RESEARCH

BIS | **Department for Business Innovation & Skills**

Measuring the Economic Impact of Further Education

Preface

In February 2009, the Learning and Skills Council (LSC)[1], in partnership with the Department for Business, Innovation and Skills (BIS)[2], commissioned a study to develop a model to examine the impact of the Further Education (FE) sector in delivering its primary function: providing people with the skills they need in the labour market.

The research team was led by Cambridge Econometrics (CE), in collaboration with the Warwick Institute for Employment Research (IER). The study team was directed by Rachel Beaven (CE) and managed by Mike May-Gillings (CE), with expert analysis provided by Professor Rob Wilson (IER) and Professor Derek Bosworth (IER). Model building was undertaken by Sunil Joshi (CE) and Simone Nitsch (CE).

The work was guided by a Steering Committee that included Chris Littler (BIS), Matt Bursnall (BIS) and Simon McKee (BIS).

The focus of this research paper is the learning funded by BIS for people aged 19 and over. It presents: the approach taken; the model results; and the results of additional sensitivity testing, making use of the flexibility of the model, undertaken by BIS.

The views expressed in this report are the authors' and do not necessarily reflect those of the Department for Business, Innovation and Skills.

cambridge econometrics

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[1] In April 2010 the Learning and Skills Council was succeeded by the Young People's Learning Agency (YPLA) and the Skills Funding Agency (SFA, an agency of BIS).
[2] In June 2009 the Department for Innovation, Universities and Skills (DIUS) merged with the Department for Business, Enterprise and Regulatory Reform (BERR) to form the Department for Business, Innovation and Skills (BIS). In April 2010, BIS took over the full role of client for this project.

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Executive Summary

Overview

1.   The model outlined in this report aims to measure the economic value of the government-funded qualifications provided by the post-19 Further Education (FE) sector, including colleges, private training providers and voluntary & charity sector providers.

2.   The approach to measuring the economic value of the sector was to estimate the Net Present Value (NPV) associated with undertaking different qualifications and aggregating them up to the sector as a whole. The NPV is calculated by estimating the discounted benefits from achieving a qualification over the working life of the learner, and subtracting the costs associated with undertaking the qualification.

- The future benefits consist of higher wages and better employment prospects for learners, as well as 'spillovers' to other individuals and employers;

- The costs consist of government funding and fees paid by individuals or employers, as well as output forgone during learning.

3.   The results presented in the report reflect the allocation of FE participation funding in 2008/09 and the best evidence that is currently available on the benefits. The aim of the exercise was to produce a framework which can be continually updated as better and more up-to-date evidence becomes available. In this sense, it should be seen as a continual work-in-progress. Given that the current evidence is incomplete and imperfect, it was necessary to make a number of assumptions to fill the gaps.

4.   The NPV of qualifications started in 2008/09 is estimated to be £75bn over the years in which successful learners remain in the workforce. Apprenticeships deliver the highest NPV per qualification started; but in terms of the return on government investment - the NPV of each qualification divided by its funding costs - vocational qualifications delivered in the workplace offer a similar return to Apprenticeships at around £35 - £40 per pound of funding.

Benefits

5.   The benefits associated with different qualifications consist of the following elements:

Wage returns: The benefits to individuals in terms of increased wages over the course of their working life. The main source of evidence is McIntosh (2010)[3], which assesses the existing evidence on the wage returns associated with the successful completion of different qualifications. For example, individuals with a particular qualification earn x%

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[3] The Value of Skills: An evidence review submitted to the UK Commission for Employment and Skills, (McIntosh, 2010)
http://www.ukces.org.uk/tags/report/the-economic-value-of-intermediate-vocational-education-and-qualifications

more than similar individuals without that qualification. However, this evidence does not cover all of the areas required for this model; section 3 discusses how the existing evidence was interpreted, and the gaps filled. Table 1 summarises the wage premia adopted in the model.

Table 1: Wage Premia Adopted in the Model (%)

Provision Type	Previous Highest Qualification				
	None	L1	L2	L3	L4 & L5
Apprenticeship L2	16	16	16	4	4
Work Based NVQ L2	9	9	4.5	2.25	2.25
Provider-based NVQ L2	4	2	1	0.5	0.5
Apprenticeship L3	18	18	18	9	4.5
Work Based NVQ L3	15	15	15	7.25	3.75
Provider based NVQ L3	11	11	11	5.5	2.75
Basic Skills[1]	3	5	5	5	5
Developmental learning[2]	3	5	5	1.25	1.25

1 These are the lower level skills that are needed for individuals to enter work and participate in society, predominantly "Skills for Life" literacy and numeracy qualifications and English for Speakers of Other Languages (ESOL) qualifications.
2 This includes qualifications below level 2, excluding basic skills qualifications, which are typically used as an initial step to help people to progress to level 2 qualifications and beyond.

Employment returns: Not only could qualifications increase the wages which individuals earn in employment, but they could also increase the probability of being in employment over the course of their lifetime. This literature is less well-developed compared to that on wage returns, so the model is currently populated with outputs from BIS in-house analysis of the Labour Force Survey (LFS). This is based on comparing the employment rate (excluding the inactive) of individuals at different qualification levels, and is discussed in more detail in section 4. Table 2 shows the employment premia adopted in the model.

Table 2: Employment Premia Adopted in the Model (%)

Provision Type	Previous Highest Qualification		
	L1 & below	L2	L3 & above
Apprenticeship L2	2.7	0.7	0.7
Work-based NVQ L2	2.7	0.7	0.7
Provider-based NVQ L2	5.4	1.4	1.4
Apprenticeship L3	3.8	1.05	0.3
Work-based NVQ L3	3.8	1.05	0.3
Provider-based NVQ L3	7.7	2.1	0.5
Basic Skills	1.4	0.3	0.3
Developmental learning	1.4	0.3	0.3

Spillovers: Not all of the benefits of learning will be captured by the learners themselves. The benefits of enhanced productivity could be captured by their employers in the form of higher profits or increased competitiveness, and by co-workers or other employers due to the transfer of knowledge. At present, there is a relative lack of evidence on spillovers, but Dearden, Reed and Van Reenen (2005)[4] suggest that the increase in productivity from training is double the increase in wages. Dearden et al (2005) consider only productivity spillovers at an industry level, but is the only source that has attempted to quantify spillovers. There is also evidence of a number of 'wider' social benefits to adult learning, but it is very difficult to assign monetary values to such benefits. Based on these considerations, the model assumes that the increase in total productivity is double the increase in wages implied by the above premia.

6.   These benefits will accrue over the rest of an individual's working life, and must therefore be discounted to account for the fact that benefits realised in the future are less valuable than those realised now. In line with Green Book methodology, a discount rate of 3.5% for the first thirty years is adopted and 3% thereafter.

Costs

7.   Costs to the economy include:

Direct Costs

- **Government Funding:** Qualifications can either be fully-funded by the government, or co-funded by the government and individuals or their employers. The model uses information on the proportion of qualifications within each learning stream which are co-funded. Qualifications which are fully privately funded (i.e. to which no government funding is attached) are outside the scope of this model.

- **Fees:** This includes fees paid by individuals or their employers. The model assumes that for co-funded qualification aims, the expected fee is collected. Evidence in the Independent Review of Fees and Co-Funding in Further Education in England[5] suggests that this is not the case. However, the model effectively assumes that the cost of the shortfall is borne by employers in terms of the costs to mentor an employee undertaking learning or by paying a wage above the value of the learner's output. To the extent that this is not the case, the cost would be less than estimated here and therefore the estimates presented in this paper would underestimate the NPV.

Indirect Costs

- **Forgone Output:** Whilst individuals are undertaking learning, on average they will be less productive than if they were working. This output forgone is calculated by multiplying the guided learning hours associated with each qualification, by the average wage at their previous highest qualification. This is equivalent to assuming no output is produced during guided learning hours. In many cases where training is done in the workplace the guided learning hours will not replace productive time, e.g. when

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[4] 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.
[5] Independent Review of Fees and Co-Funding in Further Education in England (Banks, 2010): http://www.bis.gov.uk/assets/biscore/further-education-skills/docs/i/10-1025-independent-review-fees-co-funding-fe-england.pdf

learning is done in an individual's own time such as in night classes, or when learning is done on the job engaging in productive activity. Therefore, the model may overestimate the forgone output associated with particular qualifications for some individuals, thus underestimating NPV.

Results

8.   Table 3 shows the NPV for individual qualifications in each learning stream. At the first level, it differentiates between 'first' qualifications, where the learner has reached this level of qualification for the first time, and 'all qualifications' where, in calculating the average, learners who already had that level of qualification are included. For both cases, estimates of the following are provided:

- The NPV for each qualification achieved within that learning stream;

- The NPV for each qualification started - This is lower than the NPV per achievement, because it includes learners who are not successful, and the model assumes no returns from non-completions;

- The NPV per £ of state funding, which is derived by dividing the total NPV per qualification started in a learning stream, by the government funding directed towards it

Table 3: NPV per start, per achievement and per £ of government funding

Provision Type	First only			All Qualifications		
	NPV per a'ment (£000s)	NPV per start (£000s)	NPV per £	NPV per a'ment (£000s)	NPV per start (£000s)	NPV per £
Apprenticeship L2[1]	136	99	42	112	82	35
Work-Based NVQ L2	67	49	37	59	43	33
Provider-based NVQ L2	50	36	12	31	22	7
Apprenticeship L3	154	109	35	106	75	24
Work Based NVQ L3	82	60	36	72	52	31
Provider based NVQ L3	94	66	16	87	61	15
Basic Skills	27	20	23	27	20	23
Developmental learning	25	19	28	25	19	28
Average[2]	**54**	**40**	**28**	**47**	**35**	**25**

1 The principle data source on Apprenticeship returns – McIntosh (2007) – uses a comparison group for L2 Apprenticeships that contains a mix of individuals - some whose previous highest qualification is at L1 and some at L2. Therefore, the wage return reported in that literature does not distinguish between achievement at a higher level than currently held and achievement at the same level

2 Includes all learning streams weighted by the number of qualification aims in each learning stream

9.   So, for example, comparing Apprenticeships and work-based NVQs at L2 (first qualifications only):

- The NPV per achievement is higher for Apprenticeships - £136,000 compared to £67,000;

- The NPV per start is also higher for Apprenticeships - £99,000 compared to £49,000. The ratio of NPV per achievement and NPV per start is broadly the same for Apprenticeships and NVQs in the workplace, reflecting the fact that success rates are similar across the two routes;

- The NPV per pound of state funding is less markedly higher for Apprenticeships than is NPV per achievement and NPV per start. This is because of the higher costs of Apprenticeships relative to a standalone NVQ L2 in the workplace.

10.   Based on aggregating the NPV of different learning streams according to 2008/09 funding allocations, the NPV of the FE system to the economy is estimated to be around £75bn. Table 4 illustrates how this estimate is derived from the assessment of individual learning streams, using the number of qualifications achieved and the average NPV for each achievement.

Table 4: NPV of the 19+ FE System, Based on 2008/09 Funding Allocations

	Participation[1] Funding (£m)	Qualification aims (000s)		Average NPV per achievement (£000)	Total NPV (£bn)
		Starts	Achievements		
Apprenticeship L2	179	76	56	112	6
Work-based NVQ L2	771	587	429	59	25
Provider-based NVQ L2	353	113	81	31	3
Apprenticeship L3	298	94	67	106	7
Work-based NVQ L3	298	179	131	72	9
Provider based NVQ L3	283	68	47	87	4
Basic Skills	557	651	476	27	13
Developmental learning	273	400	300	25	8
TOTAL	3,012[1]	2,169	1,586	47	75

1 Total participation funding was £3.1bn in 2008/09. The difference reflects the fact that a small number of academic and very short qualifications have been excluded from the analysis due to a lack of evidence about their respective benefits.

11.   To take an example, £298m of government funding was attached to 94,000 L3 Apprenticeship starts in 2008/09. Based on a success rate of 71%, this translates into around 67,000 achievements. The average NPV is £106,000 for individuals who achieve a L3 Apprenticeship. Multiplying this by the 67,000 achievements implies the total economic value of L3 Apprenticeships is £7bn. Applying similar logic to the other learning streams implies a total NPV of the sector, based on 2008/09 funding allocations, of £75bn.

Sensitivity Analysis

12.   The NPV estimates outlined in this paper are based on an assessment of the best available evidence, supplemented by a number of judgements and assumptions, in order to complete gaps. Sensitivity testing is a valuable method to investigate the properties of the model. By changing a single key assumption, the impact on the results can be isolated and interpreted. In order to assess the sensitivity of the above findings, the impact of changing five key assumptions has been assessed, and these are discussed in detail in section 5.

13.   The analysis highlighted that these NPV estimates are sensitive to a number of changes to the assumptions about the benefits, but are relatively insensitive to changing assumptions relating to the costs. This is because of the long time period over which the benefits are expected to accrue (i.e. over the rest of an individual's working life) compared to the costs.

14.   In particular, relatively small changes in the wage and employment premia can have a significant impact on the magnitude of the estimates. However, if all estimates used in the model overstate or understate the respective premia by a similar proportion, this will have little impact on the relative NPVs of different learning streams, i.e. the order of qualifications in table 3, in terms of highest NPV to lowest NPV, is unchanged.

15.   Similarly, where an individual undertakes multiple aims within the same year, whether they only get the benefit associated with the highest qualification, or all qualifications, has a modest impact on the magnitude of the NPV estimates, but very little impact on the relative figures.

1. Introduction and Terms of Reference

1.1.   In February 2009, the Learning and Skills Council (LSC)[6], in partnership with the Department for Business, Innovation and Skills (BIS)[7], commissioned a study to examine the impact of the Further Education (FE) sector in delivering its primary function: providing people with the skills they need in the labour market.

1.2.   The research team was led by Cambridge Econometrics (CE), in collaboration with the Warwick Institute for Employment Research (IER). The focus of this report is the learning funded by BIS for people aged 19 and over. The model also has the potential to make similar calculations for the learning funded by the Young People's Learning Agency (YPLA) for people aged 16-18.

1.3.   The model aims to measure the economic value of the qualifications provided by the FE sector. This is done by estimating the Net Present Value (NPV) of different learning streams and aggregating this up to the sector as a whole. To do this, the model considers:

- The future benefits in terms of higher wages and better employment prospects for individuals undertaking the learning, as well as 'spillovers' to other individuals and employers;

- The costs of undertaking learning, in terms of government funding and fees paid by individuals or employers, as well as output forgone during learning.

1.4.   The model is currently based on the best available evidence in all of these areas. However, given the incomplete and imperfect nature of this evidence, it was necessary to make a number of assumptions in order to complete the gaps. One of the main aims of this project was to develop a modelling framework which can be continuously updated as better and more up-to-date evidence becomes available. In this sense, the model should be seen as a continual work in progress.

1.5.   An overview of the methodology used to assess the economic impact of the FE sector is presented in section 2. Section 3 then provides a more detailed explanation of how the wage premia were derived for use in this model; similarly, section 4 describes BIS in-house analysis to calculate the employment premia. Section 5 outlines the initial findings from the modelling and assesses the sensitivity of the results to changes in various assumptions.

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[6] In April 2010 the Learning and Skills Council was succeeded by the Young People's Learning Agency (YPLA) and the Skills Funding Agency (SFA, an agency of BIS).
[7] In June 2009 the Department for Innovation, Universities and Skills (DIUS) merged with the Department for Business, Enterprise and Regulatory Reform (BERR) to form the Department for Business, Innovation and Skills (BIS). In April 2010, BIS took over the full role of client for this project.

2. Overview of the Methodology

Introduction

2.1   This section presents an overview of the model to assess the impact of the FE sector. In particular, it addresses the following:

- How FE provision is characterised for the purposes of this model. It considers the number of qualifications started within each year, and how these translate into achievements;

- The high-level approach underpinning the model, including what is being measured and how;

- The scope of the benefits and costs considered in the model, including both those to the economy, and to the Exchequer.

Characterising FE provision

2.2   The model characterises the FE sector in terms of the number of qualifications of each type that are started in a given year. The following learning streams are considered:

- Full National Vocational Qualifications (NVQs) at both Level 2 (L2) and Level 3 (L3), undertaken in a provider setting;
- Full NVQs at L2 and L3 undertaken in a workplace setting;
- Apprenticeships at L2 and L3[8];
- Basic skills – Lower-level skills which are needed for individuals to enter work and participate in society, predominantly 'Skills for Life' literacy and numeracy qualifications, and English for Speakers of Other Languages (ESOL) qualifications.;
- Developmental learning – Qualifications below L2, excluding basic skills qualifications, which are typically used as an initial step to help people to progress to L2 qualifications and beyond.

2.3   The literature generally assesses wage returns relative to those individuals that hold qualifications at the level below, as defined on the Labour Force Survey (LFS). For example, a learner with five GCSEs graded A-C or a L2 NVQ in engineering is qualified to L2; a learner with two or more A-levels or a L3 NVQ in engineering is qualified to L3.

2.4   Qualification success rates from the BIS Statistical First Release (SFR) are then used to determine how many of the qualifications started are converted into achievements. Finally, the extent to which learners have increased the level of their highest qualification is

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[8] From February 2011 the quality standards associated with Apprenticeships have been revised to ensure greater consistency and quality. To reflect this change, and to ensure greater clarity on the relative levels of academic and vocational education, Apprenticeships at L2 will be called intermediate Apprenticeships and Apprenticeships at L3 will be called advanced Apprenticeships. For further details see http://www.bis.gov.uk/assets/biscore/further-education-skills/docs/s/11-521-specification-apprenticeship-standards-england

determined by apportioning achievements across the various levels of previous highest qualification using assumptions about prior qualification levels taken from the FE Prior Qualifications Survey[9]. The extent to which learners have increased the level of the highest qualification they hold is subsequently referred to as improved qualifications.

Supply-Side versus Demand-side Effects

2.5   The model focuses on the supply-side impacts of the FE sector. In other words, it looks to measure the benefits and costs to the economy of the service that is provided by the sector – i.e. the increase in value added that comes from improving the skills of the workforce.

2.6   This is in contrast to some other approaches, which measure demand-side impacts – these tend to focus on the expenditure of the sector and the secondary impacts of that expenditure across the economy. For example, such an approach has been used to assess the impact of FE and HE by Strathclyde University[10]. Such a demand-side approach analyses education as if it were a conventional industry, highlighting major economic characteristics of educational institutions, including their sources of revenue, employment created, output generated etc.

The Impact of FE on economic performance

2.7   Figure 2.1 summarises the process by which the FE sector can benefit the economy on the supply side. The economic benefit to the economy is in terms of increased Gross Value Added (GVA) per capita. The diagram shows GVA per capita, decomposed into various components:

- Labour productivity: GVA per hour worked;

- Working time: Working hours - full- or part-time work, overtime;

- The employment rate: Workers per member of the working-age population, in turn reflecting the extent of unemployment and economic activity;

- The activity rate i.e. the relative size of the working-age population. This will be affected by demographic structure and the policy regime and social practice with regard to retirement age.

2.8   By improving skill levels, FE provision is assumed to raise labour productivity and the employment rate (the economic activity of the working-age population, and success in matching workers to jobs). These were the effects that were noted, with attempts at quantification, in the Leitch Review[11].

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[9] IFF research forthcoming as part of the BIS research series
[10] 'Kelly, U., D. McLellan and I. McNicoll (2006). *The Universities UK Economic Impact Modelling System Introduction and User Guide.* University of Strathclyde. January
[11] 'Leitch Review of Skills: Prosperity for all in the global economy - world class skills', Final Report, December 2006, HMSO. www.hm-treasury.gov.uk/d/leitch_finalreport051206.pdf. See, for example, paragraphs 42 & 43 on pp15-16.

Figure 2.1: The Economic Benefit of the FE Sector
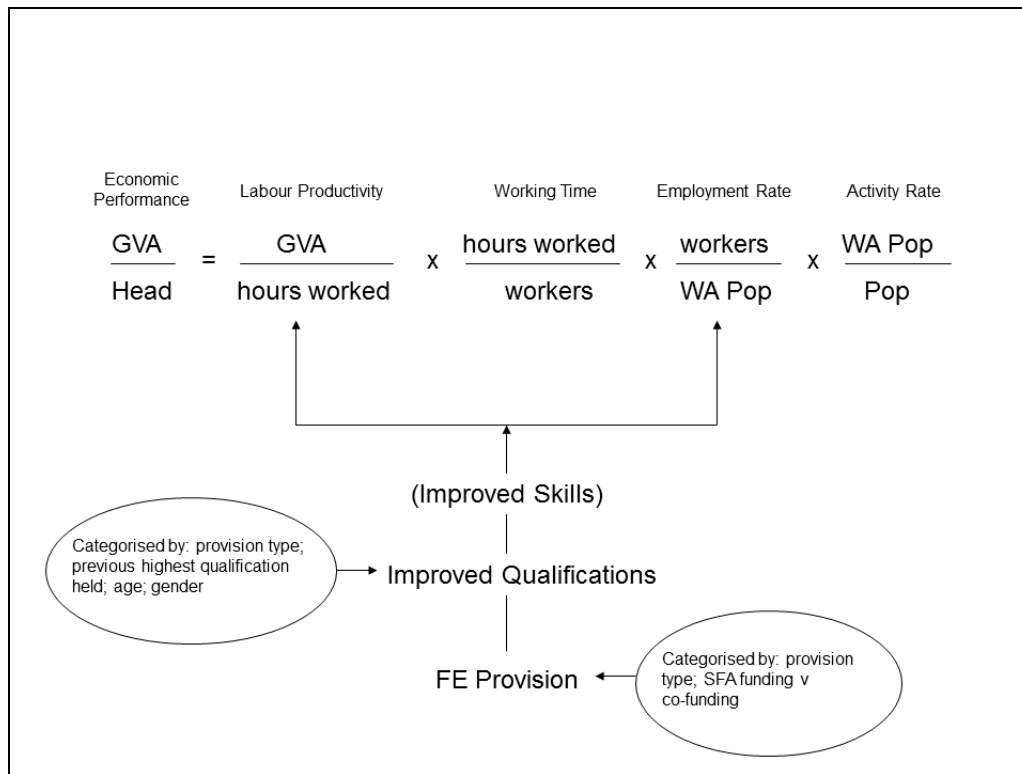
2.9   The model identifies:

- The relationship between the scale and nature of FE provision (measured as spending on different types of provision) and the scale of improved qualifications, in each learning stream;

- The most appropriate way to categorise types of provision (categories of qualification). This is helpful in relation both to tracing the effect of FE provision and in relation to the subsequent impacts in the model;

- The scale of the effect of improved qualifications on productivity, wages and employment.

Benefits and Costs to the Economy

2.10   The discussion so far has focussed on the benefits to the economy, namely the impact on GVA per capita. Our interest is in the net benefit to the economy and so the model also needs to identify the associated costs. Table 2.1 summarises the costs and benefits to the economy:

Table 2.1: Costs and Benefits to the Economy

Benefits	
Increase in Value Added =	
	Increased Employment x Total Productivity per head
	+
	Existing Employment x Increase in Productivity per head
Costs	
Direct Costs	Cost of FE Provision
Indirect costs (loss of value added)	Decreased hours while training x Total Productivity per head

Benefits

2.11   The benefits of the FE sector therefore represent the potential increase in value added output, achieved by:

i.   Higher productivity due to the skills gained by those employed: Typically, research in the field of the economic impact of learning attempts to measure the impact on the wages of the learner, and to use this as a proxy for the future productivity increase. The model has therefore been constructed to make best use of this literature, as described in section 3.

ii.   Higher lifetime employment chances: Learning could also mean that individuals are more likely to be in employment, not just immediately after learning has taken place, but over the course of their lifetime. Increased employment is measured as the increase in full-time equivalent employment. The literature in this area is less well-developed compared to that on wage returns, therefore the initial inputs for this part of the model are derived from BIS in-house analysis of the LFS. This is described in more detail in section 4.

2.12   The benefits of learning are not necessarily limited to the individual obtaining the qualification. For this reason, the model allows for an additional (spillover) increase in productivity, to include any value added which is not captured in the increased wages of the learner. This will include:

- Increased profits or competiveness for the learner's employer;

- Increased wages for other workers – This could result directly from the transfer of knowledge between individuals, or indirectly through Research and Development or technology adoption;

- 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.

2.13   At present, there is a relative lack of evidence on spillovers, but Dearden, Reed and Van Reenen (2005)[12] suggest that the increase in productivity from training is double the increase in wages. Dearden et. al. (2005) consider only productivity spillovers realised within the same industry in which the training takes place and do not differentiate the extent of the spillover between different industries and different levels of study. Other studies suggest that benefits will also accrue to other industries. Galindo-Rueda, and Haskel (2005)[13] shows that firms in higher skill geographical areas are, other things equal, more productive than firms in less skilled areas. Blundell (1996)[14] also shows that employers gain from training undertaken by other employers.

2.14   There is also evidence of a number of 'wider' social benefits to adult learning, but it is very difficult to assign monetary values to such benefits. See for example Barton et al (2007)[15] on basic skills courses and Hammond & Feinstein (2006)[16] on adult education more widely.

2.15   Based on these considerations, the model assumes that the increase in total productivity is double the increase in wages implied by the above premia. The functionality of the model allows for this assumption to be updated with separate values for individual learning streams as better and more up-to-date evidence becomes available. A sensitivity analysis of this assumption is not conducted explicitly but is equivalent to the sensitivity analysis around the premia in section 5.

2.16   The benefits of learning, both in terms of wage and employment effects for the individual, and spillovers to others, will occur for the rest of an individual's working life. This time period is calculated based on a retirement age of 60 for women and 65 for men, and data showing the average age of individuals undertaking different qualifications is shown in table 2.2. We apply the same wage premia over the rest of their working lives as these premia were calculated based on cross-sectional analysis of people of different ages. Future benefits are then discounted, at a rate of 3.5% for the first 30 years, and 3% thereafter. This is consistent with Green Book methodology.

Costs

2.17   The costs to the economy consist of:

- The **direct** costs of public funding, and fees paid by individuals and/or their employers;
- The **indirect** costs of value added which is forgone whilst learning takes place.

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[12] 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.
[13] Galindo-Rueda, F and Haskel, J (2005), Skills, Workforce Characteristics and Firm-Level Productivity: Evidence from the Matched ABI/Employer Skills Survey IZA Discussion Paper No. 1542.
[14] Blundell, R., Dearden, L. and Meghir, C. (1996), The Determinants of Work Related Training in Britain, London: Institute of Fiscal Studies.
[15] Barton, D., Ivanic, R., Appleby, Y., Hodge, R. and Tusting, K (2007) *Literacy, Lives and Learning.* Routledge, London.
[16] Hammond, C and Feinstein, L (2006) *Are Those Who Flourished at School Healthier Adults? What role for adult education?* Centre for Research on the Wider Benefits of Learning, Research Report No 17.

Table 2.2: Average age of learners in each provision type

Provision Type	Average age (years)
Apprenticeship L2	28
Work-based NVQ L2	40
Provider-based NVQ L2	32
Apprenticeship L3	27
Work-based NVQ L3	42
Provider-based NVQ L3	31
Basic Skills	38
Developmental Learning	38

Calculated using the Skills Funding Agency's administrative data collection, the Individualised Learner Record (ILR).

2.18   The direct cost of FE is the cost of provision, which consists of public funding and fees paid by both individuals and employers. The funding allocated to each institution flows from the number of qualification aims they deliver, with running costs and additional support costs expected to come from that funding. Depending on circumstances, learners or employers are expected to pay the provider 50% of the tuition costs for some qualification types, with the remaining 50% funded by the government. This is typically referred to as co-funding. Table 2.3 shows the proportion of qualification aims for which, based on the learners enrolled in 2008/09, the costs were expected to be apportioned between state funding and fees paid by learners or employers.

2.19   The other cost identified in the model is the loss of value added during the time the learner is undertaking training. The model uses average wages at the learners' previous highest qualification level as a proxy for this, and multiplies by the guided learning hours associated with that particular aim. This is therefore equivalent to assuming that no output is produced during guided learning hours.

Table 2.3: Proportion of each provision type which is co-funded

Apprenticeship L2	100%
Work-based NVQ L2	20%
Provider-based NVQ L2	36%
Apprenticeship L3	100%
Work-based NVQ L3	43%
Provider-based NVQ L3	49%
Basic Skills	5%
Developmental Learning	9%

2.20   This same assumption has been made for qualifications delivered in the workplace as for those in a provider setting. Central data collections for work-based qualifications do not indicate the balance of guided learning hours between off-the-job and on-the-job learning, during which time some output is likely to be produced. It is therefore likely that forgone output is overestimated for work-based learning. However, the sensitivity analysis in section 5 finds that the main outputs of the model are relatively insensitive to this assumption.

Benefits and Costs to the Exchequer

2.21   The previous section assesses the costs and benefits to the economy as a whole, as this is the main focus of the model. However, the model also has the functionality to assess the costs and benefits to the Exchequer, in terms of changes in tax receipts and benefit payments. It will also include the direct public funding costs referred to in the previous section (but excludes fees paid by individuals and/or their employers). Table 2.4 summarises these costs and benefits:

Table 2.4: Costs and Benefits to the Exchequer

Benefits	
Increase in Tax Revenues =	
	Increase in Income Tax and NICs
	+
	Increase in VAT
Decrease in Benefits	Increase in Employment x Average Benefit Payment
Costs	
Direct Costs	Cost of FE Provision borne by the Public Sector
Indirect Costs	Loss of Income Tax, NICs and VAT during training

Benefits

2.22   The benefits to the Exchequer consist of the increased tax receipts from future increases in value added, and reduced benefit payments from increased employment. As discussed in the previous section, the benefits of increased value added would accrue to both individuals and to employers. Individuals would earn more, leading to higher income tax payments and National Insurance Contributions. They would also spend a proportion of their higher earnings, thus increasing VAT receipts. Employers would also make higher corporation tax and VAT payments to the extent that they capture the increased value added.

2.23   Because of the lack of evidence, it is unclear how spillovers would be apportioned between individuals and employers. This part of the model adopts a simplified approach, by assigning the spillover benefits to individuals' wages, and thus applying the appropriate income tax, National Insurance Contributions and VAT rates.

Costs

2.24   The direct cost to the Exchequer is the cost of provision borne by the public sector (i.e. one of the components of the direct costs to the economy). The other cost identified in the model is the loss of tax revenues associated with the value added forgone during training, which comprises the income tax, National Insurance Contributions and VAT associated with the wages forgone by the learner.

Summary

2.25   To summarise, the model adopts a so-called 'supply-side' approach, in attempting to measure the economic impact of the qualifications provided by the FE sector on future value added. This includes the impact on the learner's future wages and probability of employment, as well as spillovers to others. The costs of learning are also considered – both in terms of the direct costs of government funding as well as fees paid by individuals and employers, and the indirect costs of the output forgone whilst learning takes place. Figure 2.2 summarises the specification adopted for this model.

Figure 2.2: Model Specification Flowchart
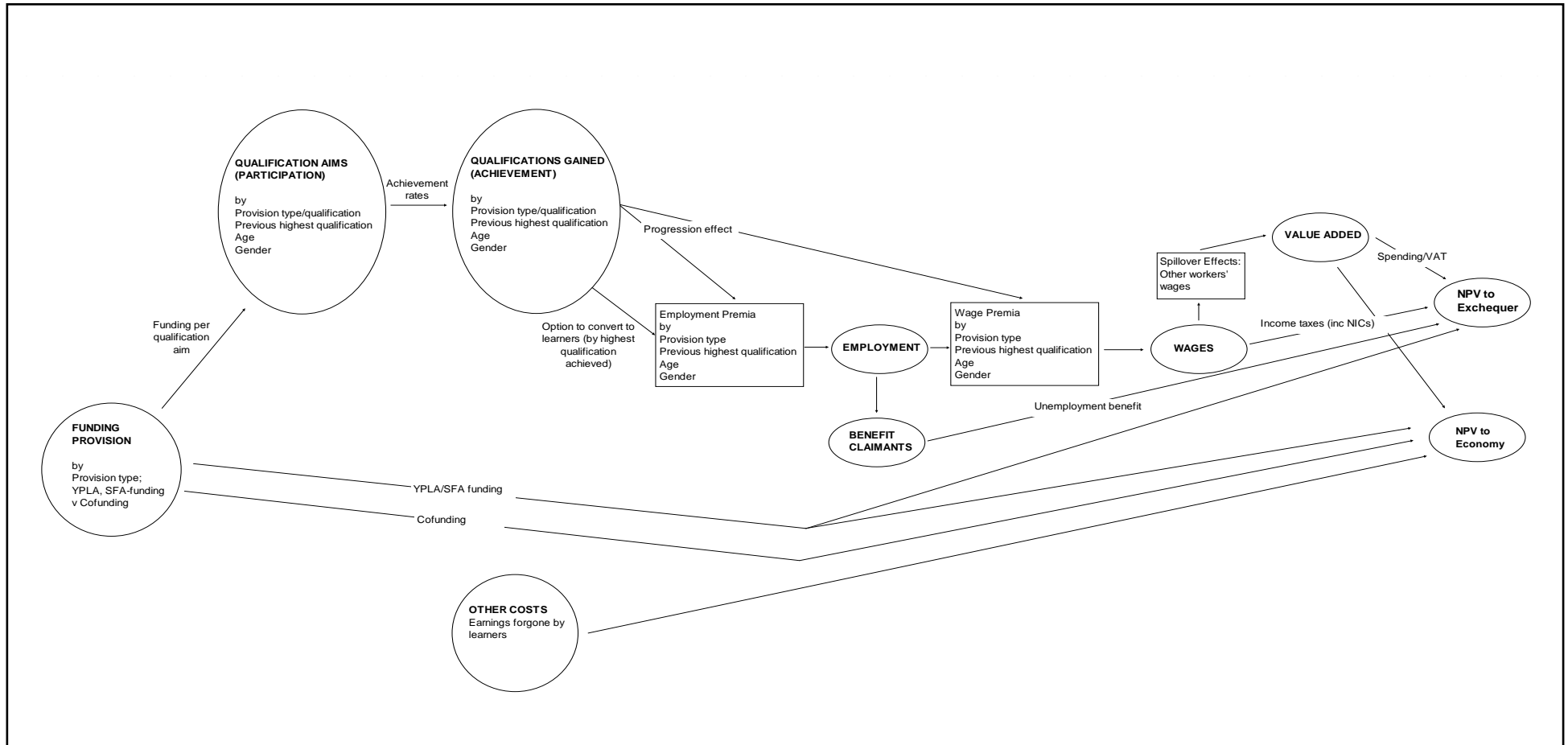
3. Wage Premia

Introduction

3.1   Wage premia are estimates of the additional wages, in percentage terms, that an individual is likely to receive over the rest of their working life, having achieved a particular qualification, compared to a similar individual who does not hold that particular qualification (average returns) or only has qualifications at the level below (marginal returns).

3.2   The wage premia adopted in the model, outlined in table 3.1, are primarily taken from recommendations in McIntosh (2010)[17], which is a review of various literature sources on the returns to vocational qualifications. The approaches to estimating returns can vary and as such the literature can sometimes present conflicting evidence; therefore, McIntosh (2010) seeks to identify a set of premia that are as far as possible consistent with each other.

3.3   Historically, the literature has attempted to disaggregate wage premia by gender. In the evidence reviewed by McIntosh for vocational qualifications, the margins of error around the gender-specific premia estimates typically show no significant difference, and if the central estimates decomposed by gender were used, they would come with wider confidence intervals. See, for example, tables 1 and A1 in McIntosh (2007)[18]. In calculating the estimates presented in this report, separate premia for males and females were therefore not adopted.

Table 3.1: Wage premia adopted in the model (%)

	Previous Highest Qualification				
Provision Type	None	L1	L2	L3	L4 & L5
Apprenticeship L2	16	16	16	4	4
Work-based NVQ L2	9	9	4.5	2.25	2.25
Provider-based NVQ L2	4	2	1	0.5	0.5
Apprenticeship L3	18	18	18	9	4.5
Work-based NVQ L3	15	15	15	7.25	3.75
Provider-based NVQ L3	11	11	11	5.5	2.75
Basic Skills	3	5	5	5	5
Developmental learning	3	5	5	1.25	1.25

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[17] The Value of Skills: An evidence review submitted to the UK Commission for Employment and Skills (McIntosh 2010) http://www.ukces.org.uk/tags/report/the-economic-value-of-intermediate-vocational-education-and-qualifications
[18] A Cost Benefit Analysis of Apprenticeships and Other Vocational Qualifications [McIntosh, 2007] http://www.education.gov.uk/research/programmeofresearch/projectinformation.cfm?projectid=14962&resultspage=1

Derivation of Premia

3.4   The diversity of the FE sector means the literature does not provide estimates of wage premia for all combinations of qualification type and prior education. This section discusses the premia taken from the literature, and the derivation of working assumptions to fill the gaps. For each learning stream, the appropriate excerpt from McIntosh (2010) is presented, and the use of this evidence to derive premia for the model is then discussed.

Provider-based NVQ Level 2

"When individuals acquire an NVQ2 qualification as their new highest qualification, the most recent evidence suggests that they earn around 4% more than individuals with no qualifications. The wage gap is around 2% compared to low qualified individuals (with at best Level 1 academic qualifications and at best Level 2 vocational qualifications other than NVQ2)..." McIntosh (2010)

3.5   The counterfactual of 'L1 and L2 vocational qualifications other than NVQ2' does not directly provide an estimate for all individuals with prior qualifications at L2, because the model does not differentiate between academic and vocational routes of previous highest qualification. The counterfactual implies that a learner with a prior L2 will only get the wage benefit if that L2 is vocational. The premium is therefore adjusted, based on LFS estimates of the percentage of people for whom that L2 was acquired through the vocational route only; effectively we make a conservative assumption that there are zero returns for those with a previous L2 obtained through the academic route. A similar approach is used elsewhere in the model where the counterfactual includes vocational qualifications at the level now being studied but excludes academic qualifications at that level.

Provider-based NVQ Level 3

"At Level 3, all vocational qualifications receive positive and statistically significant returns when held as highest qualifications relative to specific control groups, ranging from 11% for NVQ3 up to 25% for ONC/OND, with the others in the range of 16-18%, all measured relative to individuals with at best other Level 3 vocational qualifications (other than the one being considered in each case) and at best Level 2 academic qualifications." McIntosh (2010)

3.6   This implies that the counterfactual used for the 11% estimate is all qualifications up to and including L3 (excluding academic L3), so 11% was used for all prior qualification levels below L3.

Apprenticeships Level 2

"The estimates reveal substantial wage returns in 2004/05 to Modern Apprenticeships, of around 18% at level 3 and 16% at Level 2 compared to individuals whose highest qualification is at Level 2, or at level 1 or 2 respectively" McIntosh (2010)

3.7   McIntosh uses a comparator group of L1 and L2, so the same premium was used for people with prior qualifications at L1 and L2. McIntosh does not suggest that people with no prior qualifications would receive returns that are any different from those at L1, so the same premium is adopted in this case.

Apprenticeships Level 3

> *"A place on a level 3 Apprenticeship is difficult to obtain and it is only those with good GCSEs or similar that could expect to be accepted. A comparison group of individuals with no qualifications at all would therefore have been inappropriate."*
>
> *"The estimates reveal substantial wage returns in 2004/05 to Modern Apprenticeships, of around 18% at level 3 and 16% at Level 2 compared to individuals whose highest qualification is at Level 2, or at level 1 or 2 respectively"* McIntosh (2010)

3.8   For L3 Apprenticeships, McIntosh therefore argues for a comparator group of L2 only. Despite this, the Prior Qualifications Survey shows that 13% of people taking Apprenticeships at L3 do have prior qualifications below L2. Given the argument presented by McIntosh about the quality of individuals expected to obtain a L3 Apprenticeship place, individuals with lower levels of prior qualifications are likely to have proved themselves in the workplace since leaving school, and have similar prior earning potential to others on a L3 Apprenticeship. A premium of 18% was therefore used for learners with prior qualifications up to and including L2.

Workplace-based NVQ L2

> *"The available evidence shows that obtaining a vocational qualification through one's employer is the most valuable acquisition route. An individual with an NVQ2 held as a highest qualification and obtained through work earns on average around 10% more than an individual with no or low level qualifications."* McIntosh (2010) sources from Jenkins et al (2007)

3.9   Considering the source materials in Jenkins (2007), the 10% quoted in McIntosh (2010) relates to a coefficient of 0.1 in a logit model. The actual wage effect from this evidence is therefore estimated to be 9%. A wage premium of 9% is therefore adopted for a L2 NVQ undertaken in a workplace setting, for learners with prior qualifications up to and including L1.

Workplace-based NVQ L3

3.10   The previously-cited evidence from McIntosh (2010) suggested a premium of at least 11% for L3 NVQs. The model therefore adopted 11% for NVQ L3 in a provider setting, but given the evidence that obtaining a vocational qualification through one's employer is the most valuable route, and the lack of direct evidence on L3 NVQs delivered in the workplace, the premium relating to a L3 in the workplace is uprated.

3.11   The approach taken is to look at the established evidence for L2 in the three different routes, and the ratios between them. A value for a L3 NVQ in the workplace is

then interpolated between the established evidence for L3 in providers and L3 Apprenticeships using the same ratios. This approach is summarised in table 3.2.

Table 3.2: Wage Premia Estimates for Vocational Qualifications in the Workplace (%)

	Provider	Workplace	Apprenticeship[2]
L2	2[1]	9[1]	16
L3	11[1]	14.5[3]	18

1 Jenkins et al (2007)
2 McIntosh (2007)
3 Linear interpolation: i.e. same distance between provider and Apprenticeship as at L2

Basic Skills

3.12   Based on the 'sophistication of use' argument, the wage returns from Skills for Life are assumed to increase as prior qualification levels increase. The Borghans & Bas ter Weel (2004) evidence implies a wage premium of 2.5% compared to individuals with no prior qualifications, and 5% compared to those previously qualified to L1. A return of 5% is then assumed in the model for all levels of prior qualification at L2 and above.

3.13   Another notable source of evidence is Brooks et al (2000), which was reviewed in McIntosh (2004)[19]. McIntosh's interpretation of this evidence was that on average, a basic skills course is equivalent to one fifth of a level. The Skills for Life premia adopted in the model are broadly consistent with this additional source of evidence, as they equate to around one fifth of the return associated with moving up a full level in the majority of cases.

Developmental Learning

3.14   This includes qualifications below L2, excluding basic skills qualifications, which are typically used as an initial step to help people achieve qualifications at L2 and above. To our knowledge, wage returns to these qualifications are not covered in the literature. Therefore, because of the similarities with Basic Skills qualifications, the same premia are adopted in the model up to prior qualifications at level 2. For level 3 and above we treat developmental learning in the same way as we treat non-first qualifications and adopt premia that are 25% of those achieved for people previously qualified up to level 2. The rationale for this is discussed in the next paragraph.

Non-First Qualifications

3.15   Qualifications are said to be non-first when a person already has a qualification at that level or above. To our knowledge, wage returns to these qualifications are not covered in the literature. However, one would still expect there to be some benefit to these qualifications, on average. The average learners must have taken the qualification for some reason (e.g. taking a second NVQ L3 if the demand for labour in their previous industry falls).

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[19] Literature Review of the Effects of Improvements in Adult Basic Skills. Report Prepared for the National Assembly for Wales, McIntosh 2004
(http://www.arsyllfadysgu.com/uploads/publications/1174.pdf).

3.16   We use premia that are 25% of those achieved when an individual achieves a qualification having previously been just one level below. Taking NVQ L2 in a provider setting for example, the premium when moving from L1 to L2 is 2%, so the premium adopted for individuals already qualified to L3 or above is 0.5%. Where an individual was previously qualified to L2, the Apprenticeship L2 is also non-first but a different approach to calculate the premium is used. Because of the mixed level counterfactual typically adopted in the literature there is often specific evidence on the premia received when an individual achieves a qualification at the same level as their previous qualification. This was discussed in paragraph 3.5 and because of this a premium of 1% for those previously qualified to L2, is adopted in the model rather than 0.5%. The 25% assumption is not evidence-based, but we test the sensitivity of the results to this assumption in section 5. Assuming zero wage premia for non first qualifications has a modest impact with overall NPV falling by 12%.

4. Employment Premia

Introduction

4.1.   Compared to that on wage returns, the literature on the employment returns to vocational qualifications is less well-developed. For the purposes of the initial modelling therefore, estimates of employment premia are derived from BIS in-house analysis of the LFS, combined with a number of ad hoc assumptions to reflect the difficulties of measuring the employment impact of vocational qualifications, particularly those undertaken in a workplace setting.

4.2.   This analysis calculates the difference in employment rates for groups of individuals with different levels of previous highest qualification. It then estimates the impact of increasing qualification levels as the differential between the employment rates at each level. This simple approach does not directly control for self selection into higher levels of qualification, rather this issue is addressed through the chosen definition of employment rate. The derived assumptions are given in table 4.1 and explained below.

Table 4.1: Employment Premia Adopted in the Model (%)

	Previous Highest Qualification		
Provision Type	**L1 & below**	**L2**	**L3 & above**
Apprenticeship L2	2.7	0.7	0.7
Work-based NVQ L2	2.7	0.7	0.7
Provider-based NVQ L2	**5.4**	1.4	1.4
Apprenticeship L3	3.8	1.05	0.3
Work-based NVQ L3	3.8	1.05	0.3
Provider-based NVQ L3	**7.7**	**2.1**	0.5
Skills for Life/ESOL	1.4	0.3	0.3
Level 1 / Foundation tier (FLT)	1.4	0.3	0.3
Figures in bold are outputs of the LFS analysis. Other figures are derived from these using additional assumptions. It is not expected that the premia will be accurate to one decimal place. They are shown to this level of accuracy to illustrate how the calculations were made and the differences between learning streams.			

Definition of Employment Rate

4.3.   There are differences in the literature in terms of how employment rates are calculated from the LFS for statistical and econometric analysis. The argument is characterised by how one uses the economically inactive category and is discussed in

more detail by McIntosh (2010)[20]. For the purpose of this analysis, the employment rate is defined as the number of people in employment, as a percentage of those employed or unemployed but actively seeking work. In effect, inactive individuals are removed from the numerator and denominator of the calculation. This is subsequently referred to as the 'active unemployment' rate.

4.4.   The chosen definition was based on a consideration of the decision process that individuals are most likely to follow when moving from inactivity to employment. In many cases, individuals will first decide to return to the workplace and will then either take a job, which may include training, or start training to improve their chances of (re)-entering the workplace. The decision chain is thus expected to be Inactive to Active to Employment and or training. Premia derived from an unemployment rate including inactive individuals may therefore overstate the employment returns to qualifications.

4.5.   On the other hand, some individuals may actually be seeking work, but declare themselves inactive to avoid the stigma of unemployment. To the extent that this occurs, excluding these individuals from our calculation of the employment rate may understate the employment impact of qualifications.

Employment Rates

4.6.   Table 4.2 shows employment and inactivity rates by highest qualification[21], for people for whom their highest qualification was obtained both through academic and vocational routes.

4.7.   There is a general consensus in the literature that the marginal employment returns decrease as the level of highest qualification increases (e.g. Jenkins et al 2007[22]). So, for example, the marginal impact on employment as a result of moving from L1 to L2 will be greater than for moving from L2 to L3. Table 4.2 is consistent with this for academic qualifications up to L3 but not for vocational qualifications.

4.8.   It can be argued that this is a result of a selection effect - the more academically able are more likely to do well at school. This increases the measured employment effect of an academic L2, for example. Those who are less able at school are more likely to do a L2 vocational qualification after leaving school, so this selection effect reduces the measured employment effect of a vocational L2.

4.9.   Ideally, future research will control for this selection effect using a counterfactual analysis, but to our knowledge such evidence is not available at present. In the interim, an ad hoc correction is made using the average employment effects for vocational and academic qualifications at L2 and L3 respectively. This analysis does not distinguish between the different qualification types used in the model, but again future research should look to fill this gap in the evidence base.

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[20] McIntosh (2010) discussion on page 76 and 77
[21] Whether they have no qualifications or low level qualifications will make little difference to their lifetime employment chances. No qualifications and L1 qualifications were therefore combined into a single category 'below L2'.
[22] The Returns to Qualifications in England: Updating the Evidence Base on Level 2 and Level 3 Vocational Qualifications (Jenkins et al 2007) http://cep.lse.ac.uk/_new/publications/series.asp?prog=CEE

Table 4.2 Unemployment Rates according to LFS data (%)

	% of individuals 'not in work'[1]		% of individuals unemployed (excluding inactive)[2]		Marginal change in 'active unemployment' rate		
Route	Academic[3]	Vocational[4]	Academic[3]	Vocational[4]	Academic[3]	Vocational[4]	**Average**
L4	10.2	10.2	2.4	2.4	-2.1	-1.7	
L3	15.6	13.4	4.5	4.1	0.3	-4.3	**-2**
L2	18.6	23.5	4.1	8.4	-7	-2.7	**-4.8**
Below L2	36.6	36.6	11.1	11.1			
1 (Unemployed + economically inactive) / all							
2 Unemployed / (unemployed +employed).							
In the LFS individuals are deemed unemployed if they are available for work and are actively seeking work but have not done an hour or more of paid work in the previous week. Individuals are considered to be (economically) inactive if they are not available for work and not seeking work.							
3 The highest qualification held was obtained through the academic route. The LFS variable indicating highest prior qualification uses a hierarchical structure in which academic qualifications come before vocational qualifications so people whose highest qualification is academic may also have a vocational qualification at that level, but the opposite is not the case.							
4 Highest qualification is vocational and has no academic qualification at that level							
Source: LFS 2008 Q4.							

4.10.   The percentage point difference in unemployment rates between levels of highest qualification are given in the final column of table 4.2. For consistency with the standard way of reporting returns, these are converted into percentage increases and this calculation is shown in table 4.3. For example, the employment rate amongst individuals whose previous highest qualification is at L2 is 93.7%. Obtaining a L3 will increase this by two percentage points, implying an increase of 2.1%.

Table 4.3: Implied Employment Premia from LFS Data (%)

	Below L2 to L2	L2 to L3	L1 to L3
Percentage point increase in the probability of employment	4.8	2	6.8
Baseline rate of employment[1]	88.9	93.7	88.9
Percentage increase in probability of employment	5.4	2.1	7.7

1 LFS estimate of employment rate for all people at the lower level whether their highest qualification was attained through an academic or a vocational route.

Further adjustments

4.11   The premia derived above were used as the basis for the employment effects in the model. However, there were a number of adjustments made, as described below:

- Learners who do Apprenticeships and vocational qualifications in the workplace will generally be employed already and will have thus demonstrated some propensity to be employed. Applying the full employment premia derived above to these programmes may therefore overestimate the true employment effect. However, it is possible that such individuals will experience an increased probability of employment over the rest of their working life. To account for this, a 50% reduction was made to employment

premia when applying them to Apprenticeships and other forms of work-based learning, in line with the approach adopted by McIntosh (2007).

- For non-first qualifications, a wage premium equivalent to 25% of the full effect was adopted (see paragraphs 3.16 and 3.17). The same approach is applied to the employment premia.

Summary

4.12   Due to the lack of evidence on the employment-enhancing effects of vocational qualifications, the approach taken here is necessarily a simplified one, based on analysis of the LFS data. Selection effects and issues of causality have been considered, but a full study of these effects was beyond the scope of the project.

5. Results

5.1   The initial results of this model reflect the allocation of FE participation funding in 2008/09, and the best evidence which is currently available on the wage, employment and spillover benefits of different qualifications. Table 5.1 shows the NPV of different learning streams, as estimated by the model.

5.2   At the first level, it differentiates between 'first' qualifications, where the learner has reached this level of qualification for the first time, and 'all qualifications' where, in calculating the average, learners who already had that level of qualification are included. For both cases, estimates of the following are provided:

- The NPV for each qualification achieved within that learning stream;

- The NPV for each qualification started - This is lower than the NPV per achievement, because this includes learners who are not successful, and the model assumes no benefits from non-completions. To the extent that there are benefits, our estimates will underestimate the true NPV per start;

- The NPV per £ of state funding, which is derived by dividing the total NPV for qualifications started in a learning stream by the government funding directed towards it.

Table 5.1: NPV per start, per achievement and per £ of government funding

Provision Type	First only			All Qualifications		
	NPV per a'ment (£000s)	NPV per start (£000s)	NPV per £	NPV per a'ment (£000s)	NPV per start (£000s)	NPV per £
Apprenticeship L2[1]	136	99	42	112	82	35
Work-Based NVQ L2	67	49	37	59	43	33
Provider-based NVQ L2	50	36	12	31	22	7
Apprenticeship L3	154	109	35	106	75	24
Work Based NVQ L3	82	60	36	72	52	31
Provider based NVQ L3	94	66	16	87	61	15
Basic Skills	27	20	23	27	20	23
Developmental learning	25	19	28	25	19	28
Average[2]	**54**	**40**	28	**47**	**35**	25

1 The principle data source on Apprenticeship returns – McIntosh (2007) – uses a comparison group for L2 Apprenticeships that contains a mix of individuals - some whose previous highest qualification is at L1 and some at L2. Therefore, the wage return reported in that literature does not distinguish between achievement at a higher level than currently held and achievement at the same level
2 Includes all learning streams weighted by the number of qualification aims in each learning stream

5.3   So, for example, comparing Apprenticeships and work-based NVQs at L2 (first qualifications only):

- The NPV per achievement is higher for Apprenticeships - £136,000 compared to £67,000;

- The NPV per start is also higher for Apprenticeships - £99,000 compared to £49,000. The ratio of NPV per achievement and NPV per start is broadly the same for Apprenticeships and NVQs in the workplace, reflecting the fact that success rates are broadly similar across the two routes;

- The NPV per pound of state funding is less markedly higher for Apprenticeships than is NPV per achievement and NPV per start. This is because of the higher costs of Apprenticeships relative to a standalone NVQ L2 in the workplace.

5.4   Based on aggregating the NPV of different learning streams according to 2008/09 funding allocations, the NPV to the economy of the FE system is estimated to be around £75bn. Table 5.2 illustrates how this estimate is derived from a consideration of individual learning streams, using the number of qualifications achieved and the average NPV for each achievement (taken from table 5.1).
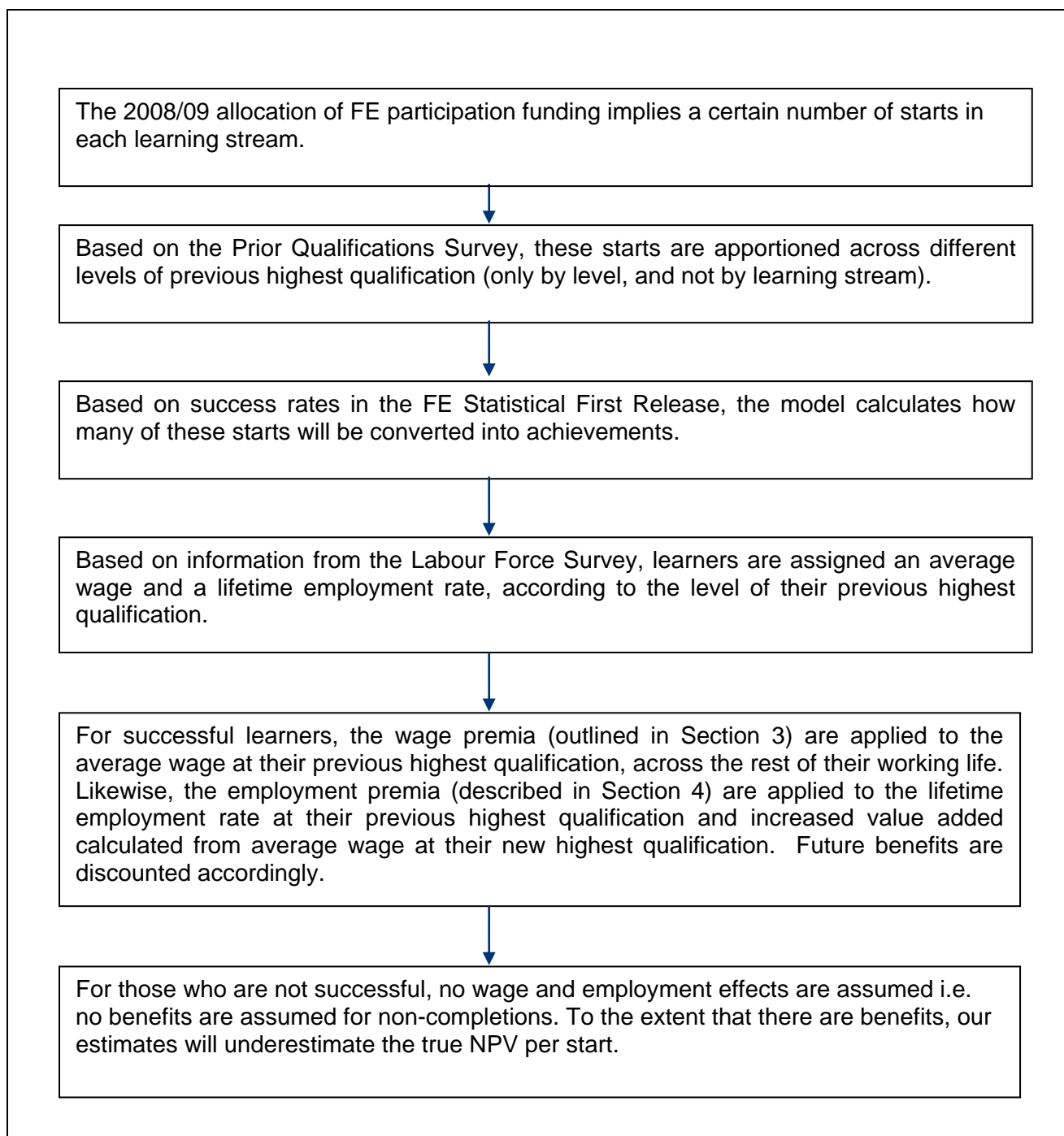
Table 5.2: NPV of the 19+ FE System, Based on 2008/09 Funding Allocations

	Participation[1] Funding (£m)	Qualification aims (000s)		Average NPV per achievement (£000)	Total NPV (£bn)
		Starts	Achievements		
Apprenticeship L2	179	76	56	112	6
Work-based NVQ L2	771	587	429	59	25
Provider-based NVQ L2	353	113	81	31	3
Apprenticeship L3	298	94	67	106	7
Work-based NVQ L3	298	179	131	72	9
Provider based NVQ L3	283	68	47	87	4
Basic Skills	557	651	476	27	13
Developmental learning	273	400	300	25	8
TOTAL	**3,012**[1]	**2,169**	**1,586**	**47**	**75**

1 Total participation funding was £3.1bn in 2008/09. The difference reflects the fact that a small number of academic and very short qualifications have been excluded from the analysis, due to a lack of evidence on their respective benefits.

5.5   To take an example, £298m of government funding was attached to 94,000 L3 Apprenticeship starts in 2008/09. Based on a success rate of 71%, this will translate into around 67,000 achievements. The average NPV is £106,000 for individuals who achieve a L3 Apprenticeship. Multiplying this by the 67,000 achievements implies a total economic value of L3 Apprenticeships of £7bn.

5.6   The modelling process is summarised in figure 5.1.

Figure 5.1: Summary of modelling process

The 2008/09 allocation of FE participation funding implies a certain number of starts in each learning stream.

Based on the Prior Qualifications Survey, these starts are apportioned across different levels of previous highest qualification (only by level, and not by learning stream).

Based on success rates in the FE Statistical First Release, the model calculates how many of these starts will be converted into achievements.

Based on information from the Labour Force Survey, learners are assigned an average wage and a lifetime employment rate, according to the level of their previous highest qualification.

For successful learners, the wage premia (outlined in Section 3) are applied to the average wage at their previous highest qualification, across the rest of their working life. Likewise, the employment premia (described in Section 4) are applied to the lifetime employment rate at their previous highest qualification and increased value added calculated from average wage at their new highest qualification. Future benefits are discounted accordingly.

For those who are not successful, no wage and employment effects are assumed i.e. no benefits are assumed for non-completions. To the extent that there are benefits, our estimates will underestimate the true NPV per start.

Sensitivity Analysis

5.7 The NPV estimates outlined in this paper are based on an assessment of the best available evidence, supplemented by a number of judgements and assumptions, in order to complete the gaps. Sensitivity testing is a valuable method to investigate the properties of the model. By changing a single key assumption, the impact on the results can be isolated and interpreted. In order to assess the sensitivity of the initial findings, the impact of changing five key assumptions has been tested.

5.8   This therefore provides an illustration of the sensitivity of these results to changing certain key assumptions. It does not to attempt to produce lower and upper bound estimates, because this would entail setting all assumptions to their lower and upper bound values respectively. This would produce results with large ranges, and such extreme figures would not be particularly insightful.

5.9   Table 5.3 therefore describes illustrative changes to five key assumptions, and the impact they have on the results. Of interest is not only the impact on the NPV of the system as a whole, but how the changes affect the relative NPVs per start and per government pound between different learning streams.

Table 5.3: Sensitivity Analysis

Change	*Impact*
In the case of multiple aims in a given year, whether to count the benefits of all qualifications or only the highest qualification done by each learner The returns literature typically considers the impact of individual qualifications rather than groups of qualifications. In the absence of evidence, the main outputs assume that if an individual undertakes more than one qualification in the same year, they get the benefit from all qualifications achieved. For example, if a learner undertakes a SfL qualification and a Level 3, with (illustrative) wage premia of 5% and 10% respectively, the total wage premium would be 15%. This analysis tests how the results change if the individual only gets the return associated with the highest qualification i.e. 10%.	**Modest Impact** Considering only the highest aim undertaken by a learner in a particular year reduces the total NPV from £75bn to £64bn, a fall of 15%. This does not affect the *relative* NPVs for different learning streams, i.e. the order of qualifications in terms of highest NPV to lowest NPV is unchanged.
Adjustments to the wage premia Section 3 outlines the gaps in the wage premia evidence, and the rationale for the assumptions made to fill these gaps. Even where estimates are directly provided by the literature, there are confidence intervals around the point estimates. Therefore, the sensitivity of the results to changes in wage premia is assessed: i. All wage premia are reduced by 10%; in other words, it is assumed that the wage effect is 10% lower than the base case. ii. All wage premia are increased by 10%, in other words, it is assumed that the wage effect is 10% higher than the base case.	**Modest Impact** i. This reduces the total NPV from £75bn to £68bn, a drop of 9%. ii. This increases the total NPV from £75bn to £82bn, an increase of 9%. Neither scenario affects the *relative* NPVs for different learning streams. i.e. the order of qualifications in terms of highest NPV to lowest NPV is unchanged.

Adjustments to the employment premia Section 4 explains that the literature on employment effects is less well-developed than that on wage effects. There is therefore greater uncertainty about the extent to which FE increases an individual's lifetime employment status. This is particularly an issue for learning undertaken in the workplace. Therefore, the sensitivity of the results to changes in the employment premia is assessed: i. All employment premia are reduced by 50%; in other words, only half of the employment effect is assumed. ii. All employment premia are increased by 50%.	**Modest Impact** i. This reduces the total NPV from £75bn to £66bn, a drop of 12%. ii. This increases the total NPV from £75bn to £84bn, an increase of 12%. There is also a slight change in the relative NPVs per £ of government funding for qualification types delivered in the workplace, although the differences between learning streams remain small.
Forgone output for qualifications delivered in the workplace: In the case of all qualifications, whether they be delivered in a provider setting or in the workplace, the model assumes that no output is produced during guided learning hours. For workplace training in particular this is not necessarily the case - because some training is on-the-job, output may be produced during training, or learning may be done in an individual's own time at night classes. The sensitivity of the results is assessed by calculating the NPV using the alternative assumption that no output is lost during the guided learning hours associated with work-based learning.	**Minimal Impact** This increases the NPV from £75bn to £80bn, an increase of 7%. It also leads to a small improvement in the position of work-based qualifications compared to provider based qualifications and a modest improvement in L3 work-based qualifications compared to L2 work-based qualifications; but again the differences between work-based learning streams remains small.
Wage premia for non-first qualifications As discussed in sections 3 and 4, there is a lack of evidence on the returns to non-first qualifications in the literature. Therefore, wage and employment premia equivalent to 25% of those achieved by moving up a full level were assumed. The sensitivity of the results to these assumptions was assessed by calculating the NPV using the extreme assumption that non-first qualifications have zero wage returns.	**Modest Impact** This reduces the total NPV from £75bn to £66bn, a drop of 12%. This does not affect the *relative* NPVs for different learning streams. i.e. the order of qualifications in terms of highest NPV to lowest NPV is unchanged.

5.10   This analysis suggests that the magnitude of the NPV estimates is more sensitive to the assumptions about the benefits than about the costs. Even relatively small differences in the wage and employment premia could have a significant impact on the NPV estimates. For example, a 10% change in the wage premia could change the total NPV by 9%. There is also considerable uncertainty around the wage returns to non-first qualifications. Under an extreme case where these generated zero wage returns, this would reduce the NPV of the FE system by around 12%. However, this is an extreme assumption – it seems unlikely that there are no returns for the average learner from undertaking a particular qualification.

5.11   To the extent that the wage and employment premia underestimate or overestimate the true returns by a similar proportion across all learning streams, then this will have less of an impact on the relative NPVs associated with different qualifications. Similarly, where individuals take multiple qualifications within the same year, whether they are assumed to get only the return associated with the highest qualification, or to all qualifications, this has little impact on the relative NPVs of different learning streams.