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Measuring the Net Present Value of Further Education in England

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Contents

Summary

In 2009, the Department for Business, Innovation and Skills (BIS) commissioned a study to examine the impact of the Further Education (FE) sector as a whole in delivering its primary function: providing people with the skills they need in the labour market[1]. The research team was led by Cambridge Econometrics (CE), in collaboration with the Warwick Institute for Employment Research (IER).

The aim of the exercise was to produce a framework for estimating Net Present Value which could be continually updated as better and more up-to-date evidence became available. Annex 2 provides a summary of the original model and references appropriate sections in the original model and data manual.

BIS have used the original model framework and updated it to incorporate new evidence from two sources:

- New estimates of the 3-5 year average wage and employment returns to courses completed between 2007/08 and 2010/11 – published as part of a major new study using matched administrative data[2].
- The introduction of advanced learning loans, specifically the Resource Accounting and Budgeting (RAB) charge to government (the amount which learners are expected not to repay and which is therefore a cost to government).

Assumptions in the original model that have not been changed include:

- A 'spillover' (i.e. the increase in productivity in addition to that captured by the learner in the form of higher wages) equal to 100% of the wage increase (see later section for a full discussion of this assumption, and the effect of varying it);
- A discount rate of 3.5% for the first 30 years and 3% thereafter (consistent with the Green Book)
- Real earnings growth of 2% per annum.

Based on the updated model, table 1 provides estimates of the Net Present Value (NPV) of qualifications started in 2013/14:

1. NPV per aim started: The NPV of each qualification started, factoring in the fact that some will not be achieved (no benefits are assumed for non-achievements).
2. NPV per pound of government funding: The NPV per qualification divided by the government funding costs.
3. Total NPV: benefits to the UK economy over the lifetime of all of the learners starting courses in 2013/14. Present benefits and costs are also provided.

Table 1 shows that the total NPV of all publically-funded FE qualifications started in 2013/14 is estimated to be £70bn over the years in which successful learners remain

in the workforce and the average return for each qualification started is £34,000. L3 Apprenticeships deliver the highest value, in terms of both NPV per qualification started and the return on government investment. After accounting for the relative number of learners on each qualification type, full level 2 qualifications contribute most to the overall NPV. Readers should be aware that the estimates cannot be generalised to the whole population and relate only to the kinds of individuals who would undertake vocational education.

Table 1 - NPV of qualifications started in 2013/14 (gross of deadweight)

	NPV per aim started (£000)	**NPV per pound of government funding (£)**	**Total NPV (£bn)[1]**	**Present benefits (£bn)[1]**	**Present costs (£bn)[1]**
Full level 2	66	21	28	31	3
Full level 3 - loans	67	21	4	4.4	0.7
Full level 3 - grant	68	16	5	5.2	0.6
English and maths[2]	14	17	7	7	1
Below level 2	7	10	5	6	1
Level 2 Apprenticeship	61	26	12	14	2
Level 3 Apprenticeship	88	28	10	12	2
TOTAL	**34**	**20**	**70**	**79**	**9**

1 Total NPV (£bn) is the difference between the 'gross present benefits' and 'gross present costs'
2 Referred to as skills for life in the original model report

These findings continue to show strong economic returns to a range of publically-funded qualifications in the Further Education sector. The key differences between the new estimates and those previously published are:

- Looking at individual qualifications, there has been a significant increase in the returns to full level 2 qualifications. The matched data demonstrates the higher wage effects of these qualifications compared to the estimates used in the model previously.

- The average NPV per pound of government funding (i.e. across the system as a whole) has reduced from £25 to £20, primarily because we have more robust evidence on the employment effects of qualifications which are slightly lower than those used in the model previously.

- The total NPV has reduced from £75bn to around £70bn, primarily because of reductions in the overall budget between 2008/09 and 2013/14 and the reduced employment premia mentioned above.

Updating the Model with better and more up-to-date evidence

The model has been updated in 3 ways:

- *Applying the new 3-5 year (average) wage returns from the matched data*
- *Applying the new 3-5 year (average) employment returns from the matched data*
- *Accounting for Advanced Learning Loans – a new policy since the previous report was published*

The rationale and method for each change is covered in the 3 sections below. The impact of each change, on each provision type, is shown sequentially in table 7 (see page 10).

1. *3-5 year (average) wage returns*

In December 2014, BIS published a major new study estimating the returns to Further Education using an innovative new approach (Bibby et. al., 2014)[2]. The new approach to estimation was made possible by the construction of a database linking administrative FE learner information, with benefit information (from DWP data) and PAYE employment histories (from HMRC data).

The wage premia in Bibby et. al. (2014) are compared with those previously used in the model in table 2. The previous wage premia consider those who achieve a qualification compared to everyone whose highest qualification is at the level below, controlling for observable characteristics e.g. returns to a L3 Apprenticeship compared to similar people at level 2. The new premia compare those who achieve a qualification with those who start but do not achieve and as such provide a better control for unobservable characteristics (see Chapter 6 of Bibby et. al., (2014) for their assessment of the robustness of this counterfactual). Additionally the new premia compare all achievers with all non-achievers after accounting for prior qualifications and a comprehensive set of covariates[1] in the econometric specification. As such, we apply the 'new' premia in table 1 to all learners irrespective of their previous qualification level.

[1] sex; age; ethnicity; disability; region; Index of Multiple Deprivation (IMD); type of funding (none, LCS, ESF, both); mode of attending (FT/PT); offender; spell duration; number of previous FE learning spells; an indicator of Subject Area (SSA); the number of days an individual was on active benefits in the year before learning; whether an individual has an inactive benefit spell in the year before learning; number of days in sustained (6 months) employment an individual has just before learning.

Table 2 - Wage premia, comparing the latest and previous estimates

Provision Type	Wage Premia	
	Original	New
Full level 2	2%[1]	11%
Full level 3 (loan and grant funded)	11%[1]	9%
English and maths[3]	5%[2]	3.5%
Below level 2[4]	5%[2]	2%
Level 2 Apprenticeship	16%[1]	11%
Level 3 Apprenticeship	18%[1]	16%

1 Compared to similar people whose highest qualification is one level below.
2 Compared to people with a full level 2 qualification, but without Maths or English at L2
3 'Skills for life' in the original model report
4 'Foundation learning tier' in the original model report

Overall the new estimates of wage premia are very similar to the original ones. The main points to note are:

- There has been a significant increase in the estimate of the returns to a full L2. This is most likely because the method provides a better control for unobservable characteristics. For example, people with low or no qualifications on the Labour Force Survey (LFS) – the counterfactual in the original model – are a very heterogeneous group, , many of whom would not take such qualifications, whereas the matched data only includes those who actually enter FE.
- There has been a small reduction in the estimate of the returns to Maths and English qualifications and a larger reduction in the estimate of the returns to qualifications below L2. However, the estimate for qualifications below L2 is likely to understate the 'true' returns since it will not capture any benefits in terms of progression to L2 and beyond. A recent evaluation of below L2 learning[7] highlights the value of such learning in terms of progression, e.g. 26% of learners had undertaken further learning since their original course – half of these at a higher level.
- There has been a reduction in the estimate of the wage returns to L2 apprenticeships.

Persistence

The wage and employment premia previously used in the model were based on people of all ages who held the qualification in question. As such, the people used to calculate the premia and the base wage could have achieved the qualification at any time in the last 30 years or so – so the premia imply a degree of persistence.

With Bibby et. al. (2014) the premia and base wages are averages across people in the first 3-5 years following completion of their FE training. Bibby et. al. (2014) assesses the extent to which the premia will be persistent beyond the 5 year cut off (a cut off necessitated by the data available) and presents a strong argument that they will persist. Central to his argument are charts presented in Annex 1 showing the returns estimates in each of the 6 years after achieving the qualification.

Data limitations mean it is not possible to test persistence beyond this point empirically. However, a comparison of the new premia with the original premia provides us with further reassurance in assuming persistence over the life cycle because both sets are of a similar magnitude (with the exception of full level 2).

As outlined above, the model estimates the benefits over the years the learner remains in the workforce. As such we need to account for earnings growth over the lifecycle so we apply the wage premia to average earnings (by prior qualification level) across all individuals in the workforce

Impact of the new wage premia on the NPV estimates: the impacts of the new wage premia mirror the changes in the premia themselves; the NPV of full level 2 increases markedly, L3 Apprenticeships increase slightly and the NPV of other provision types show small to moderate reductions.

2. *3-5 year (average) employment returns*

This section draws again from Bibby et. al. (2014)[2]. The Bibby et. al. employment premia are compared with those in the original model in table 3. In general the new estimates are much lower than the original ones. This is likely to be because Bibby et. al. (2014) better controlled for previous employment history in their analysis than had been the case in the previous literature. It is worth noting that the employment returns for apprenticeships are estimated to be zero. Positive employment returns could be witnessed beyond the five-year measurement period (and one needs to be employed to start an apprenticeship, so we may expect initial employment effects to be small) but they nonetheless suggest that the main benefits of apprenticeships are increased wages in employment, rather than an increased likelihood of employment. The only exception to the general pattern of decreases in the employment return estimations is full level 3 qualifications, which have increased from 2% to 4%.

Table 3 - Employment premia, comparing the latest and previous estimates

Provision Type	Employment Premia[1]	
	Original	New
Full level 2	5.4%[1]	2%
Full level 3 (loan and grant funded)	2.1%[1]	4%
English and maths[3]	1.4%[2]	0.6%
Below level 2[4]	1.4%[2]	0%
Level 2 Apprenticeship	2.7%[1]	0%
Level 3 Apprenticeship	1.1%[1]	0%

1 Compared to similar people whose highest qualification is one level below.
2 Compared to people with a full level 2 qualification but without Maths or English at L2
3 'Skills for life' in the original model report
4 'Foundation learning tier' in the original model report

As with base wages, we need to account for changing employment rates over the life cycle so we apply the employment premia to lifetime average employment rates (by prior qualification level) across all individuals in the workforce.

Impact of the new employment premia on the NPV estimates: the impacts of the new employment premia on the NPV estimates mirror the changes in the premia themselves; most provision types show a small but significant reduction. The exception is again full level 3, for which the NPV increases because the estimated employment premia are higher than the previous estimates.

3. *Advanced Learning Loans*

In 2013/14, we introduced Advanced Learning Loans for learners aged 24 and over studying qualifications at Levels 3 and 4 (although apprenticeships have subsequently been removed from loans). The RAB charge of these loans (the amount which learners are expected not to repay and which is therefore the cost to government in this model) is 50% (to the nearest 5%, consistent with the published RAB charge in the BIS annual report[4]) and this has been incorporated into the cost element of the loan-funded full level 3 estimates. However there are no separate estimates for the benefits of loan-funded qualifications so we have made a holding assumption that the benefits are equal to grant-funded qualifications.

Additional Measures of Economic Returns

This paper has so far focussed on the measures of economic impact used in the previous report i.e. the NPV per start, the NPV per pound of government funding and the total NPV for all qualifications started in a given year. There are two other

measures of returns which are potentially insightful when measuring the returns to education interventions, and these are shown in the table below:

1. NPV per total pound of investment i.e. not just per pound of government investment, but per pound of government, individual and employer investment as well.
2. Internal rates of return (IRR): The discount rate at which present costs equal present benefits.

Table 4 - NPV of qualifications started in 2013/14 – two further measures

	NPV per total £ of investment	**IRR (%)**
Full level 2	7	36
Full level 3 - loans	4	25
Full level 3 - grant	4	25
English and maths	7	40
Below level 2	3	26
Level 2 Apprenticeship	4	30
Level 3 Apprenticeship	3	23
TOTAL	**5**	**31**

Table 4 suggests that full level 2 qualifications and English & maths have the highest NPV per total pound and IRR. This reflects the fact that these qualifications require less private investment (in the form of privately sourced fees and foregone output) than level 3 qualifications and apprenticeships.

Sensitivity Analysis

Deadweight

When the original model was produced, there was very little evidence on the extent to which learners would have undertaken their programmes in the absence of government funding (i.e. 'deadweight'). London Economics (2012)[3] produced a framework for assessing deadweight in FE, and also undertook some analysis on deadweight in apprenticeships, which they estimated to be around 30%.

In a methodological review of the evidence underlying our previous NPV estimates, Cambridge Economics and IER recommended that until better evidence was

available on the other learning streams (and they acknowledged the difficulties of obtaining such robust evidence), we should assume the same deadweight for all provision types in the model - but accepting that this may be an overestimate for lower-level provision, including English and maths.

As expected, the impact of applying 30% deadweight is to reduce the overall NPV by 30%, from £70bn to £49bn (total NPV) and from £20 per pound of government funding to £14 per £. Table 5 shows NPV figures for individual provision types after applying the 30% deadweight assumption.

Table 5 - NPV of qualifications started in 2013/14 (*net of deadweight*)

	NPV per aim started (£000)	**NPV per pound of funding (£)**	**Total NPV (£bn)**
Full level 2	46	15	19
Full level 3 - loans	47	15	3
Full level 3 - grant	47	11	3
English and maths	10	12	5
Below level 2	5	7	4
Level 2 Apprenticeship	43	18	9
Level 3 Apprenticeship	62	20	7
TOTAL	**24**	**14**	**49**

Spillover

The updated figures use the same spillover assumption as the original model. This was based on Dearden (2005)[5] which used an industry level panel and found that a one percent increase in training intensity is associated with a 0.3% increase in wages and a 0.6% increase in productivity. That is, the total impact on productivity is around double the impact observed on wages. We therefore apply a simple ratio of 100% against the increase in learners' wages (implied by the wage premia) to estimate the additional change in value added captured through the spillover effects.

However, undertaking some sensitivity analysis, even if the spillover was just 25% (the amount necessary to cover non-wage labour costs, as suggested by IER / Cambridge Econometrics (2014)[6], the overall NPV per government pound would be

£12. Table 6 shows the NPV estimates if we apply a spillover of 25% to each provision type separately.

Table 6 - NPV of qualifications started in 2013/14 *(applying a 'spillover' of just 25%)*

	NPV per aim started (£000)	**NPV per pound of funding (£)**	**Total NPV (£bn)**
Full level 2	43	14	18
Full level 3 - loans	47	13	3
Full level 3 - grant	47	11	3
English and maths	9	11	4
Below level 2	4	6	3
Level 2 Apprenticeship	35	15	7
Level 3 Apprenticeship	49	15	5
TOTAL	**21**	**12**	**44**

Even if we applied both 30% deadweight and a 25% spillover simultaneously, the NPV per government pound (for the system as a whole) would be £9 – still amounting to a strong return on government investment.

Clearly, the spillover and deadweight assumptions are just two of the areas in which sensitivity analysis could be carried out. Chapter 5 of the original report demonstrates the sensitivity of the NPV estimates to changing different parameters within the model.

Summary of Changes

The tables below summarise the changes which have been made to the NPV estimates in this paper – highlighting the impact of changing each of the different assumptions sequentially (i.e. the column saying in turn).

Table 7 – Sequential impact of each change

Columns display the impact on NPV of applying each change sequentially.

	NPV per aim started (£000)			
	Original premia[1] and volumes (10/11)	**Original premia[1] using 13/14 volumes**	**New employment premia, 13/14 volumes**	**New wage new and employment premia, 13/14 volumes**
Full level 2	22	22	13	66
Full level 3 - loans	-	-	69	67
Full level 3 - grant	61	61	69	68
English and maths	20	20	15	14
Below level 2	19	19	12	7
Level 2 Apprenticeship	82	82	59	61
Level 3 Apprenticeship	75	75	61	88
Total	**35**	**32**	**23**	**34**

	NPV per SFA £			
	Original premia[1] and volumes (10/11)	**Original premia[1] using 13/14 volumes**	**New employment premia, 13/14 volumes**	**New wage new and employment premia, 13/14 volumes**
Full level 2	7	7	4	21
Full level 3 - loans	-	-	22	21
Full level 3 - grant	15	15	16	16
English and maths	23	23	18	17
Below level 2	28	28	17	10
Level 2 Apprenticeship	35	35	25	26
Level 3	24	24	19	28

	NPV per SFA £			
	Original premia[1] and volumes (10/11)	**Original premia[1] using 13/14 volumes**	**New employment premia, 13/14 volumes**	**New wage new and employment premia, 13/14 volumes**
Apprenticeship				
Total	**25**	**18**	**14**	**20**

	Total NPV (£bn)			
	Original premia[1] and volumes (10/11)	**Original premia[1] using 13/14 volumes**	**New employment premia, 13/14 volumes**	**New wage new and employment premia, 13/14 volumes**
Full level 2	3	9	6	28
Full level 3 - loans	-	-	4	4
Full level 3 - grant	4	8	5	5
English and maths	13	9	7	7
Below level 2	8	14	8	5
Level 2 Apprenticeship	6	17	12	12
Level 3 Apprenticeship	7	8	7	10
Total	**75**	**65**	**48**	**70**

1 Original estimates from Cambridge Econometrics (2011) – based on 10/11 volumes. The 'Total NPV' column does not sum to the Total given at the bottom because the original model included Train to Gain which was phased out from 2010.

References

1: Cambridge Econometrics (2011) Measuring the Economic Impact of Further Education, March 2011
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32329/11-816-measuring-economic-impact-further-education.pdf

2: Bibby et. al. (2014) Further education: comparing labour market economic benefits from qualifications gained, December 2014.
[https://www.gov.uk/government/publications/further-education-comparing-labour-market-economic-benefits-from-qualifications-gained

3: London Economics (2012) Assessing the Deadweight Loss Associated with Public Investment in Further Education and Skills, May 2012.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32281/12-767-assessing-deadweight-loss-with-investment-further-education.pdf

4 BIS Annual Report (2014)

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/329057/BIS_annual_report_and_accounts_2013_-_2014.pdf

5 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.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32329/11-816-measuring-economic-impact-further-education.pdf

6 BIS Research Paper 166 (2014): Methodological Issues in Estimating the Value Added of Further Education, Higher Education and Skills: A review of relevant literature

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/305635/bis-14-668-methodological-issues-in-estimating-the-value-added-provided-by-higher-education-further-education-and-skills-intervention.pdf

7 BIS Research Paper 166 (2013): Evaluation of the Impact of Learning Below Level 2

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/253585/bis-13-1261-evaluation-of-the-impact-of-learning-below-level-2.pdf

Annex 1: Charts from the analysis of persistence in Bibby et. al. (2014)

The below charts are taken from Bibby et. al. (2014), section 6, and show returns estimates in each of the 6 years after achieving the qualification for different cohorts of learners.

Figure 1: Daily earnings premiums for cohorts of learners whose highest learning aim is Full level 2 in the relevant year *[Figure 6 in Bibby et. al. (2014)]*

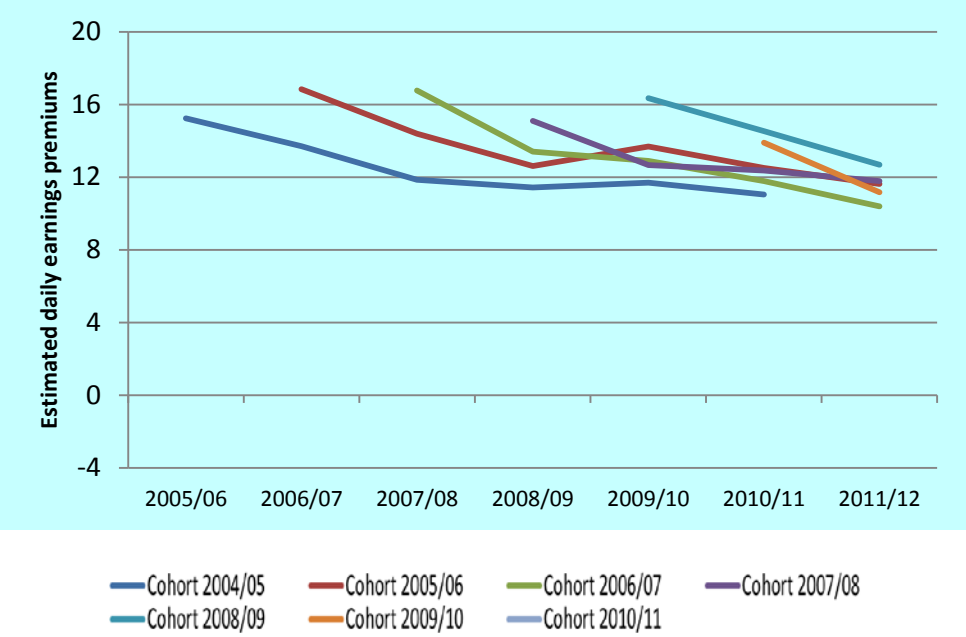


Figure 2: Daily earnings premiums for cohorts of learners whose highest learning aim is Full level 3 in the relevant year *[Figure 7 in Bibby et. al. (2014)]*

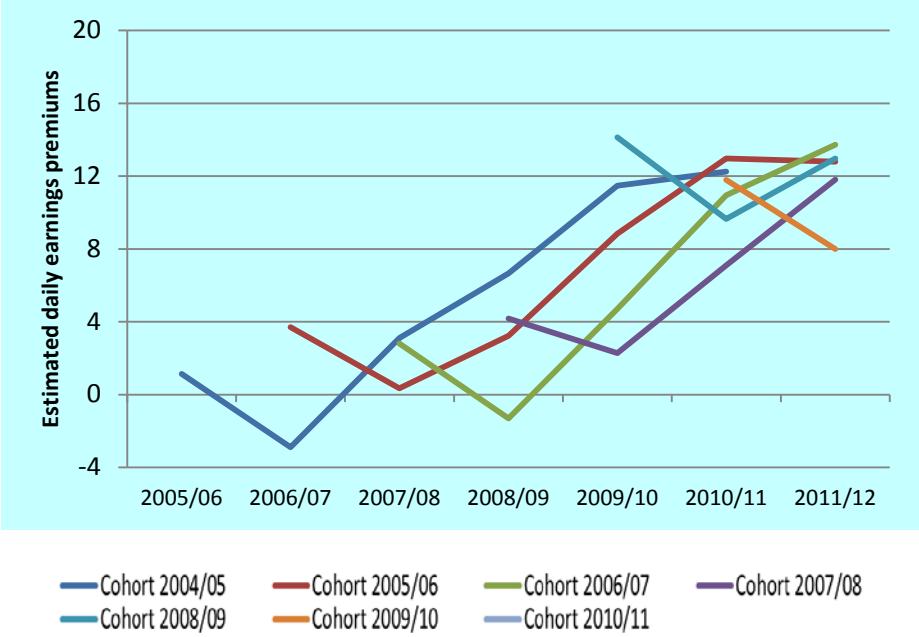


Figure 3: Daily earnings premiums for cohorts of learners whose highest learning aim is level 3 Apprenticeship in the relevant year *[Figure 8 in Bibby et. al. (2014)]*

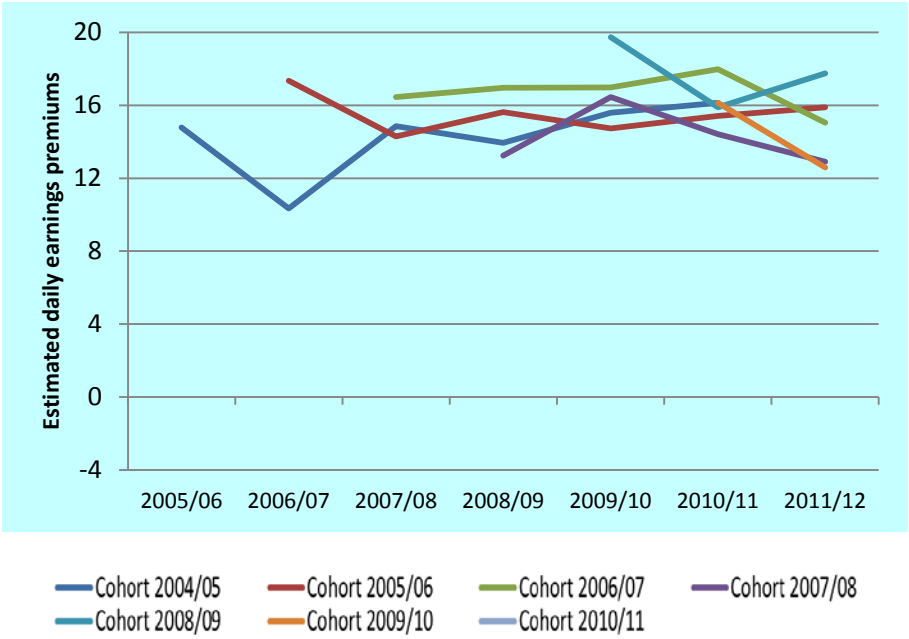
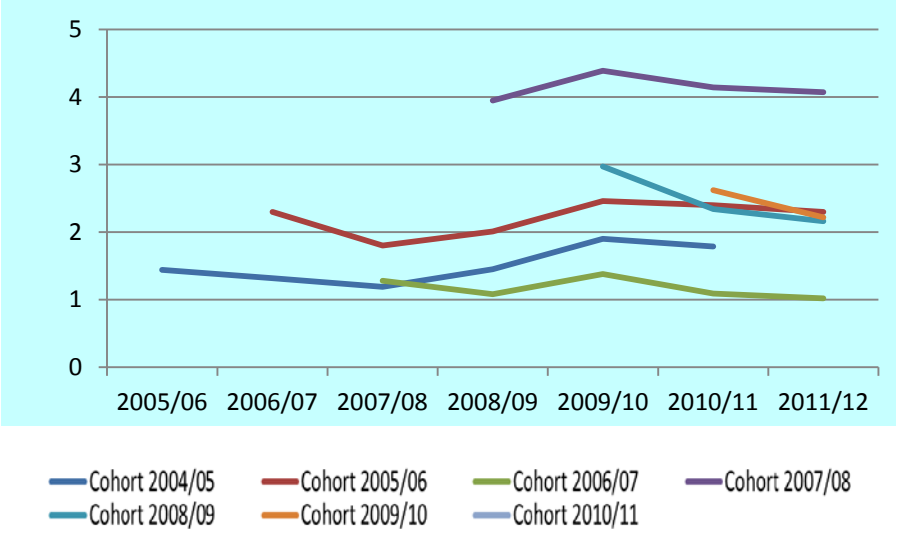


Figure 4: Employment probability premiums for cohorts of learners whose highest learning aim is Full Level 2 in the relevant year *[Figure 9 in Bibby et. al. (2014)]*



Annex 2: Methodology underpinning the model

This section provides a brief summary of the methodology underpinning the model – it is outlined in more detail in the original report[2].

The Impact of FE on economic performance

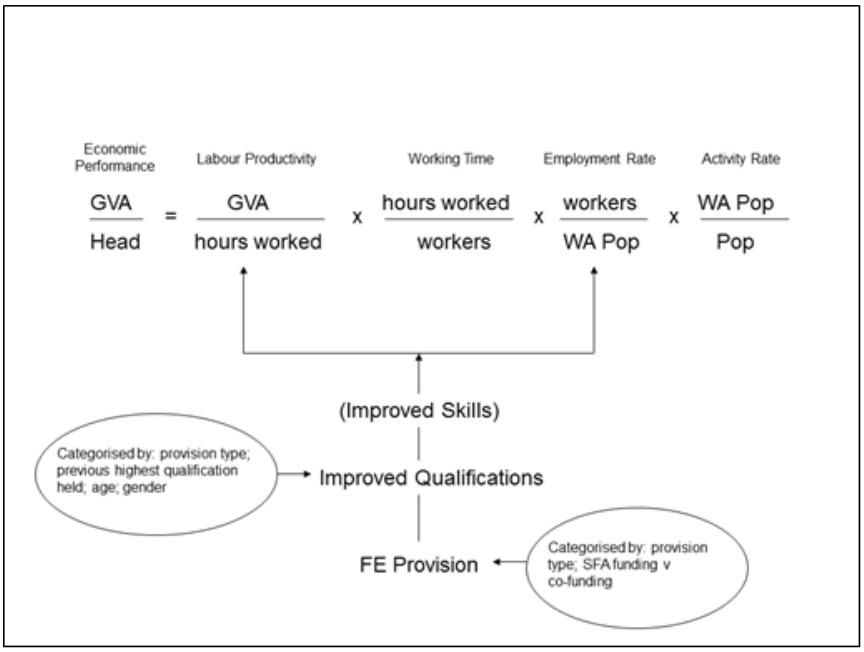
Figure A1 summarises the process by which the FE sector can benefit the economy. The economic benefit to the economy is Gross Value Added (GVA) per capita. The diagram shows GVA per capita, decomposed into various components:

- labour productivity (GVA per hour worked);
- working time (working days per year; full or part-time work; overtime);
- the employment rate (workers per working-age population, in turn reflecting economic activity and the extent of unemployment);
- the relative size of the working-age population (the demographic structure and the policy regime and social practice with regard to retirement age)

FE provision, by improving skill levels, is assumed primarily to affect two of these components. Improved skill levels are assumed to raise productivity and the employment rate (the economic activity of the working-age population, and success in matching workers to jobs).

[2] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32329/11-816-measuring-economic-impact-further-education.pdf

Figure A1 – The impact of FE on Economic Performance



Benefits to the economy

In line with the figure, the benefits considered by the model are based on the impact of qualifications on Gross Value Added:

- Wage effects are calculated by applying wage premia to the national average wage at the learner's previous highest qualification level – to give the additional wage attributable to gaining the qualification.
- Employment effects are calculated by applying employment premia to the national average employment rate at the learner's previous highest qualification level – because these individuals would otherwise have been unemployed or prone to spells of unemployment). The benefit of these is measured by the average wage for the new level they have achieved.
- There will also be gains in productivity captured by those other than the learner ('spillovers') – including increases in:
    - Other workers' wages and productivity (e.g. from knowledge sharing);
    - Firm productivity, e.g. better use of current capital;
    - Other firms' productivity, e.g. competing through reciprocal human capital investment.

Costs to the economy

The costs considered by the model include:

- Forgone output during training is calculated by multiplying the guided learning hours associated with each qualification, by the national average wage at their previous highest qualification level.

- Participation funding is taken from the Skills Funding Agency's Individual Learner Record data.
- Fees paid by businesses or individuals. The model uses the assumption that the full expected fee contribution is collected. Evidence suggest this is not the case (see the Bank's Independent review of fees and funding of further education in England[3] and "apprenticeship evaluation: employer"[4]) but we assume that the costs of the short-fall is borne by employers in terms of the costs to mentor an employee undertaking learning or paying a wage above the trainee's marginal product.

These costs and benefits are summarised in figure A2 over the page.

Out-of-Scope

Noteworthy effects that are not included in the model are: 'social' benefits, such as reduced crime or improved health. 'Social' costs, such as forgone time and family care are covered by the foregone wage because the learning may have displaced work or 'leisure' time if we assume the opportunity cost of leisure time is equal to the wage an individual could have earned in that time.

Figure A2 – 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
Loss of Value Added	Decreased Employment x Total Productivity per head

[3] Independent review of fees and co-funding in further education in England: co-investment in the skills of the future (2010) https://www.gov.uk/government/publications/independent-review-of-fees-and-co-funding-in-further-education-in-england-co-investment-in-the-skills-of-the-future

[4] Apprenticeships evaluation: employer (2014) https://www.gov.uk/government/publications/apprenticeships-evaluation-employer

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