deadweight for particular programmes such as basic skills. For presentational purposes, it is advised that NPV estimates be presented both net and gross of deadweight.
4. CE/IER (2013b) consider various aspects of estimating deadweight and additionality associated with Apprenticeships and makes recommendations about the data required to more accurately estimate deadweight and to overcome some of the limitations of existing evidence. The report also recommends that the assessment of qualitative additionality (the increase in the quality of training that is provided through publicly funded training) be given importance alongside that of quantitative additionality.
5. In line with the recommendations of CE/IER (2013b), some of the shortcomings of existing estimates, for Apprenticeships, would be improved through better definition of the treatment and comparator groups (i.e. employers participating in Apprenticeships and those not participating in the programme, respectively) which would require additional data to those already available. As outlined in the review by CE/IER, the recommendation is for additional variables to be added to existing surveys (i.e. BIS's Apprenticeship Employer Evaluation Survey and UKCES's Employer Skills Survey or Employers' Perspectives Survey) so that sufficient information on both participating and non-participating employers may be obtained as to allow for appropriate comparison of the two groups and more robust estimates of deadweight and additionality.

5.5 Option value of progression to further learning

In this review, the option value of different forms of learning refers to the value presented by particular qualifications due to the access they provide to other learning opportunities (typically with higher earnings potential). Progression to further learning stemming from initial qualifications or achievements is often considered as an outcome in itself and few studies have explicitly considered this 'option value.' There is much evidence in the literature that 'learning begets learning,' The treatment of this issue affects the

specification of the earnings function – i.e. whether only the highest qualification should be included or whether all qualifications should be included separately in order to indicate the value of each and to provide also an indication of the returns to different combinations of qualifications. Currently in the BIS estimates of returns to different forms of learning, the analysis of matched administrative data accounts for any benefits from further learning done in the seven years post-attainment of the qualification under consideration.

Recommendations

1. The matched data analysis carried out by London Economics and others goes some way in considering this issue already. This analysis captures any wage and employment outcomes that might be associated with any progression to further learning during the seven years after completion of a particular qualification.
2. When presenting estimates based on analysis of the LFS, it should be expressed more explicitly that the estimated returns refer to qualifications when undertaken as an individual's highest level of qualification. This should help to aid understanding of what the returns represent.
3. There is an important role for qualitative research tracking learners over time to further investigate this issue and issues of progression more generally. Already various surveys of learners consider the degree to which individuals have an appetite to progress to further learning and how many already are doing so. Patterns according to level of study and personal characteristics of learners can also be considered using such survey data. Considering actual outcomes compared to learners' attitudes to progression may help to identify and address barriers to progression.

5.6 Past benefits as a measure of future benefits and returns to the marginal versus average learner

Given recent substantial expansion of HE and FE, there is increasing concern that the returns to different forms of learning are falling over time however the evidence in the literature tends to support the view that the returns (particularly to HE) have been holding up despite expansion. Many suggest that this is an indication that demand has at least kept pace with supply.

Though most studies tend to report the earnings returns to the average learner, many also point out that these returns are not necessarily the same as those to the marginal learner. The returns to the marginal learner (and to particular groups of interest) are often more informative than returns to the average learner particularly for purposes of designing and evaluating policies aimed at increasing participation in education or improving the situation of particular groups.

Recommendations

1. Instead of simply using a weighted average based on the historical make-up of participants in different programmes of learning, there is a need to consider how the learner population (or the median learner) has changed over time e.g. looking at

returns by sector, age and considering how the breakdown of the learner population has changed.

2. For HE in particular, it is also important to consider the effects of the large expansion of learner numbers over time when comparing past and future returns. Whilst evidence to date tends to suggest that the returns to HE have been holding up, continued review of this is valuable and would help to consider if some aspects of expansion (e.g. in terms of particular subject areas) could have an impact on future returns. An analogous point can be raised with respect to recent expansion of participation in Apprenticeships, particularly as far as expansion has been greater amongst older, existing employees and within non-traditional sectors (e.g. retail and hospitality) for whom the evidence suggests that returns are lower on average.
3. The heterogeneity of learners and programmes should be considered in estimating returns as far as possible. However, there are limitations on this from a data perspective (e.g. insufficient sample cell sizes at very detailed level) and more intuitively, presenting estimates for a vast number of learner groups would not be appealing or meaningful, particularly from a policy perspective.

5.7 Aggregation of returns

A number of studies estimate the returns to individuals and then aggregate up to the firm and / or economy level (with various assumptions underlying the process of aggregation) in order to obtain an estimate of the total economic value of different forms of learning. One shortcoming that is relatively common in considering the total returns to the economy is the limited nature or lack of data on the total costs of different forms of learning. Another note of caution is that in many studies where individual level effects are aggregated to derive total benefits of learning, the possibility of labour market displacement effects are often not accounted for in any direct manner (though they are often noted).

Recommendations

1. Considering the operational relevance of this issue, there is not a lot further that can be suggested. It is necessary to have an aggregated estimate of NPV (for nearly all programmes) in order to evaluate alternative uses of public money, so it is imperative then that estimates (at a lower level) which are to be aggregated be as robust as possible to minimise the risk of adding-up. Though aggregate figures are needed (and unavoidable) it is the more disaggregated estimates which provide the valuable insights for policy development.
2. Multiplying the returns per qualification by the number of achievements seems sensible (as done in the FE impact model). It is important however that these aggregated estimates factor in at least some adjustment for displacement effects and other possible equilibrium effects.
3. As suggested by a recent report for DFE (Cattan and Crawford, 2013), macroeconomic analyses can provide an upper bound on estimates but microeconomic results and aggregation of these is a more appealing approach.

5.8 Cross-cutting issues

The review also presents a number of issues which are not particular to any of the seven methodological issues but rather are relevant to most (if not all) and more generally. The cross-cutting issues which have emerged in the review include:

1. In the literature reviewed here, much analysis is based on data from cross-sectional surveys thus there are limitations in the evidence base, particularly in terms of identifying causal relationships between different forms of learning and gains to individuals, employers and the State;
2. Overall, additional data analysis would be beneficial to clarify the returns to different forms of learning and to ensure estimates which are utilised in budget decision-making and in communications with employers and the public more generally are robust. There should be a focus on longitudinal data (in order to facilitate analysis of causal relationships) as well as employer-employee matched data. Future matched administrative data sets will also be valuable for overcoming a number of methodological problems encountered in estimating the returns to different forms of learning;
3. Quantitative analysis is of the utmost importance however qualitative approaches should not be overlooked and a mixed methods approach would add much value to the current evidence base. More qualitative approaches can provide insights for the analysis of the returns to different forms of learning and for designing policies aimed at maximising these returns and optimising their distribution;
4. It is important to reiterate the importance of heterogeneity amongst learners, employers and learning/training programmes. Heterogeneity should be considered and an overriding aggregate estimate of the returns to learning, whilst important from a practical perspective, should not provide the final verdict on a programme's worth or value as the returns to different groups are varied.

Bibliography

- Acemoglu, D. and J. Angrist (2000). 'How Large Are Human-Capital Externalities? Evidence from Compulsory Schooling Laws', *NBER Macroeconomics Annual*, 15: 9-59.
- Akbari, A. and Y. Aydede (2013). *Economic benefits of studying economics in Canada: a comparison of wages of economics majors with those in other disciplines circa 2005*. CLSRN Working Paper No. 109. Canadian Labour Market and Skills Researcher Network.
- Ananiadou, K., A. Jenkins and A. Wolf (2003). 'The benefits to employers of raising workforce basic skills levels: a review of the literature,' London: National Research and Development Centre (NDRC).
- Anchor, J., J. Fiservova, K. Marsikova and V. Urbanek (2011). 'Student expectations of the financial returns to higher education in the Czech Republic and England: evidence from business schools,' *Economics of Education Review*, 30: 673-681.
- Anderson, T. and H. Metcalf (2003). *Modern Apprenticeship Employers: Evaluation Study*. DfES Research Report RR417. London: Department for Education and Skills (DfES).
- Arrow, K. J. (1973). 'Higher education as a filter,' *Journal of Public Economics*, 2(3): 193-216.
- Ashenfelter, O., C. Harmon and H. Oosterbeek (2000). A review of estimates of the schooling/earnings relationship, with tests for publication bias. NBER Working Paper 7457. Cambridge, MA, USA: National Bureau of Economic Research (NBER).
- Asplund, R. (2004). 'The provision and effects of company training: a brief review of the literature,' *ETLA Discussion Paper No. 907*. Helsinki: The Research Institute of the Finnish Economy (ETLA).
- Barron, J., D. Black and M. Loewenstein (1989). 'Job matching and on-the-job training,' *Journal of Labor Economics*, 7(1): 1-19.
- Bartel, A. (2000). 'Measuring employer's return on investments in training: evidence from the literature,' *Industrial Relations*, 39(3): 502-524.
- Battistin, E. and B. Sianesi (2006). 'Misreported schooling and returns to education: evidence from the UK,' *Cenmap Working Paper CWP07/06*. London: Centre for Microdata Methods and Practice.
- Becker, G. (1960). 'Underinvestment in college education?' *The American Economic Review*, 50: 346-354.
- Becker, G. (1964). *Human capital: A theoretical and empirical analysis, with special reference to education*. New York: National Bureau of Economic Research.
- Belzil, C. (2007). 'The return to schooling in structural dynamic models: a survey,' *European Economic Review*, 51: 1059-1105.
- Bennell, P. (1996). 'General versus vocational secondary education in developing

- countries: a review of the rates of return evidence,' *The Journal of Development Studies*, 33(2): 230-247.
- BIS (2011a). 'National Learner Satisfaction Survey: Apprentices Report,' BIS Research Paper Number 19. London: Department for Business, Innovation and Skills.
- BIS (2011b). 'National Learner Satisfaction Survey: Further Education Research Study Report,' BIS Research Paper Number 21. London: Department for Business, Innovation and Skills.
- Bishop, J. (1994). 'The Impact of Previous Training on Productivity and Wages', in L. Lynch (ed.) *Training and the Private Sector*, pp. 161-199. Chicago: University of Chicago Press.
- Black, S. and L. Lynch (1996). 'Human-capital investments and productivity,' *The American Economic Review*, 86(2): 263-267.
- Blakemore, A. and D. Hoffman (1988). 'Seniority rules and productivity: an empirical test,' *Economica*, 56(223): 359-371.
- Blanden, J., F. Buscha, P. Sturgis, and P. Urwin (2012) 'Measuring the earnings returns to lifelong learning in the UK.' *Economics of Education Review*, 31(4): 501-514.
- Blanden, J., M. Draca and S. McIntosh (2005). 'The economic and social returns to FE colleges,' A report for the Department for Education and Skills.
- Blundell, R., L. Dearden and B. Sianesi (2005). 'Evaluating the effect of education on earnings: models, methods and results from the National Child Development Survey,' *Journal of the Royal Statistical Society*, 168: 473-512.
- Blundell, R., L. Dearden, C. Meghir and B. Sianesi (1999). 'Human capital investment: the returns from education and training to the individual, the firm and the economy.' *Fiscal Studies*, 20(1): 1-23.
- Booth, A. and M. Coles (2005). 'Increasing returns to education and the skills under-investment trap,' IZA Discussion Paper No. 1657. Bonn, Germany: Institute for the Study of Labor (IZA).
- Bourbeau, E., P. Levebvre and P. Merrigan (2012). 'The evolution of the returns to education for 21 to 35-year-olds in Canada and across the provinces: results from the 1991-2006 analytical Census files,' *Canadian Public Policy - Analyse de Politiques*, xxxviii: 531-549.
- Brown, J. (1989). 'Why do wages increase with tenure? On-the-job training and life-cycle wage growth observed within firms,' *The American Economic Review*, 79(5): 971-991.
- Brown, S. and J. Sessions (1998). 'Education, employment status and earnings: a comparative test of the strong screening hypothesis.' *Scottish Journal of Political Economy*, 45(5): 586-591.
- Brunello, G., S. Comi and D. Sonedda (2012). 'Training subsidies and the wage returns to continuing vocational training: evidence from Italian regions,' *Labour Economics*, 19: 361-372.
- Card, D. (1999). 'The causal effect of education on earnings,' In O. Ashenfelter and D. Card (eds), *Handbook of Labor Economics*, Volume 3. Elsevier.
- Card, D., J. Kluve and A. Weber (2009). 'Active labor market policy evaluations: a meta-

- analysis,' IZA Discussion Paper No. 4002. Bonn, Germany: Institute for the Study of Labor (IZA).
- Carneiro, P., J. Heckman and E. Vytlačil (2011). 'Estimating the marginal returns to education,' *The American Economic Review*, 101: 2754-2781.
- Cattan and Crawford (2013). The returns to education: a review of the macro-economic literature. CEEDP0006. London: Centre for the Economics of Education, London School of Economics and Political Science.
- CE/IER (2011). Measuring the Economic Impact of Further Education. BIS Research Paper number 38. London: Department for Business, Innovation and Skills.
- CE/IER (2013a) 'Review of the Economic Benefits of training and qualifications research based on cross sectional and administrative data', BIS Report Paper Number 105. London: Department for Business, Innovation and Skills.
- CE/IER (2013b) 'Measuring Additionality in Apprenticeships,' BIS Research Paper Number 138. London: Department for Business, Innovation and Skills.
- CEBR (2013). *Productivity Matters: The impact of Apprenticeships on the UK economy*. Centre for Economics and Business Research.
- Cellini, S. and L. Chaudhary (2012). 'The labor market returns to a for-profit college education,' NBER Working Paper 18343. Cambridge, MA, USA: National Bureau of Economic Research (NBER).
- Chatterji, M., P. Seaman, L. Singell Jr. (2003). 'A test of the signalling hypothesis.' *Oxford Economics Papers*, 55: 191-215.
- Chevalier, A. and J. Lindley (2009). 'Overeducation and the skills of UK graduates,' *Journal of the Royal Statistical Society*, 172, part 2: 307-337.
- Chevalier, A., C. Harmon, I. Walker and Y. Zhu (2004). 'Does education raise productivity, or just reflect it?' *The Economic Journal*, 114: F499-F517.
- Colombo, E. and L. Stanca (2008). *The Impact of Training on Productivity: Evidence from a Large Panel of Firms* (No. 134). University of Milano-Bicocca, Department of Economics. Konings and Vanormelingen (2010)
- Constantatos, C. and E. West (1991). 'Measuring returns from education: some neglected factors,' *Canadian Public Policy*, 17(2): 127-138.
- Courtioux, P. (2012). 'How income contingent loans could affect the returns to higher education: a microsimulation of the French case,' *Education Economics*, 20(4): 402-429.
- Dickerson, A. (2005). 'A study on rates of return to investment in level 3 and higher qualifications,' Report to the Department of Trade and Industry (DTI).
- De Coulon, A. and A. Vignoles (2008). *An analysis of the benefit of NVQ2 qualifications acquired at age 26-34*. CEE Discussion Paper 106. London: Centre for the Economics of Education.
- De Grip, A. and J. Van Loo (2002). 'The economics of skills obsolescence: a review,' *The Economics of Skills Obsolescence*, 21: 1-26.
- Dearden, L. (1999). 'Qualifications and earnings in Britain: how reliable are conventional OLS estimates of the returns to education?' IFS Working Paper series, No. W99/7. London: The Institute for Fiscal Studies (IFS).

- Dearden, L., McGranahan, L. and B. Sianesi (2004). 'Returns to education for the 'marginal learner': evidence from the BCS70,' CEE Discussion Paper 45. London: Centre for the Economics of Education.
- Dearden, L., Reed, H. and J. Van Reenen (2000). 'Who gains when workers train? Training and corporate productivity in a panel of British industries,' IFS Working Paper series, No. W00/04. London: The Institute for Fiscal Studies (IFS).
- Dearden, L., Reed, H. & Reenen, J.V. (2005a). 'The Impact of Training on Productivity and Wages: Evidence from British Panel Data', IFS Working Papers W05/16, London: The Institute for Fiscal Studies (IFS).
- Dearden, L, Reed, H, & Van Reenen, J (2005b), 'Estimated Effect of Training on Earnings and Productivity, 1983-99.' CEP Discussion Papers dp0674, Centre for Economic Performance, LSE
- Dearden, L., S. McIntosh, M. Myck, and A. Vignoles (2002). 'The returns to academic and vocational qualifications in Britain.' *Bulletin of Economic Research*, 54(3): 249-274.
- Devereux, P. and W. Fen (2011). 'Earnings returns to British education expansion,' *Economics of Education Review*, 30: 1153-1166.
- Dickson, M. and C. Harmon (2011). 'Economic returns to education: what we know, what we don't know and where we are going - some brief pointers,' *Economics of Education Review*, 30: 1118-1122.
- Dickson, M. and S. Smith (2011). 'What determines the return to education: an extra year or a hurdle cleared?' *Economics of Education Review*, 30(6): 1167-1176.
- Dupray, A. (2001). 'The signalling power of education by size of firm and the long-term effects on workers' careers,' *International Journal of Manpower*, 22(1/2): 13-38.
- Elias, P. and K. Purcell (2004). Seven years on: graduate careers in a changing labour market. Higher Education Careers Services Unit, Institute for Employment Research, University of Warwick, Coventry.
- Feinstein, L., F. Galindo-Rueda and A. Vignoles (2004). 'The labour market impact of adult education and training: a cohort analysis,' *Scottish Journal of Political Economy*, 51(2): 266-280.
- Fersterer, J., J. Pischke and R. Winter-Ebmer (2008). 'Returns to Apprenticeship training in Austria: evidence from failed firms,' *The Scandinavian Journal of Economics*, 110(4): 733-753.
- Fraser, S. (2003). 'The impact of Investors in People on small business growth: who benefits?' *Environment and Planning C: Government and Policy*, 21: 793-812.
- Fredland, J. and R. Little (1980). 'Long-term returns to vocational training: evidence from military sources.' *The Journal of Human Resources*, 15(1): 49-66.
- Gambin, L., Hasluck, C., Hogarth, T., Ryan, P. and P. Elias (2011). 'Options Study for the Long-term Evaluation of Apprenticeships,' BIS Research Paper Number 56. London: Department for Business, Innovation and Skills.
- Garrett, R., M. Campbell and G. Mason (2010). The value of skills: an evidence review. UKCES Evidence Report 22. Wath-upon-Deane: UK Commission for Employment and Skills.
- Gemici, S., J. Rojewski and I.H. Lee (2012). 'Use of propensity score matching for training

- research with observational data,' *International Journal of Training Research*, 10(3): 219-232.
- Gibson, J. (2000). 'Sheepskin effects and the returns to education in New Zealand: Do they differ by ethnic group?' *New Zealand Economic Papers*, 34(2): 201-220.
- Gradstein, M. (2000). 'An economic rationale for public education: the value of commitment,' *Journal of Monetary Economics*, 45: 463-474.
- Grenet, J. (2010). 'Is extending compulsory schooling alone enough to raise earnings? Evidence from French and British compulsory schooling laws,' *The Scandinavian Journal of Economics*, 115(1): 176-210.
- Griliches, Z. (1977). 'Estimating the returns to schooling: some econometric problems,' *Econometrica*, 45(1): 1-22.
- Habermalz, S. (2006). 'The speed of employer learning and job market signaling revisited,' IZA Discussion Paper No. 2309. Bonn, Germany: Institute for the Study of Labor (IZA).
- Hallsten, M. (2012). 'Is it ever too late to study? The economic returns on late tertiary degrees in Sweden,' *Economics of Education Review*, 31: 179-194.
- Hansen, W.L. (1963). 'Total and private rates of return to investment in schooling,' *Journal of Political Economy*, 71(2): 128-140.
- Hansen, J. (2006). 'Returns to University Level Education: Variations within Disciplines, Occupations and Employment Sectors,' Ottawa: Human Resources Development Canada.
- Hanushek, E. (2009). 'The Economic Value of Education and Cognitive Skills,' In Sykes, G., Schneider, B. and D. Plank (eds) *Handbook of Education Policy Research*, pp. 39-56. New York: Routledge.
- Harkness, S. and S. Machin (1999). 'Graduate earnings in Britain, 1974-95,' DfEE Research Brief No 95. Nottingham: Department for Education and Employment (DfEE).
- Harmon, C. and I. Walker (2001). 'The returns to education: a review of evidence, issues and deficiencies in the literature,' DfEE Research Report No 254. Nottingham: Department for Education and Employment.
- Heckman, J., Lochner, L. and P. Todd (2008). 'Earnings functions and rates of return,' *Journal of Human Capital*, 2(1): 1-31.
- Heywood, J. (1994). 'How Widespread are Sheepskin Returns to Education in the U.S.?' *Economics of Education Review*, 13(3): 227-234.
- Hogarth, T., Gambin, L., Winterbotham, M., Baldauf, B., Briscoe, G., Gunstone, B., Hasluck, C., Koerbitz, C. and Taylor, C. (2012). 'Employer Investment in Apprenticeships and Workplace Learning: The Fifth Net Benefits of Training to Employers Study', BIS Research Paper Number 67, London: Department for Business, Innovation and Skills.
- Holland, D., I. Liadze, C. Rienzo and D. Wilkinson (2013). 'The relationship between graduates and economic growth across countries,' BIS Research Paper No 110. London: Department for Business, Innovation and Skills.
- IFF/IER (2010). 'Train to Gain Employer Evaluation: Sweep 5 Research Report. Coventry:

Learning and Skills Council.

- Jenkins, H. (1995). 'Education and Production in the United Kingdom,' Nuffield College, Oxford, Economics Discussion Paper no. 101.
- Jenkins, A., C. Greenwood and A. Vignoles (2007). 'The returns to qualifications in England: updating the evidence base on level 2 and level 3 vocational qualifications,' CEE DP 89. London: Centre for Economics of Education (CEE).
- Jenkins, A, Vignoles, A, Wolf, A, and F. Galindo-Rueda (2003). 'The Determinants and Labour Market Effects of Lifelong Learning', *Applied Economics*, 35: 1711-1721.
- Jespersen, S., J. Munch and L. Skipper (2008). 'Costs and benefits of Danish active labour market programmes,' *Labour Economics*, 15: 859-884.
- Kaymak, B. (2012). 'Quantifying the signaling role of education,' Preliminary draft for 2012 SOLE meetings.
- Keep, E., K. Mayhew and M. Corney (2002). 'Review of the evidence on the rate of return to employers of investment in training and employer training measures,' SKOPE Research Paper No. 34. Oxford: Centre on Skills, Knowledge and Organisational Performance.
- Kennedy, H. (1997). *Learning Works: Widening participation in Further Education*. Coventry: Further Education Funding Council.
- Kirby, S. and R. Riley (2008). 'The external returns to education: UK evidence using repeated cross-sections,' *Labour Economics*, 15(4): 619-630.
- Kjelland, J. (2008). 'Economic returns to higher education: signaling v. Human Capital Theory an analysis of competing theories,' *The Park Place Economist*, 16(1): 70-77.
- Krueger, A. and C. Rouse (1998). 'The effect of workplace education on earnings, turnover and job performance,' *Journal of Labor Economics*, 16(1): 61-94.
- Kuckulenz, A. (2006). 'Wage and productivity effect of continuing training in Germany: a sectoral analysis,' ZEW Discussion Paper No. 06-025. Centre for European Economic Research.
- Kuckulenz, A. and T. Zwick (2003). 'The impact of training earnings: differences between participant groups and training forms,' ZEW Discussion Paper No. 03-57. Centre for European Economic Research.
- Layard R. and G. Psacharopoulos (1974). 'The screening hypothesis and the returns to education,' *Journal of Political Economy*, 82(5): 985-998.
- London Economics (2011a), *The Long Term Effect of Vocational Qualifications on Labour Market Outcomes*, BIS Research Paper Number 45. London: Department for Business, Innovation and Skills.
- London Economics (2011b). 'The returns to Higher Education qualifications,' BIS Research Paper number 45. London: Department for Business, Innovation and Skills.
- London Economics (2012a). 'The impact of investment in intangible assets on productivity spillovers,' BIS Research Paper number 74. London: Department for Business, Innovation and Skills.
- London Economics (2012b). 'Assessing the deadweight loss associated with public

- investment in education and skills,' BIS Research Paper number 71. London: Department for Business, Innovation and Skills.
- London Economics (2012c). 'Estimating the impact of training on productivity using firm-level data,' BIS Research Paper number 72. London: Department for Business, Innovation and Skills.
- London Economics and Ipsos MORI (2013). 'The impact of Further Education Learning,' BIS Research Paper Number 104. London: Department for Business, Innovation and Skills.
- Long, M. (2001). 'Training and economic returns to workers,' In Smith, E. (ed), Return on investment in training: research readings. Australia: National Centre for Vocational Education Research (NCVER).
- Long, M. (2010). 'Changes in the returns to education and college quality,' *Economics of Education Review*, 29: 338-347.
- Martins, P. and J. Jin (2010). 'Firm-level social returns to education,' *Journal of Population Economics*, 23: 539-558.
- Mason, G. and K. Bishop (2010). Adult training, skills updating and recession in the UK: the implications for competitiveness and social inclusion. LLAKES Research Paper 10. London: Centre for Learning and Life Chances in Knowledge Economies and Societies (LLAKES).
- McGuinness, S., F. McGinnity and P. O'Connell (2009). 'Changing returns to education during a boom? The case of Ireland,' *LABOUR*, 23 (Special Issue): 197-221.
- McIntosh, S. (2004). 'Further analysis of the returns to academic and vocational qualifications,' CEE DP 35. London: Centre for the Economics of Education (CEE).
- McIntosh, S. (2007). *A cost-benefit analysis of Apprenticeships and other vocational qualifications*. DfES Research Report RR834. London: Department for Education and Skills (DfES).
- McIntosh, S., J. Wenchao and A. Vignoles (2011). 'Firms' engagement with the Apprenticeship programme,' DFE Research Report DFE-RR180. London: Department for Education (DFE) and Centre for Analysis of Youth Transitions (CAYT).
- Meager, N. (2009). 'The role of training and skills development in active labour market policies,' *International Journal of Training and Development*, 13(1): 1-18.
- Menon, M. (2008). 'Perceived rates of return to higher education: further evidence from Cyprus,' *Economics of Education Review*, 27: 39-47.
- Migali, G. and I. Walker (2011). 'Estimates of the causal effects of education on earnings over the lifecycle with cohort effects and endogenous education.' University of Lancaster, Economics Working Paper.
- Mincer, J. (1958). 'Investment in human capital and personal income distribution,' *Journal of Political Economy*, 66(4): 281—302.
- Meghir, C. and M. Palme (2005). 'Educational Reform, Ability, and Family Background,' *American Economic Review*, 95(1): 414-424.
- Melnik, A., Pollatschek, M.A. and Y. Comay (1973). 'The option value of education and the optimal path for investment in human capital,' *International Economic Review*,

14 (2): 421–435.

Moretti, E. (2004). 'Estimating the social return to higher education: evidence from longitudinal and repeated cross-sectional data,' *Journal of Econometrics*, 121: 175-212.

NAO (2012a). *Adult Apprenticeships*. London: National Audit Office.

NAO (2012b). *Adult Apprenticeships: Estimating economic benefits from Apprenticeships – Technical paper*. London: National Audit Office.

Neal, D. (2004). 'The measured black-white wage gap among women is too small,' *Journal of Political Economy*, 112(1): S1-S28.

Nilsson, A. (2010). 'Vocational education and training - an engine for economic growth and a vehicle for social inclusion?' *International Journal of Training and Development*, 14(4): 251-272.

Oosterbeek, H. and D. Webbink (2007). 'Wage effects of an extra year of basic vocational education,' *Economics of Education Review*, 26: 408-419.

Pereira, P. and P. Martins (2004). 'Returns to education and wage equations,' *Applied Economics*, 36: 525-531.

Psacharopoulos, G. (1981). 'Returns to education: an updated international comparison.' *Comparative Education*, 17(3): 321-341.

Psacharopoulos, G. (1989). 'Time trends of the returns to education: cross-national evidence,' *Economics of Education Review*, 8(3): 225-231.

Psacharopoulos, G. (1994). 'Returns to investment in education: a global update,' *World Development*, 22(9): 1325-1343.

Psacharopoulos, G. (2009). 'Returns to investment in higher education: a European survey,' A contribution to the Higher Education Funding Reform Project CHEPS-led consortium for the European Commission.

Psacharopoulos, G. and H. Patrinos (2004). 'Returns to investment in education: a further,' *Education Economics*, 12(2): 111-134.

PWC (2005). *The economic benefits of higher education qualifications*. A report produced for the Royal Society of Chemistry and the Institute of Physics. PriceWaterhouseCoopers.

Redding, S. (1996). 'The low-skill, low-quality trap: Strategic complementarities between human capital and R & D,' *The Economic Journal*, 458-470.

Riley, J. (2001). 'Silver Signals: Twenty-five years of screening and signalling,' *Journal of Economic Literature*, 39(2): 432-478.

Robinson, P. (1997). 'The myth of parity of esteem: earnings and qualifications,' CEP Discussion Paper No. 354. London: Centre for Economic Performance (CEP).

Ryan, P. (2001) 'The School-to-Work Transition: a Cross-National Perspective,' *Journal of Economic Literature*, 39, 34-92.

Sabates, R. and S. Parsons (2012). 'The contribution of basic skills to health related outcomes during adulthood: evidence from the BCS70,' BIS Research Paper Number 91. London: Department for Business, Innovation and Skills (BIS).

Sabates, R., L. Feinstein and E. Skaliotis (2007). 'Determinants and pathways of

progression to level 2 qualifications: evidence from the NCDS and BHPS,' Wider Benefits of Learning Research Report No. 21. London: Centre for Research on the Wider Benefits of Learning, Institute of Education.

- Schultz, T. (1961). 'Investment in human capital' [Presidential address delivered at the annual meeting of the American Economic Association, Saint Louis, MO, December, 1960] *The American Economic Review*, 51: 1–17.
- Sianesi, B. and J. Van Reenen (2003). 'The returns to education: macroeconomics.' *Journal of Economic Surveys*, 17(2): 157-200.
- Spence, M. (1973). 'Job Market Signaling Michael Spence,' *The Quarterly Journal of Economics*, 87(3): 355-374.
- Stefanik, M. (2011). 'Changes in private returns to education caused by tertiary education expansion in Slovakia,' *Review of Applied Socio-Economic Research*, 2: 167-176.
- Stiglitz, J. (1975). 'The Theory of 'Screening,' Education, and the Distribution of Income,' *American Economic Review*, 65: 283–300.
- Sweetland, S. (1996). 'Human capital theory: foundations of a field of inquiry,' *Review of Educational Research*, 66(3): 341-359.
- Uri, N. (1982). 'The impact of vocational education on productivity in the United States,' *Technological Forecasting and Social Change*, 21: 251-266.
- Usher, T., S. Baldwin, M. Munro, E. Pollard and F. Sumpton (2010). 'The role of finance in decision-making of Higher Education applicants and students,' BIS Research Paper No. 9. London: Department for Business, Innovation and Skills (BIS).
- Vedder, R. (2004). 'Private vs. social returns to higher education: some new cross-sectional evidence,' *Journal of Labor Research*, XXV(4): 677-686.
- Vignoles, A., A. de Coulon and O. Marcenaro-Gutierrez (2011). 'The value of basic skills in the British labour market,' *Oxford Economic Papers*, 63: 27-48.
- Vivian, D., Winterbotham, M., Godwin, L., Morris, S., Hogarth, T. and L. Gambin (2012). 'Evaluation of Apprenticeships: Learners,' BIS Research Paper Number 76. London : Department for Business, Innovation and Skills.
- Walker, I. and Y. Zhu (2011). 'Differences by degree: evidence of the net financial rates of return to undergraduate study for England and Wales,' *Economics of Education Review*, 30: 1177-1186.
- Walker, I. and Y. Zhu (2013). 'The impact of university degrees on the lifecycle of earnings: some further analysis,' BIS Research Paper Number 112. London: Department for Business, Innovation and Skills.
- Winterbotham, M., Vivian, D., Huckle, C., James, A.S., Hogarth, T., Gambin, L., and C. Hasluck (2012). 'Evaluation of Apprenticeships: Employers,' BIS Research Paper Number 77. London: Department for Business, Innovation and Skills.

Annex A

Table 1: Summary of assumptions and findings related to signalling versus productivity-enhancing effects of learning

Study	Assumptions/approach	Findings
Hansen, 1963	n/a	Notes that it is difficult to separate impacts of intelligence and schooling on productivity
Griliches, 1977	Review of existing evidence	Including a direct measure of ability in earnings function has relatively small direct effect on earnings (upward bias of 0.01). Often bias is zero.
Psacharopoulos, 1981	Review of existing literature	Objections to using wages to proxy total productivity returns are not generally supported in the literature; Signalling effects may arise initially at point where employers assess prospective employees but little evidence of persistent signalling effects
Brown & Sessions, 1998	Test strong and weak signalling hypotheses (SSH and WSH, respectively) using employee versus self-employed methodology	Find evidence in support of WSH but not for SSH. There are some productivity enhancing effects of education.
Riley, 2001	Review of existing literature	Notes some shortcomings of previous work: Completers v non-completers does not produce strong effect; context specific findings not universally applicable; many do not specify variant of signalling hypothesis they are testing; Notes problems with data used by Layard and Psacharopoulos (1974) where

Study	Assumptions/approach	Findings
		they find little effects of credentials on earnings and issues with transferring the finding of sheepskin effects by Heywood (1994) which are only relevant in private non-union sector.
Keep, 2002	Review of existing evidence	Notes that there are a number of variants of signalling effects; evidence does not form consensus on size of signal; overall evidence that signalling exists
Chatterji <i>et al</i> , 2003	Propose direct measure of signalling – the difference between the qualifications required for a job (to get it) and those needed to do that job; survey of workers	Find a significant, positive, gender-specific return to the signal variable – indicating a downward bias in the return to education estimated without such an indicator.
Sianesi & Van Reenen, 2003	Use matched data for individuals who started the same learning aims but compares completers to drop-outs	Substantial marginal returns associated with most qualification levels and individual qualifications.
Chevalier <i>et al</i> , 2004	Considers raising of school-leaving age in England and Wales to test for signalling effects; RoSLA would increase attainment of all and highest ability would increase further in order to maintain signalling effect	Find no evidence to support signalling effect – only those at margin of SLA are affected by reform but no effect on those who would have stayed on anyway
McIntosh, 2007	Cost benefit analysis of Apprenticeships; considers signalling effects in sensitivity analysis by reducing the returns to Apprenticeships (by a percentage)	Reducing the return to 75 per cent (i.e. assuming signalling effect is 25 per cent of wage return to Apprenticeship) results in NPV of Apprenticeship reducing from £105k to £87k for Level 3 and from £73k to £58k for Level 2.
De Coulon & Vignoles, 2008	Earnings equations with dummy variables for different qualifications;	Negative / no effect of NVQ2 on earnings.

Study	Assumptions/approach	Findings
	NVQ2 considered in light of signalling versus productivity effects	Signalling – NVQ2 could provide a negative signal to employers regarding individuals ability or motivation; Productivity – the content of NVQ2 may not be valued by employers
Kjelland, 2008	Attempts to test for signalling by controlling for intelligence and motivation in earnings function; Data from NLSY – motivation based on Rotter Scale (locus of control); ability AFQT scores	Finds strong positive and significant correlation between ability and earnings but no significant effect for motivation indicator. Limitations on these measures. Results are inconclusive. Including motivation not found to change the returns estimates.
Grenet, 2010	Considers returns associated with RoSLA in England and Wales and in France to test for signalling effect	In England and Wales, reform resulted in increase in share with qualifications v no qualifications whereas no such change in France. Also increase in average earnings (6 to 7 per cent) in England and Wales but none in France. Argues difference is due to change in qualifications – thus signalling effects rather than increased productivity
Martins & Jin, 2010	Consider firm-level social returns to education	Argue that educational expansion may actually result in an increase in the earnings of less educated workers in larger firms not because of higher productivity but because such workers become rarer in the workforce.
CE/IER, 2011	<i>Ad hoc</i> correction for selection into employment. No explicit modelling of signalling effects.	Main estimate of NPV of FE to the economy is £75 billion.
Gibson, 2000	Test ‘sheepskin’ effects by including credentials dummy along with years of education in earnings	Find effects of credentials far outweigh years of schooling effects – large sheepskin effects. Finds significant sheepskin effects

Study	Assumptions/approach	Findings
	function. Particularly interested in effects by ethnic group.	for ethnic minorities particularly for higher level qualifications.
Kaymak, 2012	Uses US panel data; workers grouped into high/low skilled according to occupation; assumes that extent of signalling depends on how fast employers learn true productivity of workers	Average return to signalling for low skilled workers is 22 per cent of total OLS return to education (range 19 to 25 per cent); for high skilled signalling estimated to be 1 per cent of OLS return on education (range 0 to 2.7 per cent. After 15 years of labour market experience, signalling effect is nil.
NAO, 2012a/b	No explicit modelling of signalling effects.	Technical Report notes that the literature review provided insufficient evidence on the value of signalling effects.

Table 3.2: Summary of assumptions and findings related to non-earnings benefits of learning

Study	Assumptions/approach	Findings
Black and Lynch, 1996	Considers effects of employer provided training on business productivity (sales) using US data	Find 10 per cent increase in average educational attainment of workforce of firm increases firm productivity by 4.9 to 8.5 per cent in manufacturing and 5.9 to 12.7 per cent in non-manufacturing; training outside of working hours also has significant effect on productivity in manufacturing; provision of computer/IT training has significant effect in non-manufacturing firms
Blundell <i>et al</i> , 1999	Review of literature Difficult to obtain data on firm productivity, competitiveness and profitability and difficult to identify appropriate counterfactual.	Conclude that increase in wages should provide a lower bound on the productivity gains from training. Previous studies attempt to quantify directly the contribution of training to firm productivity show positive impact of training. Estimates range from very large effects to little or no effects. Cites two studies that find the productivity impact is twice as large as the wage increase associated with training.
Sianesi & Van Reenen, 2003	Review of macroeconomic studies Compare neoclassical approach to new growth theory studies of impact of human capital on economic performance	Evidence suggests that the returns to human capital are higher for firms than for individuals – not all productivity gains are captured by individual workers Summarise findings at economy level: <ul style="list-style-type: none"> • Barro-style growth regressions suggest increasing school enrolment rates by 1 percentage point leads to an increase in per capita GDP growth of between 1 and 3 percentage points every year; • raising average education level by one year would raise level of output per capita by 3 to 6 per cent. Over short run the empirical estimates using both frameworks tend to result in same change in estimates of GDP.
Vedder, 2004	Uses cross-sectional data to consider private versus social returns to education in US	Finds negative effect of State spending on HE on economic growth but there is significant and positive

Study	Assumptions/approach	Findings
	(State level data, 25 years); considers state rate of participation in HE, state spend on HE	correlation between proportion of state's population aged 25+ years with four or more years of college and economic growth
Dearden <i>et al</i> , 2005	Use a 14 year panel of firm-level training data and allow training to be a choice variable; estimate of productivity impact of training at industry-level	Increase of 1 percentage point in proportion of employees who are trained is associated with 0.3 per cent increase in wages and 0.6 per cent increase in productivity (value added per head).
PWC, 2005	Considers economic benefits of HE (with focus on sciences) and notes benefits to Exchequer	Returns in form of increased tax and national insurance contributions by graduates with enhanced earnings. Find rate of return to the State is 12 per cent for chemistry qualifications, 13 per cent for physics.
Kuckulenz, 2006	Considers returns to continuing training in Germany using sector-level data	Estimates that the increase in productivity arising from training is equal to 3x the wage increase; also finds higher skilled workers capture larger share of rent than do lower skilled. Evidence of knowledge spillovers between firms in same sector.
Long, 2010	Estimates changes in the effects of educational attainment and college quality on three cohorts of students in the US. Does not consider impacts on employers	Finds increase in years of education is associated with increased labour force participation. Has found changes in some benefits over time, including a decrease in the positive effect of education on civic participation and delay in marriage and child bearing.
Martins & Jin, 2010	Use matched employer-employee panel data from Portugal to test model of where educated workers transfer part of their general skills to uneducated workers	Find firm-level social return of 14 per cent (compared to 10 per cent on basis of individual returns). An increase of one year of schooling in average education of workers within the firm increases wages of uneducated workers by 2.4 per cent. Range of spillover effects estimated is 14 to 23 per cent.
CE and IER, 2011	Assumes increase in total productivity is double the increase in wages (as per Dearden <i>et al</i> results) Do not carry out sensitivity analysis of this assumption explicitly	Main estimate of NPV of FE to the economy is £75 billion. In sensitivity analysis, find that reducing all wage premia by 10 per cent results in decrease in NPV of 9 per cent (£68 billion) whilst increasing premia by 10 per cent increases NPV by 9 per cent (to £82 billion).

Study	Assumptions/approach	Findings
		Reducing/increasing the assumed productivity gain to employers as a percentage of the wage premia would affect overall estimates in same direction.
London Economics, 2012b	Use firm-level data in a new dataset. Review of literature.	Results are inconclusive (not robust, no statistical significance). Also note issues in selection of firms to TtG and in controlling for other forms of training. Some results, which should be cautiously interpreted include, one percentage point increase in volume of training undertaken <ul style="list-style-type: none"> • reduces productivity by 0.16 per cent (where capital stock used to control for capital) • increases productivity by 0.14 per cent (where capital expenditure is used to control for capital) Disaggregation by firm size suggests that small firms witness increases in productivity associated with increased training whereas large firms see a decrease in productivity when training increases.
NAO, 2012a/b	Assumes productivity benefits to be 25 per cent of wage premium for Apprenticeships. Sensitivity analysis – produces figures assuming 50 per cent spillover effects as well.	Considers the 25 per cent figure to be a lower bound for likely productivity gains associated with Apprenticeships. Main estimates for returns to Advanced Apprenticeship is £21 per £1 of public funding; £16 for Intermediate Apprenticeships; and £18 for all Apprenticeships. If increase the spillover effects to 50 per cent rather than 25 per cent of the wage premia then results are higher - £26 per £1 public funding for Advanced Apprenticeships; £19 for Intermediate; and £22 for all.
London Economics & Ipsos MORI, 2013	Review some of the non-economic benefits	Includes improved health outcomes, social cohesion, reduction in crime, etc.

Table 3.3: Summary of assumptions and findings related to the persistence of returns to learning

Study	Assumptions/approach	Findings
Psacharopoulos, 1981	Review of international evidence on returns to education (mainly HE)	Comments on persistence and timing of returns to graduates. Notes importance of considering 'job search' after graduation when estimating age-learning profile.
Uri, 1982	Study of impact of vocational education on productivity in US; measures productivity in terms of GDP per worker hour, vocational education measured by total vocational enrolments in federally aided schools	Finds significant correlations between productivity changes and vocational education but only after considerable amount of time (10 to 20 years)
Robinson, 1997	Compares academic to vocational routes and their respective returns in the labour market	Finds deterioration in relative earnings over time for men with trade Apprenticeships and C&G advanced craft qualifications. Timescale of returns found to differ by route with returns to academic qualifications having an advantage over notionally equivalent levels of vocational qualifications in the long run.
Blundell <i>et al</i> , 1999	Review of evidence on the returns to education and training.	Summarises finding in several studies that skills depreciate considerably over time (within about 10 years of acquisition) thus there are declining returns over time. Studies also show that employer-provided training have some of the longer lasting impacts on wages compared to other types of training.
Dupray, 2001	Looks at earnings over time by firm size in France	Finds differences in erosion of returns to qualifications by firm size; concludes that in large firms age returns to education deteriorate over time as individuals are provided with other opportunities or advantages
Elias & Purcell, 2004	Study of university graduates in UK	Finds that for men, the gap between graduate and qualified non-graduate earnings grows over 15 years after graduation; growth tails off for women about 10 years after graduation. Find growth in graduate earnings in 6 to 7 year period after graduation.

Study	Assumptions/approach	Findings
PWC, 2005	Consider economic benefits of HE qualifications (with focus on sciences)	Find that graduate earnings growth at a constant rate in first few years after graduation, regardless of subject. There are marked differences in mid-career years (e.g. more growth in returns for chemistry and physics relative to other subjects).
De Coulon & Vignoles, 2008	Consider returns to NVQ2 qualifications. Acknowledge that it may take time for benefits to become significant.	Find that there may be a lag in the effect of LLL, at least for women. Find acquisition of NVQ2 has no statistically significant effect on wages even after allowing for a time lag.
CE & IER, 2011	Assumes that the benefits of FE qualifications will persist for the rest of an individual's working lifetime. No sensitivity analysis related to this assumption.	Estimated NPV per achievement (for first time qualification) is £54,000, and when consider all qualifications the NPV is £47,000 per achievement. NPV of FE for the economy is £75 billion.
Migali & Walker, 2011	Consider causal effects of education on earnings and consider cohort effects.	Find a convex earnings profile. Earnings peak for men at age 45 (when the college premium (NVQ4 v NVQ3) is around 40%) and for women, the peak is reached at age 26 (when the premium is more than 40%). Also find that the age-earnings profile for NVQ4 is higher than for NVQ3 at all ages and that the curve is steeper than that for NVQ3 at early ages for men and women.
Blanden <i>et al</i> , 2012	Examine returns to lifelong learning. Use lags and leads in their model.	Find positive and significant returns to hourly wages in 2 nd and 4 th years after a LLL event and that cumulative net return is statistically significant after 2 years (average net return is 3.6%). For women, find positive significant effect after 4 and 5 years and cumulative effect is significant after 5 years when it is 10.3 per cent.
Kaymak, 2012	Uses US panel data; workers grouped into high/low skilled according to occupation; assumes that extent of signalling depends on how fast employers learn true productivity of workers	Assumes economic life of person starts when they begin schooling (age 6 years) and lifetime is set to 59 years – assuming individual stops working at 65 years of age.
NAO, 2012a/b	Assumes that benefits of Apprenticeship persist for remainder of working lifetime	Total benefits to apprentices over working lifetime has decreased as average age at completion has

Study	Assumptions/approach	Findings
	(after completion). Assumes average age of completers is 32-33 years. No sensitivity analysis related to this assumption.	increased (compared to BIS estimates). Estimates return per £1 of public funding is: £21 for Advanced Apprenticeship; £16 for Intermediate; and, £18 for all combined.
CEBR, 2013	Assume that the economic benefits of Apprenticeship are immediately realised upon completion and they persist for working lifetime. Assume 85 per cent of apprentices are employed in all years after completion.	All Apprenticeship completions forecast over the horizon to 2020/21 are assumed to provide a constant productivity effect for the economy. Overall estimate impact of Apprenticeships on the UK economy to be £3.4 billion to 2020/21.
London Economics, 2011a	Uses matched administrative data on people's employment and earnings to consider long run impact of vocational qualifications; estimate earnings premia and employment impacts for up to seven years after attainment	Find effects persist for up to seven years; for Level 3 and Level 4 qualifications, earnings premia found to be increasing between 2 and 7 years after attainment; for Level 1 and Level 2, earnings premia relatively flat but persist.
London Economics & Ipsos MORI, 2013	Assume returns are generated over entire working lifetime. Survey of 4,000 learners.	Find that aggregate earnings across the sample increased by 8.5% while the number of earners increased by 12.4%.

Table 3.4: Summary of assumptions and findings related to additionality & deadweight loss

Study	Assumptions/approach	Findings
Constantatos and West, 1991	Study returns to HE in Canada; men only	When include figure for level of deadweight associated with public funding for HE, rate of return to HE is reduced. Baseline estimate of social rate of return to a university degree is 9.89 per cent but when include deadweight of 0.8 and ability of 0.35 return is 6.15 per cent.
Vedder, 2004	Uses cross-sectional data to consider private versus social returns to education in US (State level data, 25 years); considers state rate of participation in HE, state spend on HE	Finds that funding-participation relationship for HE is not very strong – a 10 per cent increase in state funding for HE increases proportion attending college by 1.8 per cent
IFF/IER, 2010	Evaluation of Train to Gain, Sweep 5; survey asked employers what training (amount, type) would employees have received without programme	Found 1 in 8 employees would have received training anyway without Train to Gain; total additionality found to be 76 per cent in sweep 5
Hogarth et al., 2012	Case studies of employers considering their investments in Apprenticeship and workplace learning with estimates of net benefits. Asked employers about likely response to increased cost of training resulting from reduced public funding	Qualitative findings, small sample of employers. Responses ranged from little additionality (employers would continue to train in very similar manner and quantity without subsidies) to very little deadweight (employer would withdraw from training completely without subsidies)
Winterbotham et al., 2012	Survey of employers for evaluation of Apprenticeships; asked employers likely responses in terms of training (quantity, type) if government funding reduced	For apprentices aged 19 years and older: if employers had to pay full costs 17 per cent would still have taken on apprentices in last 3 years; with half costs, 29 per cent would have continued with apprentices; number of apprentices would have been reduced by 85 per cent with full fees and 73 per cent for half fees. Considering 16 to 18 and 19+ year olds, half fees result in 53 per cent decrease in apprentice numbers, full fees result in 61 per cent reduction.
London	Estimates deadweight and additionality attributed to Apprenticeships and FE	Estimates that deadweight loss is equal to 28 per cent of training that is publicly funded. DWL is also found to

Study	Assumptions/approach	Findings
Economics, 2012a	using data from NESS09	<p>be larger for older apprentices. Additionality is estimated to be 72 per cent.</p> <p>The study notes that without employer-employee data DWL is likely overestimated whilst additionality is underestimated.</p> <p>The commonly used figure for DWL is 30%.</p>
CEBR, 2013	<p>Based on NESS09 analysis in BIS RP 71 – assume future 86 per cent of future Apprenticeship completions are ‘additional,’ Implies deadweight of 14 per cent.</p> <p>No sensitivity analysis regarding this assumption.</p>	<p>The 86 per cent additionality figure is calculated on the basis of 72 per cent of apprentices would have received no training (NESS09) then remainder is assumed to represent 50 per cent additionality.</p> <p>Find total impact of Apprenticeships on the UK economy to be £3.4 billion to 2020/21.</p>
London Economics & Ipsos MORI, 2013	Use a survey of 4,000 FE learners to estimate deadweight by asking about their actions had there been no public funding for their programmes.	<p>Estimate deadweight loss to be 60.9 per cent overall (65.3 per cent for men, 57.8 per cent for women). Find that 30.2 per cent of training overall was additional (26.7 per cent for men, 30.03 per cent for women).</p> <p>Suggest that DWL increase with qualification level.</p>

Table 3.5: Summary of assumptions and findings related to the *option value of progression to further learning*

Study	Assumptions/approach	Findings
Robinson, 1997	Compares academic to vocational routes and their respective returns in the labour market; estimates extra pay obtained from progression onto the next level of qualification in each route	Finds that in VET, men who progress from HND/HNC from OND/ONC have 11 percentage point increase in pay; progression from 2 A-levels to first degree results in 16 percentage point increase in pay.
Sianesi & Van Reenen, 2003	Review of existing evidence	Whilst macro studies largely overlook this issue, in micro literature there is significant evidence predicting that more highly educated individuals are afforded more opportunities for work-related training later.
McIntosh, 2004, 2007	Uses LFS data to ...	Argues that it is important to control for all qualifications held
Blundell <i>et al</i> , 2005	Consider various specifications to consider effect of education on earnings using NCDS. In multiple-treatment model distinguish effect of different levels of education, estimate separate effects each	Suggest that this treatment is more attractive framework as interested in wide range of levels of education with potentially different returns
Dickerson, 2005	Uses LFS to study rates of return to investment in Level 3 and higher qualifications	
Sabates, 2007	Consider progression pathways to qualifications using data from NCDS and BHPS. Progression as an outcome	Find adults who gained a Level 2 qualification were more likely to have been previously engaged and relatively successful in other forms of learning; beyond Level 2, around 18 per cent went onto achieve subsequent higher level.
De Coulon & Vignoles, 2008	Analyse benefits of NVQ2 qualifications (and others) including participation in subsequent learning events.	Find that individuals who undertook accredited learning were more likely to undertake subsequent learning in a later period. This was found for all qualification levels up to Level 4. Those with NVQ2 were 40 percentage points more likely to acquire another qualification in a second period.
CE and IER, 2011	The NPV model includes an option through which the	Calculate the 'progression factor' based on the assumed probability of

Study	Assumptions/approach	Findings
	<p>impact of progression can be factored into estimates.</p> <p>The 'progression factor' is a ratio applied to the NPV per achiever of a particular qualification which takes account of the additional value of progression.</p> <p>No sensitivity analysis regarding this assumption.</p>	<p>continuing to a higher qualification (10% in the report), the maximum time after qualifying during which learner is expected to decide to progress or not (5 years in the report), the assumed type of probability distribution (assumed to be uniformly distributed in the report), and the discount factors for each year.</p> <p>Main estimate is total NPV of FE for the economy is £75 billion.</p>
NAO, 2012a/b	<p>Comment on progression to HE but does not include a factor to account for issue.</p>	<p>Note that 5% of Apprenticeship completers in 2005/06 immediately went onto HE and 13% had moved on after another 3 years. In 2008/09, 7% of completers immediately went into HE.</p>
London Economics & Ipsos MORI, 2013	<p>Do not directly factor in progression benefits in analysis but do consider in literature review.</p>	<p>In review of literature find that individuals with qualifications are more likely to undertake additional learning and the effect increases with level of qualification.</p>

Table 3.6: Summary of assumptions and findings related to the relationship between past and future benefits and differences in *marginal and average learners*

Study	Assumptions/approach	Findings
Psacharopoulos, 1981	International evidence review of returns to education	Suggests that as countries develop and expand their education systems the returns are falling (but not greatly). Also notes that evidence indicates that returns to education do fall as a country passes from one stage of development to the next.
Blundell <i>et al</i> , 1999	Review of existing evidence.	Comment on the rates of return to education in the UK over several decades noting that they were higher than ever before just prior to WW2, then declined in the 1970s, and rose again in the 1980. These changes are attributed to changes in interaction between demand for and supply of workers at each qualification level over time.
Sianesi & Van Reenen, 2003	Review of existing literature. Raise questions: whether sustained improvements in educational attainment necessarily led to increased macroeconomic growth? Whether there are decreasing returns to expansion of education?	They cite Krueger and Lindahl (1998) who reject the constant education-slope assumption that is commonly adopted in macroeconomic growth regressions and find that the average effect of education is not statistically significant.
Dearden <i>et al</i> , 2004	Use data from the 1970 BCS who would have been making decisions regarding 'staying on' in 1986 and regarding HE participation in 1989.	Note that the 'marginal learner' would be different in profile in more recent times. Also, economic cycle would affect returns to education. Provide different definitions of marginal learners and what the 'margin' is which they argue are relevant for different policy purposes. Find that for men, those who 'stayed on' earn 11-12% more than if they had dropped out and returns would have been about the same if those who dropped out had stayed on instead. Similarly the return for women is 18 per cent and the ATT (returns for those who stayed on) and ATNT (returns for drop-outs had they stayed on instead) are virtually the same. Find returns to HE are greatest for men who are indifferent between

Study	Assumptions/approach	Findings
		undertaking HE and remaining at Level 2/3.
Elias and Purcell, 2004	Survey of UK graduates. Graduated in 1995 and 1980.	Found growth of earnings for female graduates in 6 to 7 years after graduation was higher in 1995 graduate cohort but growth similar for men in both cohorts.
McIntosh, 2004	Considers returns to academic and vocational qualifications. Disaggregate by highest level of qualification achieved at school. Estimates separate wage equation to six groups by highest school qualification.	Finds little variation in return to qualifications over time. Returns obtained in 2002 similar to those in 1996. Concludes that increase in proportion of working age population holding some of the higher level, particularly academic qualifications does not seem to have a dampening effect on returns. Main exceptions are return to low grade GCSEs for women declined and returns to lowest C&G qualifications for men fell to being insignificant for men. Estimates returns for marginal student and points out difference to average particularly important for policy.
Pereira and Martins, 2004	Meta-analysis of studies of returns to education in Portugal	Find positive relationship between year of data used and size of coefficient on education in wage equations. Reflects increasing trend in returns to education = 1% over 10 years.
Vedder, 2004	US study	Finds returns to HE have grown over time. Finds median earnings of FT male workers with 4+ years college increased from 44.99% higher than earnings of HS graduates in 1970 to 83.26% in 2001. Increase smaller for women (56.16% to 73.62%)
Dickerson, 2005		Finds no evidence to suggest excess supply of individuals qualified at Level 3+ in UK
PWC, 2005	Estimate the returns to HE qualifications with focus on science subjects.	Find a relatively low rate of return to degrees in psychology and note that a fall in future returns might be expected as the number of students undertaking psychology degrees has been increasing.
Hansen, 2006	Uses Canadian data from three waves of National Graduate Survey (NGS) (1990, 1995, 2000) to	Finds decrease in returns to university graduates versus college/trade school graduates between 1992 and 2002 (24.2% to 16.7% for men; 31.3% to

Study	Assumptions/approach	Findings
	examine differences between colleges/trade school graduates and university graduates.	24% for women).
Oosterbeek and Webbink, 2007	Examine wage effects of an extra year of basic vocational education in NL	Find increase in wages of 3 to 4% for males overall but when consider some subsamples the extra year gave rise to negative returns.
De Coulon & Vignoles, 2008	Consider the returns to NVQ2 qualifications and find that there are wage returns to NVQ2 which contradicts previous studies.	Find that individuals who undertook LLL between 1996 and 2000 had 20% higher wages than those who did not whereas previous study (Jenkins <i>et al</i> , 2003) found no effect. Attribute the difference between their study and previous ones to better data and methods in their own study but also to genuine differences in the labour market in the early 1990s and 2004.
Psacharopoulos, 2009	Review of evidence on returns to HE in Europe	Concludes that across 16 countries with evidence for more than one point in time the returns to HE have been rising.
Grenet, 2010	Considers returns associated with RoSLA in England and Wales and in France to test for signalling effect	Finds impact of reform near zero in France but significant increase in pay for those in England as increased share with qualifications. Concludes that compulsory schooling laws do not systematically improve the labour market prospects of early school leavers.
Martins and Jin, 2010	Consider firm-level social returns to education (in terms of knowledge exchange on the job and productivity spillovers between workers)	Argue that in case of larger units of analysis, educational expansion may actually result in an increase in the earnings for less education workers as they become scarcer.
Carneiro <i>et al</i> , 2011	US data. Estimate marginal returns to alternative policies of increasing college attendance	Find marginal expansions in college attendance attract students with lower returns to education than those who currently attend college. Conclude that marginal and average returns not the same and MP RTE is more appropriate than LTE.
CE & IER, 2011	Estimates the impact of FE on the economy (NPV model). Uses past returns as an estimate of future returns.	Finds overall NPV of FE to be £75 billion.
London Economics,	LFS data to estimate returns	Some evidence that the average

Study	Assumptions/approach	Findings
2011b	to HE qualifications	return to post-graduate qualifications has increased over time. Earnings premium for doctorate increased from an average between 4.9 and 13.9% between 1996 and 1999 to average between 14.1 and 23.6% between 2006 and 2009. Evidence that premium rising over time. Similar finding for Masters degree.
Migali & Walker, 2011	Estimates causal effects of education on earnings over the lifecycle. Distinguishes between different comparator groups. Considers cohort effects.	Finds that the premia associated with NVQ4 v NVQ3 qualifications (i.e. the college premium) are greater for the older cohort (1950-55 compared to 1960-65 cohort) and the premium is higher for men in the older cohort but higher for women in the younger cohort.
Vignoles <i>et al</i> , 2011	Compares NCDS cohort to BCS cohort to examine returns to basic skills	Finds value of basic skills appears to have remained remarkably stable since 1990s despite huge increase in educational achievement across the two cohorts.
NAO, 2012a/b	Past returns to Apprenticeship are used to estimate returns in future.	Main estimates for returns to Advanced Apprenticeship is £21 per £1 of public funding; £16 for Intermediate Apprenticeships; and £18 for all Apprenticeships.
Blanden <i>et al</i> , 2012	Review of existing evidence	Note that studies of the returns to vocational adult learning based on cohort study data are limited to a particular age group.
CEBR, 2013	Estimate total impact of Apprenticeships on the UK economy to 2020/21 Assumes that trend in completions will continue and that productivity effects will be same in future as current estimates.	Estimate the total impact of Apprenticeships on the UK economy to be £3.4 billion to 2020/21. Do not alter the assumptions to provide any sensitivity analysis.

Table 3.7: Summary of assumptions and findings related to the *aggregation of the returns*

Study	Assumptions/approach	Findings
Study	Assumptions/approach	Findings
Blundell <i>et al</i> , 1999	Review of existing evidence on returns to education and training Considers findings from growth accounting research	Find significant effects at macro level in the existing study but caution that results can be sensitive to measure of educational quality used in studies.
Gibson, 2000	Notes that social rate of return normally calculated by comparing lifetime net earnings streams for person without a certain qualification to someone with it.	Finds a difference between estimates of social rate of return when including credential effect (8 per cent) and not (3.9 per cent).
Sianesi & Van Reenen, 2003	Review of macroeconomic studies of the effects education on productivity and growth. Compare findings from new growth theory studies to those based on the neo-classical human capital theory	New growth theory assumes that the stock of education affects the long-run growth rate of the economy; Neo-classical assumes that human capital affects the level of output in the economy. Finds that in the short-run (up to four years), results from both approaches are similar. New growth estimates over longer periods are typically much larger than neo-classical estimates.
Jespersen, 2008	Consider costs and benefits of ALMPs in Denmark estimating net social return using cost-benefit approach. Account for direct operation costs and multiply the cost per FTE for each year of programme. Take the earnings effect, aggregated across individuals plus any transfers less unit costs less subsidies during programme	Find net benefit to be positive for private job training and public job training. Net costs found for classroom training and residual programmes. Omit general equilibrium effects e.g. displacement – may induce bias in favour of public and private job training.
Card <i>et al</i> , 2009	Meta-analysis of microeconometric evaluations of ALMPs	Find few studies have sufficient information to carry out even crude CBA – most often programme costs unknown/unreported
Martins & Jin, 2010	Aggregate individual-level Mincer equations to the firm-level	Find a return of about 10 per cent at the firm-level. Note the difficulty in estimating the social returns to education.

Study	Assumptions/approach	Findings
CE & IER, 2011	Returns to individuals are aggregated to estimate the returns to the economy. No account is taken of labour market displacement. Aggregates the NPV of different learning streams according 2008/09 funding allocations	
London Economics, 2012b	Aggregate learner-level data before analysis. Carry out separate analysis for: 1) all firms; 2) firms by size; 3) firms by sector.	Provide estimates of deadweight loss for Apprenticeships and Train to Gain.
London Economics, 2012c	Carry out separate analysis at firm-level dependent on age of apprentices.	Results are not robust and are inconclusive. See Table 3.2 for more details.
NAO, 2012a/b	Returns to individuals are aggregated to estimate the returns to the economy. No account is taken of labour market displacement.	Main estimates for returns to Advanced Apprenticeship is £21 per £1 of public funding; £16 for Intermediate Apprenticeships; and £18 for all Apprenticeships.
CEBR, 2013	Aggregates productivity returns associated with individual apprentices by adopting various assumptions re trends in completion, productivity impact of an Apprenticeship & additionality	Estimates the total impact of Apprenticeship to be £3.4 billion to 2021/22

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