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Assessing the Deadweight Loss
Associated with Public Investment in
Further Education and Skills

MAY 2012

Prepared by London Economics on behalf of the Department for Business, Innovation and Skills

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

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Contents

Contents	2
About London Economics	7
Acknowledgements	7
Glossary	8
Executive Summary	9
What is deadweight loss?	9
How are deadweight loss and additionality defined and classified?	10
What is the economic rationale for policy intervention in the presence of deadweight loss?.....	12
What is the basic methodological approach for estimating deadweight loss?	12
In theory, what information is needed to estimate deadweight loss?.....	13
In practice, what information do we have to estimate deadweight loss?	15
Matching variables	15
Outcome (training) variables.....	16
Information on government funded training initiatives.....	16
What approach was adopted and what analysis was undertaken?	16
What publicly funded education and training programmes were considered?	16
How good were the Propensity Score Matches?	17
What were the main results?.....	17
Quantitative deadweight and additionality.....	17
Qualitative deadweight and additionality.....	19
Train to Gain	20
Quantitative deadweight and additionality.....	20
How does this tie in with previous work?	20

Train to Gain	21
Apprenticeships.....	22
Apprenticeships and Train-to-Gain Compared.....	23
What analyses might be undertaken in the future?.....	23
1 Introduction	25
1.1 Terms of Reference.....	25
1.2 Background and context.....	26
1.2.1 What is deadweight loss?.....	26
1.2.2 What is the evidence of deadweight loss	27
1.2.3 Subsidies for organisations	27
1.2.4 Subsidies for individuals.....	35
1.3 Analysis of training trends using the Labour Force Survey	40
2 Conceptual Framework	48
2.1 General firm level measurement and data issues	52
2.1.1 Understanding the counterfactual	52
2.1.2 Propensity Score Matching	52
2.1.3 Availability of detailed information on firm level characteristics.....	53
2.1.4 Availability of detailed information on training intervention.....	55
2.1.5 Availability of detailed information on training decisions	55
2.1.6 Comparison of different learning activities.....	56
2.2 How does this tie together? What data is need to produce ‘acceptable’ estimates	57
2.3 Individual level measurement and data issues.....	58
2.3.1 Matching information	59
2.3.2 Source of funding	59
2.3.3 Training information.....	59

2.3.4	Data disaggregation	59
2.3.5	Quasi-experimental approach relating to funding discontinuities	60
2.3.6	Labour Market Status	60
2.4	Modelling deadweight loss and additionality	61
2.4.1	Firm Level Data Sources	61
2.4.2	Employers Perspectives Survey	69
2.4.3	EPS Data Assessment	70
2.5	Individual Level Data Sources	76
2.5.1	Labour Force Survey	76
2.5.2	LFS Data assessment	77
2.5.3	National Adult Learning Survey	81
3	Modelling at firm level	85
3.1	Identification of the appropriate counterfactual – general discussion	85
3.2	Identification of the appropriate counterfactual – variables used	86
3.3	Data availability in relation to training – general discussion	88
3.4	How to identify the treatment group – stage 1	89
3.4.1	Apprenticeships	89
3.4.2	Train to Gain	90
3.4.3	How good were the Propensity Score Matches?	91
3.5	Impact of publicly funded training on learning activities - stage 2	93
3.6	Data issues	94
3.6.1	What we might be able measure – stage 3	101
4	Results	104
4.1	Apprenticeships	104
4.1.1	Quantitative deadweight and additionality	105

4.1.2	Disaggregated results – apprenticeship by age	106
4.1.3	Qualitative deadweight and additionality	108
4.2	Train to Gain.....	110
4.2.1	Quantitative deadweight and additionality	110
4.2.2	Qualitative deadweight and additionality	110
4.3	Where do these results sit within the wider evidence?.....	110
5	Conclusions and recommendations	116
5.1	General recommendations in relation to future work.....	116
Annex 1	Further details of propensity score matching	121
A1.1	Theory	121
A1.2	Application.....	122
Annex 2	Detailed information from the EPS	124
A1–	Number of employees.....	124
Annex 3	Descriptive statistics of the treatment and counterfactual groups	132
A3.1	Apprentices	132
A3.1.1	Summary of evidence on robustness of propensity score match	137
A3.2	Train to Gain.....	137
A3.2.1	Summary of evidence on robustness of propensity score match	142

About London Economics

London Economics is one of Europe's leading specialist economics and policy consultancies and has its head office in London. We also have offices in Brussels, Dublin, Cardiff and Budapest, and associated offices in Paris and Valletta.

We advise clients in both the public and private sectors on economic and financial analysis, policy development and evaluation, business strategy, and regulatory and competition policy. Our consultants are highly-qualified economists with experience in applying a wide variety of analytical techniques to assist our work, including cost-benefit analysis, multi-criteria analysis, policy simulation, scenario building, statistical analysis and mathematical modelling. We are also experienced in using a wide range of data collection techniques including literature reviews, survey questionnaires, interviews and focus groups.

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Glossary

NESS	National Employers Skills Survey
EPS	Employers Perspectives Survey
LFS	Labour Force Survey
NALS	National Adult Learning Survey
PSM	Propensity Score Matching

Executive Summary

London Economics were commissioned by the Department for Business, Innovation and Skills to undertake an analysis aimed at improving the current assessment of **deadweight loss** in the Further Education and Skills arena, where deadweight loss is defined as the extent to which government-funded training generates outcomes that are not additional to what would have occurred in the absence of such provision. The aims and objectives of the project were to:

- Develop a conceptual framework that defines the different routes through which deadweight can occur;
- Assess the existing evidence relating to deadweight loss in apprenticeships and other areas of Further Education and Skills;
- Draw appropriate lessons from the measurement of deadweight in other areas and consider the extent to which the methodologies adopted can be applied to Further Education and Skills;
- Produce rigorous analysis of existing data sources, including quantified estimates where the data currently allows, of deadweight in apprenticeships and other learning streams within Further Education and Skills;
- Consider the scope to undertake a comparison group study to gauge the extent of additionality;
- Identify the key evidence gaps that prevent a robust and comprehensive assessment of deadweight; and
- Develop workable and cost-effective proposals for improving existing data and new potential sources of data.

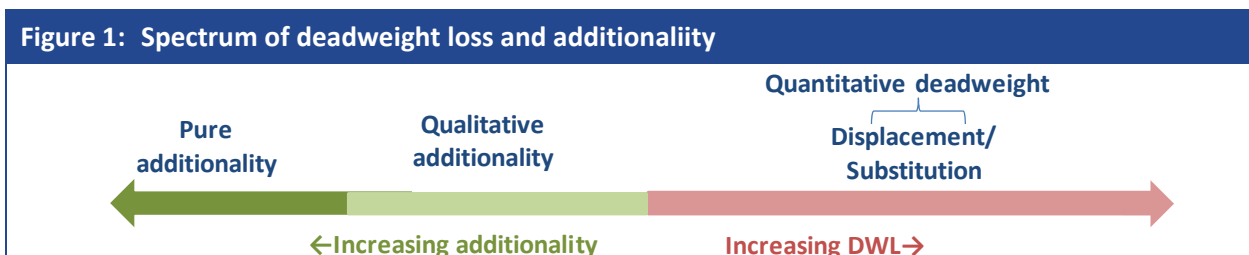
What is deadweight loss?

In general economic terms, deadweight loss is a reduction in net economic benefits resulting from an inefficient allocation of resources and is a common concept when assessing government interventions and programmes. In the context of Further Education and Skills, deadweight loss might occur following the introduction of a particular government policy aimed at raising the skills profile of the population, where the intended outcome (i.e. increased training) might have occurred (at least to some extent) in the absence of the government intervention. Deadweight loss occurs as a result of individuals or employers no longer privately financing their own skills acquisition, or those of their workforce, and substituting publicly financed training in its place. **Additionality** refers to the concept where the government policy specifically induces the desired outcome that would not have occurred in the absence of such intervention.

How are deadweight loss and additionality defined and classified?

Deadweight loss and additionality are not clear-cut concepts and are different from the concept of **economic value**. There is a degree of variation associated with their definition and classification, and a number of alternative measures of deadweight loss and additionality can be identified along a spectrum of outcomes. Presented in Figure 1, at one end of the spectrum, we define **pure additionality** or **quantitative additionality**, which refers to the training received by individuals that would not otherwise have received any training. At the other end of the spectrum, **displacement** occurs when the same workers that would have gained some comparable form of training receive the publicly funded training instead (at no net economic gain). **Substitution** occurs when there is a change in the profile of the employees that receive the training. Some workers that would have received privately funded training no longer receive any training and are replaced by different workers on the publicly funded programs (who would not have received any training otherwise).

The total crowding-out effect of privately funded training (**displacement** plus **substitution**) is defined as **quantitative deadweight loss**. In the case of quantitative deadweight loss, although there is an increase in skills for some individuals, in aggregate, there is no net increase in the level of skills acquisition (although there may still be a rationale for government intervention in these circumstances).



Source: London Economics

Figure 2: Component definitions of deadweight loss and additionality from a firm perspective

	Element	Description	Deadweight Loss	Effect on Skills
	Accreditation	Simple skills accreditation	Pure deadweight loss	No increase in skills
Quantitative Deadweight Loss	Displacement	The same (or equivalent) training would have occurred anyway in the absence of government funding. The same employees would have been trained	Crowding-out effect, quantitative deadweight loss	Increase in skills occurring but no additionality (equivalent training at firm level would have occurred anyway).
	Substitution	The same (or equivalent) training would have occurred anyway in the absence of government funding, but different employees would have been involved	Crowding-out effect, contributing to quantitative deadweight loss.	Increase in skills occurring but no additionality (equivalent training at firm-level would have occurred anyway).
	Qualitative Additionality	The employee receives better quality training compared to what would have happened without government funding	Partial additionality, some training would have happened anyway.	Additional increase in skills is taking place, but that is only partial
	Quantitative Additionality	A higher number/proportion of employees received training thanks to government funding.	The increase in the number/proportion of employees receiving training is pure additionality.	Additional increase in skills is taking place.

Source: London Economics

In between these extremes, but still delivering value, there is **partial additionality**, which occurs when public and private training are not perfectly substitutable. In this case, publicly funded training might result in an individual achieving a higher level of attainment or an employer providing better quality training than would otherwise be the case (**qualitative additionality**), although the original training that is replaced is considered to be **qualitative deadweight loss**. This deadweight loss may be reduced if the training is jointly funded by the state and employer, as is usually the policy intention. It is also important to recognise that employers also make contributions towards publicly-funded training over and above any co-funding contribution. Specifically, employers may also contribute in terms of supervision, materials, use of equipment and output foregone whilst training takes place so that there is greater additionality than that might be associated with government funding. Given this, deadweight should arguably only apply to the reduction in employers' training expenditure. For example, even though the training would have happened, they may now provide better supervision or allow the employee to spend more time training off the job, which all contribute to qualitative additionality.

In parallel to these concepts of deadweight loss and additionality, we also define certification or accreditation, where individuals already have the skills/competencies associated with the training in question, but simply accredit or certify their existing skills. The accreditation and certification of existing skills can still be economically valuable even if it does not enhance human capital by increasing the level of skills in the economy and providing workers with identifiable and portable qualifications better reflecting their skills.

Increasing the transparency of skills and qualification acquisition can reduce the costs and uncertainty associated with hiring decisions, resulting in lower costs for employers in the future.

What is the economic rationale for policy intervention in the presence of deadweight loss?

The definitions presented here solely refer to the concepts of **deadweight loss** and **additionality**, and not the **economic value** generated by the provision of publicly funded education and training. In other words, although it may be the case that a government training programme is associated with a degree of deadweight loss (and all public policy interventions will have some degree of deadweight loss), the economic benefits (i.e. to individuals, employers, the wider economy and also the Exchequer) generated by the learning may be great enough to still warrant intervention. As such, it may be beneficial for the government to invest in a training programme associated with relatively high deadweight rather than an intervention that produces significantly lower economic benefits but with more limited deadweight loss associated with it. **The existence of deadweight per se is therefore an insufficient reason for government intervention not to take place.**

Secondly, in the absence of government intervention, the provision of privately funded training may suffer from **distributional issues**. There is evidence to indicate that individuals already in possession of higher levels of qualifications are more likely to receive subsequent employer funded education and training, with those in possession of lower level or no formally recognised qualifications more likely to be overlooked. Following the introduction of a government funded training programme aimed at those with lower level qualifications, employers may re-organise their training profile - away from those with intermediate and higher level qualifications - in favour of those with a lower level of prior attainment. There may be some deadweight loss incurred, however, the policy intervention may result in the generation of significant aggregate economic value across the skills spectrum (thereby justifying the policy intervention).

There is substantial evidence of the existence of positive **externalities** associated with the acquisition of education and training (Galindo Rueda and Haskel (2005), Battu et al (2003), Metcalfe and Sloane (2007)). Externalities relate to the situation where the enhanced training provided to one worker increases not just their own productivity, but also potentially raises the productivity levels of co-workers through workers' interactions (such as imitation, learning-by-doing, social pressure or leading-by-example). In the absence of the government intervention, where labour can freely move between firms, there is an incentive for firms to under-invest in education and training for their workforce – thereby foregoing the direct and indirect productivity gains. As such, in those sectors where spillovers may occur, the government can play a role in moving the economy to a higher skills level, thus capturing these external effects.

What is the basic methodological approach for estimating deadweight loss?

The key research requirement in this analysis is to robustly assess the deadweight loss associated with publicly funded training by considering what might have happened in the

absence of a particular skills and training funding stream, controlling for all other factors. However, firms that may engage in publicly funded training (whether in a workplace or College based setting) may not be representative of all firms given the fact that the decision to engage in the training programme may have taken place on the basis of some other factors (such as the size of the firm, the sector of the firm, the current occupational or qualification structure within the firm, or the ‘taste’ or need for training amongst firms). Given that it is impossible to simultaneously observe the same firm both engaged and not engaged in a publicly funded training programme, the standard approach adopted to achieve an appropriate comparison is to implement a Propensity Score Matching model. The **Propensity Score Matching** model selects firms participating in the programme (**treatment group**) and matches them with other firms with the same observable characteristics (**the control group**), so that the only observable difference between the treatment and control group relates to participation in the programme.

To achieve robust results, it is crucial to be able to adequately control for differences between the treatment and control firms that might drive the decision to participate in publicly funded training and the level of training provided. In addition to various observable firm level characteristics¹, one important issue in this respect relates to identifying and controlling for the general **skills profile** and **skills needs** of the firm. The reason for this is because the current level or distribution of skills within firms (and the specific ‘location’ of skills gaps within the organisational structure) may drive the decision to engage in training.

The second piece of information that is required to undertake a detailed assessment of deadweight loss and additionality relates to the **source of funding** associated with each episode of training or each learning aim. The existence of this information improves the degree to which the qualitative deadweight loss and additionality associated with a particular programme may be estimated.

Turning to outcome variables, the third element of information required relates to the detailed understanding of firms’ **training decisions**. The better the quality and comprehensiveness of data available, the more precise and extensive the estimates of deadweight loss and additionality might be achievable.

In theory, what information is needed to estimate deadweight loss?

Estimating deadweight loss and additionality is very data demanding. There is no off-the-shelf data source that can be used to address all the different concepts robustly. Having developed the conceptual framework for the definition and classification of deadweight loss and additionality, we undertook an assessment of the nature of the data required to achieve ‘ideal’ estimates of the various elements of deadweight loss and additionality. As we move from left to right across Figure 3, the comprehensiveness of the information increases from basic information at a firm level incorporating the characteristics and circumstances of the firm (‘Tier 1’ information) to information that consists of matched firm-employee data incorporating employee-level training profiles and employee level prior

¹ Such as number of employees, turnover, profitability, single site/multisite, SIC code, public/private/NFP, ownership structure and region of incorporation.

attainment ('Tier 5'). The figure also classifies the tier of information necessary for the subsequent identification of decomposed deadweight loss and additionality estimates.

Figure 3: Theoretical data requirements

Increasing comprehensiveness of information →					
Tier of information needed for estimation of DWL/additionality					
	Tier1: Firm Level characteristics and 'circumstances' (for PSM)	Tier2: Level 1 plus Basic aggregate training information (no. employees, hours)	Tier3: Level 1 plus detailed training information (no. employees, hours, level, type, attainment)	Tier4: Level 3 plus Matched firm-employee level data – individual training profiles	Tier5: Level 4 plus employee level prior attainment
Accreditation	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required
Displacement	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required	Not required
Substitution	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required	Not required
Qualitative DWL	Required but not sufficient	Required – estimate improves with more comprehensive data			Not required
Qualitative additionality	Required but not sufficient	Required – estimate improves with more comprehensive data			Not required
Pure additionality	Required but not sufficient	Possible overestimate – estimate improves with more comprehensive data			

Required but not sufficient	Implies that this information is necessary for the estimation, although in isolation, may not be sufficient (i.e. information is too weak/ not detailed enough)
Not required	Implies that this information is unnecessary for the estimation – superfluous to requirements if more detailed information is available
Required	Implies that this information is necessary and sufficient for the estimation of the associated element of deadweight loss/ additionality

Source: London Economics

In terms of data quality, the most valuable type of data source to estimate the extent of deadweight loss and additionality is matched firm level and **employee level data** ('Tier 4' and above). It is only with matched firm-employee level data that complete estimates of quantitative deadweight (i.e. including **displacement/ substitutability**) might be achieved. In practice, there is limited matched data of this nature currently available that would allow us to undertake this form of analysis. As such, we are unable to observe which employees receive which training, but can observe **aggregate measures** at firm level of the number of employees trained and the characteristics of training. We are unable to assess the extent to which training is additional at individual level.

In addition to the data challenges relating to the estimation of displacement and substitution, to assess **accreditation** or **certification**, it is also necessary to have reliable information relating to workers' **prior attainment** ('Tier 5' information). Given the fact accreditation is defined as the acquisition of a qualification where an employee is already in possession of those skills, the only means of identification of accreditation is the comparison of skills before and after the intervention at an employee level. Again, there is no data available at a firm level that allows for an estimate of the incidence or extent of this.

In essence, the majority of the information that is available for the estimation of deadweight loss and additionality consists of unmatched firm level data only (i.e. 'Tier 3' information at best).

Given this, the next issues relate to the information available concerning the education and training provided by the firm to its employees, and in particular, information relating to the **number of employees** that are in receipt of training²; the nature or **quality** of the training in terms of the level of qualification; the number of hours of training or the intensity/effort associated with the training programme; and the **components** of the training programme³.

In particular, the **quality** of the training funded through public and private sources may be fundamentally different across the treatment and counterfactual groups. Although the number of workers receiving training may be broadly equivalent between the treatment and control firms, if the quality of publicly funded training exceeds the quality of the private training that would have taken place in the absence of the programme, there may be an element of **qualitative additionality** that has not been identified.

Therefore, rather than considering just the number or proportion of employees in receipt of publicly or privately funded training, the quality or scope of the training received is crucial in determining qualitative additionality. The absence of detailed training information will potentially lead to an **underestimate of the true level of additionality** associated with publicly provided training and skills acquisition. In particular, given the fact that apprenticeships are nominally equivalent to stand-alone NVQs within the National Qualification Framework, the technical certificate and key skills components gained as part of an apprenticeship (over and above the NVQ) may represent the acquisition of higher quality training, which might not be properly identified in a particular data set.

In practice, what information do we have to estimate deadweight loss?

Having undertaken a detailed assessment of the data sources that might be suitable for estimating the deadweight loss associated with Further Education and training at the employer level, we determined the **National Employer Skills Survey (NESS)** offered the best opportunities for further analysis.

Matching variables

To undertake the initial Propensity Score Matching process, information was available relating to general firm characteristics (including the number of employees, industrial sector of activity, geographic location, information on ownership and legal structure); information on the firm's internal organisation and business strategy (i.e. price, innovation or quality); occupational and skills structure, and information relating to the firm's recruitment activities, and skills shortages or gaps the firm may be facing.

² Or the **proportion** of employees if information is available on the total number of employees employed by the firm

³ For instance, programs that contain multiple modules of training and skills acquisition rolled up into a more general qualification (e.g. apprenticeships)

Outcome (training) variables

The NESS provides some detailed information on the number of employees receiving training, the type, level and length of training, details on the provider and also a set of variables on involvement in government initiatives. However the NESS is **not** a matched employer/employee dataset and therefore does not contain information on training at the individual level. In other words, we observe the number of employees receiving training and the characteristics of training at firm level, but we are unable to identify who is receiving the training provided.

Information on government funded training initiatives

The NESS also contains a section on workforce training and development dedicated to assessing the awareness of and involvement in government initiatives. More specifically, the first set of questions on government funded training relates to awareness of and involvement in various initiatives: *Train to Gain*, *Skills Pledge* and *National Skills Academies*, although there is no further detail on the number of employees trained or the type of training provided through these government funded initiatives.

In contrast, there is a detailed module of questions on awareness of *Apprenticeships* overall and at different levels (Advanced, Higher and Adult Apprenticeships for those aged 25+); the number of staff undertaking apprenticeships (disaggregated by age 16 to 18, 19 to 24 and 25+); and whether the firm offers apprenticeships but no member of staff is currently undertaking one. Unfortunately, there is some ambiguity in relation to the exact classification of apprenticeship training (i.e. whether apprenticeship training is included or additional to the training activities of firms, which is discussed at length in the main report).

What approach was adopted and what analysis was undertaken?

What publicly funded education and training programmes were considered?

To undertake the analysis of deadweight loss and additionality, we considered firms engaging in apprenticeships and *Train to Gain* as receiving publicly funded training. Given the different characteristics and detail of the information available in the NESS on the two initiatives, we built **two** treatment groups: one formed of those firms engaging in **apprenticeships** and one formed of firms engaging in the **Train to Gain** initiative.

For apprenticeships, we looked at a treatment group consisting of those firms with at least one apprentice (of any age) and excluded those firms who engage in *Train to Gain* from both the treatment and counterfactual groups. The justification is that firms involved in *Train to Gain*, but not offering apprenticeships may have fundamentally different training needs or age-skills structure and are likely to be an unsuitable counterfactual for firms providing apprenticeships.

Under *Train to Gain*, firms receive funding covering 100% of training costs for level 2 qualifications, while level 3 and level 4 qualifications are partially funded (level 3 qualifications are fully funded for 19-25 year olds). We define the second treatment group as those firms that have been actively involved in *Train to Gain* in the last 12 months and excluded those firms who engage in apprenticeships from both the treatment and counterfactual groups, so we could identify the effect of *Train to Gain* independently from apprenticeships.

How good were the Propensity Score Matches?

Despite the various data limitations, the Propensity Score Matching process worked well and was robust to a number of different specifications. However, there are two main caveats to this element of the analysis: **The first caveat relates to the identification of the counterfactual.** Even after controlling for relevant variables available in the NESS, we cannot rule out the presence of unobservable differences between the treatment and control groups. Moreover, the more variables we control for in the matching process, the higher the probability of not finding any match for each treated observation. It might also be difficult to compare firms across different forms of training and funding. **The second caveat relates to the high degree of uncertainty surrounding the measure of total training and apprenticeships undertaken.** Even if the cleaning strategy implemented attenuates the extent of measurement error, the little information available on the different issues associated with the measure of training (i.e. whether apprenticeships are additional or already included in total training, whether respondents refer to “formal” apprenticeships only, and the role of health and safety and induction training) imply that there is still a degree of uncertainty about the “true” volume of total training or the number of apprenticeships undertaken.

What were the main results?

Quantitative deadweight and additionality

To assess quantitative deadweight loss, we considered the differences between the treatment and counterfactual in the proportion of employees undertaking training. The treatment group was formed of all firms with at least one employee undertaking an apprenticeship, while the control group is drawn from all other firms (excluding those making use of other forms of government funded training). Table 1 provides an estimate for the treated group of **45.6%**, meaning that 45.6% of employees in the treated group received some form of training (either publicly or privately funded). Under the assumption that the counterfactual is correctly identified, the estimate for the control group (**33.1%**) represents an estimate for the training that would have been undertaken in the absence of public intervention.

Variable	Treated (%)	Controls (%)	Difference	S.E	T-stat
<i>Proportion of workers trained</i>	45.6%	33.1%	12.4 pp	0.01	13.83

Source: LE analysis of the NESS 2009. S.E Standard error

Proportion of workers trained - proportion of apprentices and trained employees to total number of employees

However, we cannot conclude that the difference between the control and the treatment group (12.4 percentage points) is the quantitative additionality resulting from apprenticeships because we do not know whether the difference between the treated and control groups is due to apprenticeships, other trained employees, or both. In Table 2 we look at the proportion of **privately** funded training arranged in the treatment and counterfactual group. The estimate for the control group (33.1%) is unchanged compared to Table 1, given that firms in the comparison group have not undertaken any form of publicly funded training. The estimate for the treatment group stands at **28.3%** and reflects the privately funded training provided by firms in the treatment group.

Outcome Variable	Treated (%)	Controls (%)	Difference	S.E	T-stat
<i>Proportion of workers trained privately</i>	28.3%	33.1%	-4.8 pp	0.009	-5.51

Source: LE analysis of the NESS 2009. S.E Standard error

Proportion of workers trained privately - proportion of employees receiving privately funded training to total number of employees

Using the estimates from Table 1 and Table 2, we generated an estimate of quantitative deadweight and additionality for apprenticeships as follows.

In the absence of publicly funded training in the form of apprenticeships, training incidence would have been 28.3%, which indicates a drop of 17 percentage points compared to the estimate of total training reported in Table 1. Given that the estimate for the control group is used as a benchmark for what would have happened in the absence of publicly funded training, we can disaggregate the difference into an estimate for deadweight loss (where some training would have occurred anyway) and an estimate for quantitative additionality (where no training would have happened in the absence of public intervention). The difference between 28.3% and 33.1% (4.8pp) can be seen as an estimate of the **deadweight loss** occurring and corresponds to around **28%** of the training undertaken through public funding.

Conversely, the difference between 33.1% and 45.6% (12.4pp) can be seen as an estimate of **additionality**. Consequently, as a proportion of the total amount of apprenticeship training, deadweight is equal to approximately **28%** and additionality is estimated to be approximately **72%** (Table 3). In other words, 28% of individuals who undertook publicly-funded apprenticeships would have received some training in the absence of the programme, and 72% would have received no training at all. **Given the data limitations, care should be taken over these estimates.**

Outcome Variable	Treated (%)	Control (%)	DWL	Additionality	% DWL	% Add
<i>Proportion of workers trained</i>	45.6%	33.1%		12.4 pp		72.1%
<i>Proportion of workers trained privately</i>	28.3%	33.1%	4.8 pp		27.9%	

Note: %DWL is calculated as $(0.048)/(0.048+0.124)$ and %ADD is calculated as $(0.124)/(0.048+0.124)$

Source: LE analysis of the NESS 2009. S.E Standard error

Proportion of workers trained - proportion of employees receiving privately funded training to total number of employees

Proportion of workers trained privately – proportion of employees receiving privately funded training to total number of employees

Using a similar approach, we also assessed the extent of deadweight loss and additionality within firms training apprentices of different ages. We estimated that the deadweight loss associated with apprenticeship training in firms with apprentices aged between 16 and 18 only was **16%**, increasing to approximately **27%** for firms training apprentices aged between 19 and 24 only. In contrast, the equivalent results when looking at those firms training only apprentices aged over 25 were approximately **44%**, which implies that the extent of deadweight loss associated with the public funding of apprenticeships increases as the age of the apprentice increases. In other words, the greatest level of additionality associated with the public funding of apprenticeships occurs amongst firms employing the youngest apprentices, with the least amount of additionality

occurring amongst firms training apprentices at and above the age of 25. However, these results should be considered in light of the differences in funding between age groups. When taking this into account, it implies that around 16% of 16-18 year-old apprentices would have received some training in the absence of fully-funded apprenticeships, 27% of 19-24 year-old apprentices would have received some training in the absence of co-funded apprenticeships, and 44% of 25+ apprentices would have received some training in the absence of the more limited funding for apprenticeships in that age group.

This evidence possibly reflects the fact that employers may be reluctant to privately invest in training for young employees with a low level of productivity. As such, the analysis appears to support the rationale underpinning the funding of apprenticeships (i.e. greater levels of funding for apprentices towards the lower end of the age spectrum). However, it should be acknowledged that we cannot control for the age structure of a firm and that the number of firms only having apprentices aged 25 plus is limited.

Qualitative deadweight and additionality

We also exploited information from the NESS to help us try and generate an estimate of the qualitative additionality/deadweight loss associated with apprenticeships, although due to data limitations, we are **unable to estimate qualitative deadweight**, as we were unable to robustly allocate apprenticeships to a specific level of Nationally Recognised Qualification.

The analysis presented below in Table 4 demonstrates the difference in the proportion of workers in receipt of training at different levels between the treatment and counterfactual groups. To at least partially address the possibility that there is a difference in the quality of the training received by those in receipt of publicly funded training compared to privately funded training, we also compared the number of employees receiving training to different levels of the National Qualification Framework as a proportion of the total number of employees receiving training across treated and control firms.

Table 4: Structure of training by qualification level amongst those receiving training					
Outcome Variable - proportion trained to	Treated	Controls	Difference	S.E	T-stat
Level 1	8.6%	5.5%	3.2 pp	0.006	4.890
Level 2	17.5%	7.5%	10.1 pp	0.008	12.600
Level 3	17.5%	6.3%	11.3 pp	0.008	14.560
Level 4	5.3%	4.7%	0.6 pp	0.005	1.150

Source: LE analysis of the NESS 2009. S.E Standard error

The analysis presented in Table 4 suggests that the quality of training undertaken in the group of firms receiving public funding is indeed greater than what might have occurred in the absence of publicly funded training – 49% of those employees receiving training in the treated firms did so towards a qualification, compared to only 24% in the control firms. Moreover the difference is larger at Level 2 and Level 3 qualifications, the levels at which almost all apprenticeship training takes is undertaken. This therefore suggests that employees in the treated firms were more likely to receive qualification-bearing learning compared to those in control firms, although this cannot be interpreted as a direct estimate of qualitative deadweight or additionality.

Train to Gain

For those firms in the *Train to Gain* treatment group, we can hypothesise that any additional training undertaken by the firm (relative to the control group) is through this programme, thereby allowing for a very rough upper bound of the extent to which quantitative additionality may exist. However, we are not able to estimate even an aggregate measure of deadweight loss, unless we assume that all training towards nationally recognised qualifications is undertaken through *Train to Gain*.

Quantitative deadweight and additionality

Table 5 illustrates that in the treatment group, **54%** of employees are trained, whereas only **40%** of employees are trained in the control group (so approximately 14 percentage points higher). However we don't know what proportion of this extra training is publicly funded and what proportion is privately funded, so we cannot draw any conclusions about additionality and deadweight loss associated to the *Train to Gain* programme. Given the fact that there is no information on the number of individuals trained under *Train to Gain*, we concluded that attempting to robustly estimate qualitative additionality or deadweight loss is not feasible for this programme using NESS.

Table 5: Estimated relating to Train to Gain					
Outcome Variable	Treated	Controls	Difference	S.E	T-stat
<i>Proportion of workers trained</i>	53.7%	40.0%	13.8 pp	0.01	24.32

Source: LE analysis of the NESS 2009 ATT – Average Treatment on the Treated

Proportion of workers trained - proportion of employees receiving privately funded training to total number of employees

How does this tie in with previous work?

In Table 6, we provide a summary of the existing evidence relating to the extent and magnitudes of deadweight loss and additionality across a number of analyses at both firm-level, however, it is important to remember that the analyses undertaken were based on different programmes, using different methodological approaches and definitions of deadweight, so may **not be directly comparable**.

Table 6: Summary firm-level evidence relating to deadweight loss					
Author	Programme	Method	Quant. DWL	Qual. DWL	Estimate
LSC (2010)	Train to Gain (Broker-led)	Employer survey	Y	Y	24% (1)
LSC (2010)	Train to Gain (Broker/provider-led)	Employer survey	Y	Y	5-7% (2)
National Audit Office (2009)	Train to Gain	Secondary analysis*	Y	Y	50% (3)
LSC (2010)	Train to Gain (Provider-led)	Employer survey	N	Y	33% (4)
Abramovsky et al (2005)	Employer Training Pilots	Secondary analysis**	Y	N	85-90%
Hillage et al (2006),	Employer Training Pilots	Employer survey	Y	Y	83%
Anderson and Metcalf (2003)	Modern Apprenticeships	Secondary analysis***	Y	N	44%-53%
London Economics (2012)	Apprenticeships	Secondary analysis***	Y	N	28%

Source: London Economics

Notes (1) Committed firms only; (2) Committed and participating firms only, (3) Committed and non-committed firms. For the reasons explained below, we believe that (2) is the most accurate and meaningful estimate of what firms would have done in the absence of Train-to-Gain participation funding; (4) refers to the proportion of Level 2 qualifications that would have been provided to employees by employers (Committed and participating firms) in the absence of government funding. *The secondary analysis used the employer survey data collected as part of the LSC (2010) evaluation. ** Difference in difference analysis between Pilot areas and control areas. ***Secondary analysis using NIESR 2002 Survey of Modern Apprenticeship employers. Econometric analysis using propensity score matching model based on NESS data

Train to Gain

Looking at Employer Training Pilots (the precursor to *Train to Gain*), deadweight loss was estimated to be in excess of 83%, while estimates of deadweight loss for *Train to Gain* itself ranged between 5% and 50% depending on the assumption made in relation to the degree of engagement in the programme by firms. Specifically, the analyses comparing firms ‘engaged’ with the *Train to Gain* programme in the broadest sense (i.e. aware but not necessarily ‘committed’ to *Train to Gain*) were associated with the highest estimates of deadweight (approximately **50%**).

However, as the degree of engagement with *Train to Gain* increases, the estimates of deadweight loss decrease - approximately 24% for firms ‘committed’ to *Train to Gain* and around 5-7% for firms ‘committed and taking up the training offer’. As discussed throughout the main report, one of the key methodological issues when assessing deadweight loss relates to generating the appropriate counterfactual. It is questionable as to whether firms that are either not yet committed to *Train to Gain* or committed and not yet taking up the offer of training have the same **training needs** or **training circumstances** compared to firms that are actually taking up the offer. Furthermore, given that ‘engaged’ and ‘committed’ firms have not yet drawn any *Train to Gain* participation funding, it does not seem sensible to include them in an assessment considering the deadweight loss associated with such funding. For this reason, our opinion is that the best estimates of deadweight loss associated with *Train to Gain* are at the lower end of this range. We thus believe it is reasonable to conclude that 93-95% employers did more or better training than they would have done in the absence of the *Train to Gain* programme.

However, given that *Train to Gain* funding is drawn at the level of an individual employee, this is the level at which we should arguably be assessing deadweight. The same LSC (2010) evaluation suggests that amongst provider-led employers, around 33% of employees who undertook a Level 2 qualification funded through *Train to Gain* would have

undertaken this qualification in the absence of such funding. This implies that 67% of the qualifications gained through the programme were additional. However, some of the individuals gaining qualifications who would not have done so otherwise may still have received some training from their employer (even though it did not lead to a qualification), which means that quantitative deadweight, at an individual level, is likely to be higher than 33%. However, given the design of the evaluation survey, some caution should be exercised over these individual-level estimates.

Because of data limitations, we have been unable to accurately assess the deadweight loss from *Train to Gain* using the National Employer Skills Survey. However, the analysis undertaken suggests that there may be a significant degree of additionality associated with the programme.

Apprenticeships

Despite the many methodological and data difficulties associated with the analysis, our estimates indicate that the **quantitative deadweight loss** associated with Apprenticeships stands at approximately **28%**. This implies that in the absence of any publicly-funded apprenticeships, 28% of apprentices would have undertaken some training. The results also suggest that the estimate of deadweight loss stands at **16%** amongst firms offering training to 16-18 year olds only; approximately **27%** amongst firms offering apprenticeships to apprentices aged between 19 and 24 only; and approximately **44%** amongst firms offering training to apprentices aged over 25 only. However, these findings should be considered in light of the different funding arrangements for the different age groups e.g. in the absence of *fully-funded* 16-18 apprenticeships, 16% of learners would still have received some training; in the absence of co-funded 19-24 year-old apprenticeships, 27% of such learners would still have received some training; and in the absence of the *more limited funding* for apprentices aged 25+, 44% would have received some training.

These estimates of deadweight loss are **lower** compared to those estimates derived from the only other study addressing apprenticeships (Anderson and Metcalf (2003)), where the estimates of deadweight loss ranged between 44% and 53% (depending on the level of apprenticeship), and are based on asking employers what they would (hypothetically) have done in the absence of public funding.

There are some very important caveats associated with the estimates from our analysis of NESS. In particular, the analysis presented here only addresses the **quantitative deadweight** associated with apprenticeships. In other words, these analyses consider only those workers who would have received no training in the absence of publicly-funded apprenticeships (i.e. quantitative deadweight loss only). Unlike a number of the previous assessments of *Train to Gain*, our approach does not consider the extent to which workers received better training as a result of the programme (i.e. qualitative additionality).

The estimates presented in relation to apprenticeships thus take no account of the **qualitative additionality** that would potentially arise from apprenticeships that result from the fact that an apprenticeship consists of not just a stand-alone NVQ, but also a technical certificate and Key Skills qualification. As demonstrated in relation to the proportions of trained employees receiving higher levels of training in the presence of public funding opportunities, it is entirely probable that in the absence of government funding, employers would continue to undertake training of their employees to some extent, however, it is less

likely that the training offered to employees would be as comprehensive as that currently provided. Therefore, it is important to be aware that there is a qualitative additionality component associated with apprenticeships that may not be identified when comparing the levels of total training across firms (or training towards a Nationally Recognised Qualification). Therefore, while our analysis (subject to the aforementioned caveats) suggests quantitative deadweight of around 30%, when we consider those who get better training than they would otherwise have done, qualitative deadweight is likely to be lower, and our indicative analysis of NESS suggests that this is indeed likely to be the case.

Apprenticeships and Train-to-Gain Compared

Comparisons between estimates of deadweight in apprenticeships and *Train to Gain* are not straightforward, given that the main evidence for each is based on two different methodologies (i.e. an employer evaluation survey for *Train to Gain* asking employers what they would have done in the absence of public funding – and a *Propensity Score Matching* model based on the NESS looking at observed training behaviour amongst those firms who do and do not have apprentices). However, the available evidence broadly suggests deadweight of around 30% in both cases.

The figure for *Train to Gain* is based on the number of Level 2 qualifications that would still have been undertaken in the absence of the program. The figure for apprenticeships is based on apprentices who would have received some training in the absence of the programme. In this sense, the *Train to Gain* figure captures an element of qualitative deadweight that the estimate for apprenticeships does not. Notwithstanding the difficulties of making such comparisons, this would imply that deadweight (on a like-for-like basis) in the *Train to Gain* programme is probably higher than for apprenticeships.

What analyses might be undertaken in the future?

Having developed a framework for the definition and measurement of deadweight loss and additionality, there are two main problems associated with the estimation process: the quality and extensiveness of the required data and the identification of a suitable counterfactual. While the availability of a rich dataset is a necessary condition for the identification of the counterfactual, it may not be sufficient to accurately identify what may have happened in the absence of government intervention and the extent of deadweight loss and additionality.

The question to be addressed relates to how might deadweight loss and additionality be better estimated going forward? There are two fundamental approaches. Given the fact that existing secondary data is currently insufficient in providing robust estimates (as demonstrated throughout the main report), the first approach relates to ensuring that whatever data is collected through existing processes addresses some of the relatively straightforward issues that have limited the effectiveness of the current analysis. The second approach involves the collection of new data specifically designed to address deadweight loss and additionality.

- It is inefficient not to maximise the use of existing data. Although the current version of the NESS lacks certain key information, we believe that it is imperative to eliminate the data discrepancies identified in relation to training variables. This alone would increase the precision of the estimates generated.

- We also think that it might be beneficial to ask a small number of questions specifically in relation to deadweight loss and additionality. The approach that we have adopted has been based on the fact that there is no direct approach for addressing the topic. Asking employers about the training undertaken within the firm, and what might have happened in the absence of public intervention is a possible approach to ascertain some estimates and might reduce the need for more elaborate strategies. We welcome the fact that this approach is currently being undertaken by the Department as part of a survey of apprenticeship employers.
- Quantitative analysis is just one way of understanding deadweight loss and additionality. An alternative approach would involve undertaking qualitative research with employers to understand precisely what training activity might have occurred in the absence of public funding. Although this approach would not provide robust empirical estimates, it would have the advantage of providing a deeper understanding of the specific behavioural responses of employers in the absence of publicly funded training.
- Our analysis suggests that matched data at the employer-employee level is required to estimate the various components of deadweight loss and additionality. The best source of information at both employer and employee level in the UK has been the Workplace Employers Relations Survey (WERS), which has produced some very informative analyses on more difficult to measure economic concepts. Despite some issues in relation to sample structure and the representativeness of the findings, this data source could offer significant opportunities for assessing deadweight loss and additionality going forward. It is also worth exploring the possibility of gathering some employee level information from other existing employer-level data sets (such as the BIS Employer Apprenticeship survey or the National Employers Skills Survey), as these options might provide a better option in cost effectiveness terms.
- A final option to consider involves undertaking a fully fledged randomised trial replicating the type of analysis undertaken by Wolter and Messer (2009). This approach selected a random sample of respondents within the Swiss Labour Force Survey and provided them with vouchers to undertake additional training and compared their training decisions with a control group of individuals (also within the Swiss LFS). This research approach is potentially expensive (the value of the voucher) and the fact that this approach consists of a voucher system may limit the wider applicability of the results; however, given the rolling panel nature of the LFS in the UK would allow for detailed information on the personal and socioeconomic characteristics of individuals in the treatment and control group to be collected at a relatively low marginal cost, it may be worth considering. A similar approach could be adopted at firm level (through some pre-existing firm level survey), although a degree of care would be required to structure the training voucher correctly. However, as before, the cost effectiveness of the provision of a voucher may be questionable, as would be the wider applicability of the results.

1 Introduction

1.1 Terms of Reference

The aim of the study was to improve the current assessment of value for money in apprenticeships, as well as other areas of Further Education and Skills, by considering the extent to which government-funded learning generates outcomes that are additional to what would have occurred in the absence of such provision (i.e. an assessment of deadweight loss). To achieve these aims and objectives, the project aimed to:

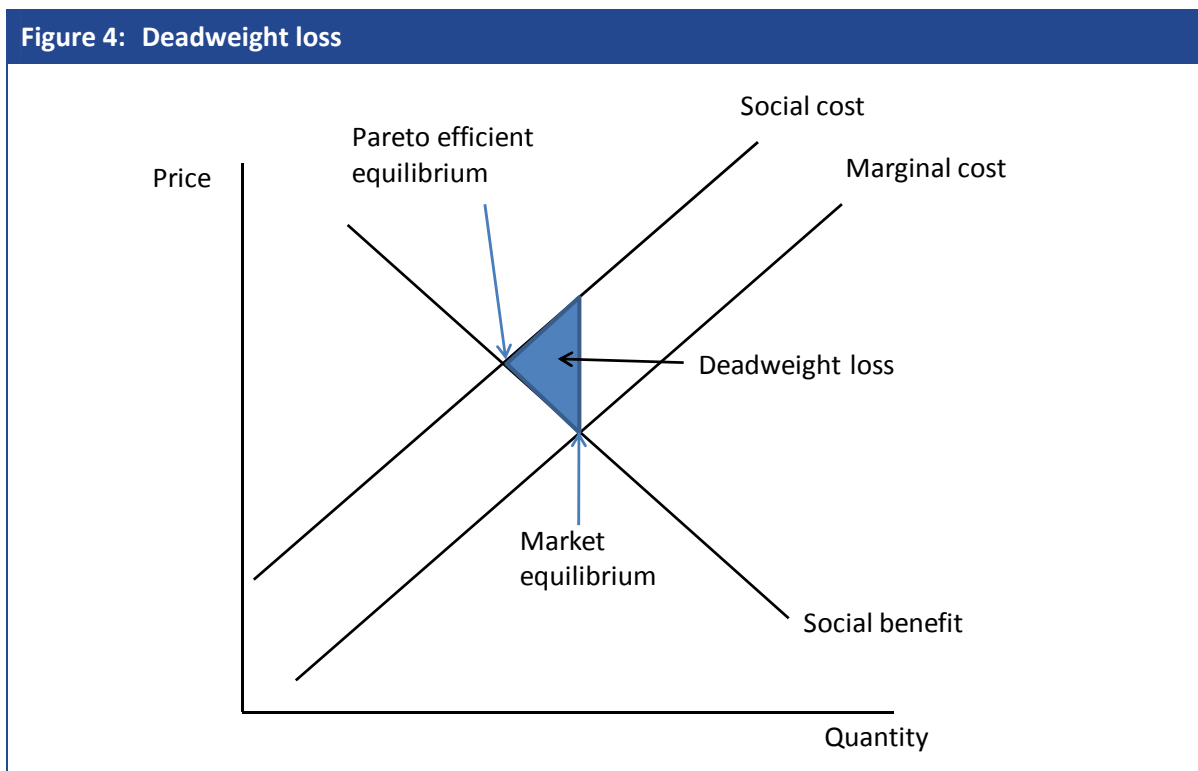
- Develop a conceptual framework that defines the different routes through which deadweight can occur, and thus act as a basis for the assessment in this study;
- Critically assess existing evidence which can shed light on deadweight in apprenticeships and other areas of FE and Skills;
- Draw appropriate lessons from the measurement of deadweight in other areas and consider the extent to which the methodologies adopted can be applied to FE and Skills;
- Produce rigorous analysis of existing data sources, including quantified estimates where appropriate, of deadweight in apprenticeships and other learning streams within FE & skills;
- Consider the scope to undertake a comparison group study, or quasi-experimental analysis to gauge the extent of additionality;
- Assess what, if any, are the key evidence gaps which prevent a robust and comprehensive assessment of deadweight across these learning streams; and
- Develop workable and cost-effective proposals for improving data availability in the future, including new approaches to data collection.

In the remainder of this section, we present some information on the (relatively limited) attempts to identify the extent of deadweight loss and additionality in the education and skills market, while in section 2, we discuss the conceptual framework for assessing deadweight loss and additionality, followed by an assessment of the availability and quality of the data sets that might be used to estimate the extent of deadweight loss. In section 3 we provide information on the approach to modelling deadweight loss at firm level and some of the data issues encountered, while section 4 provides the results of our analysis. Section 5.1 provides some recommendations for future research work.

1.2 Background and context

1.2.1 What is deadweight loss?

In simple economic terms, deadweight loss is a reduction in net economic benefits resulting from an inefficient allocation of resources. The concept of deadweight loss is common when assessing government interventions, such as the introduction of a tax or a subsidy, or the internalisation of an externality. For example, the blue “Harberger” triangle in Figure 1 illustrates the deadweight loss occurring when the market equilibrium is not Pareto optimal due to the existence of a negative externality.



Source: London Economics

In the context of government schemes such as those used in Further Education and training arena, ‘deadweight’ is the term that is applied to the extent to which the identified outcomes (e.g. privately funded training) would have occurred anyway in the absence of the government intervention⁴. This type of deadweight loss to the government can stem from both employers’ and individuals’ actions. For example, although a particular government intervention in the training market may encourage a higher level of training overall, and thus generate significant economic benefits, some employers may have provided the same training to their employees (through private means) in the absence of the government intervention. The element of privately employer funded training that no longer takes place (and is replaced by publicly funded training) would be considered deadweight loss. Similarly, the training undertaken by *individuals* who are trained through government programmes that may have occurred in the absence of government

⁴ Maton, K. (1999) *Evaluation of Small Firms Training Loans*, UK Research Partnership Limited.

intervention, either through their employers or by use of private funds, would be counted as a deadweight loss.

1.2.2 What is the evidence of deadweight loss

There are a number of studies that assess the extent of deadweight loss in education or training programmes; however, given the difficulty in estimating deadweight loss and additionality, the number of studies is relatively limited⁵.

Estimates of deadweight loss

In the majority of studies we have looked at, deadweight loss is often estimated using surveys of employers or participants in a particular scheme. However, it is clear from a number of studies that deadweight loss does exist when considering government funded education and training programmes. In addition, there is also a wide degree of variation in the estimates of deadweight and additionality depending on the government intervention. However, an important point to note in relation to the estimation of deadweight loss is that there is often little attempt to assess the extent to which the training that may have taken place in the absence of government intervention would have been comparable to the training undertaken in the presence of the government intervention. In particular, although employers may state that they would have undertaken training without government intervention, this is not to say that the training would have been of an equivalent standard or generate comparable economic value as the publicly funded training. Related to this, firms may be reluctant to invest in generic skills (i.e. those which are not specific to the firm) for fear that they may not capture the benefits if workers leave the firm (i.e. poaching externalities). It is perhaps also less likely that such firms would have provided accredited training, which can act as an important signal in the labour market and make it easier for employers to recruit workers with the necessary skills.

As such, the value and portability of such training in the wider labour market would be lower than in the presence of government intervention. This lack of portability and transferability might have implications for labour market flexibility and efficiency, and this externality in itself may provide a rationale for government intervention. This should be noted throughout the remainder of the discussion.

1.2.3 Subsidies for organisations

Train to Gain

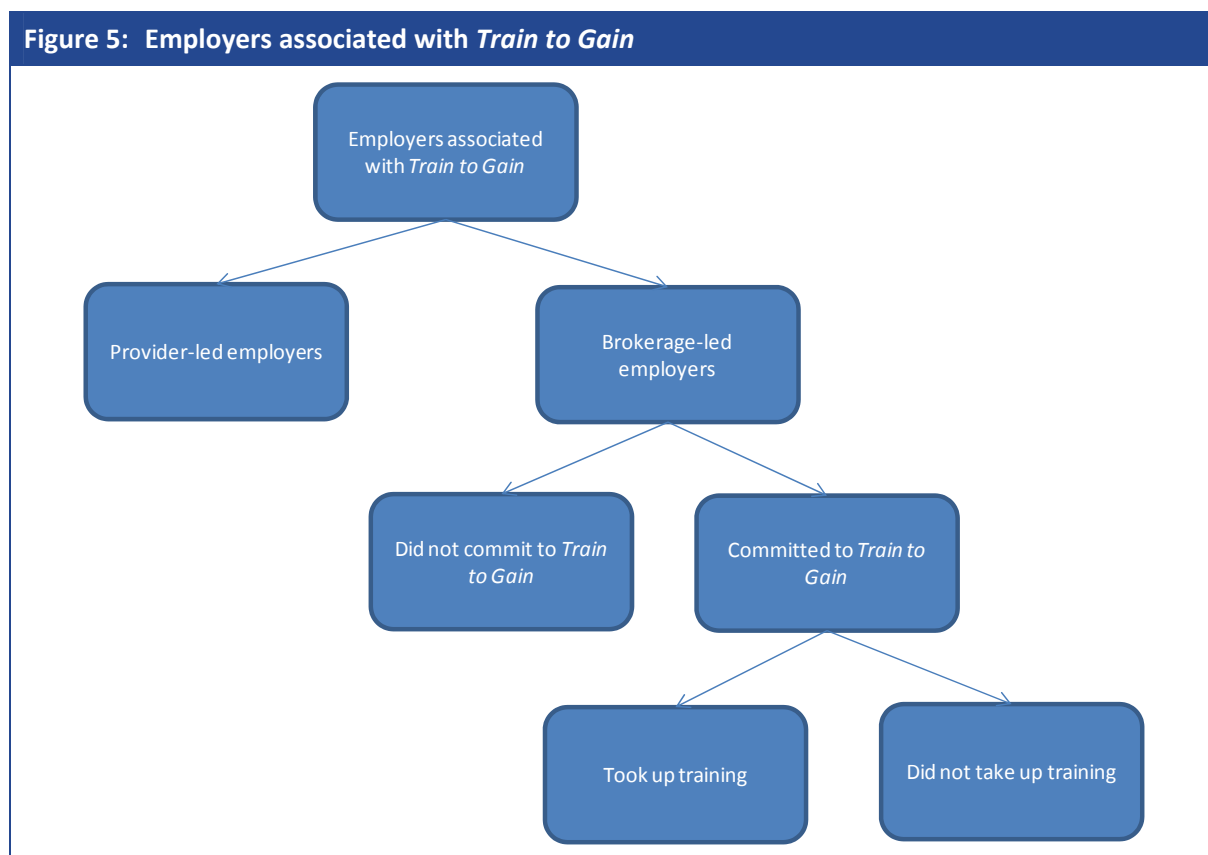
The former Learning Skills Council (2010)⁶ evaluated the *Train to Gain* programme, which was aimed at employees across the United Kingdom not already in possession of a Level 2 qualification. Over the course of the evaluation, there were five different sweeps of employer level data collected and assessed. Each sweep consisted of a telephone survey

⁵ This will be presented in section **Error! Reference source not found.** when considering the conceptual framework, and in section **Error! Reference source not found.** when considering the data sources available for estimation and the establishment of a robust counterfactual.

⁶ Learning and Skills Council (2010) *Train to Gain Employer Evaluation: Sweep 5 Research Report*

of almost 4,000 employers who were initially in contact with a *Train to Gain* skills broker. Sweep 5 focussed on the last group of employers who used the skills brokerage service, which ended in March 2009, and was amalgamated into the Regional Development Agency integrated brokerage service delivered by Business Link⁷.

The evaluation of *Train to Gain* considers two types of employers: those who commit to the *Train to Gain* programme using a skills brokerage service (broker-led) and those who contacted a training provider directly without any contact with a skills brokerage service (provider-led). Broker-led employers can be further broken down, as shown in Figure 2.



Source: London Economics

The majority of the evidence on *Train to Gain* activities and additionality/deadweight is available through a survey (the Employer Evaluation) designed to assess the skills-brokerage service. As a result, the evidence refers only to broker-led employers, which account for a relatively small proportion of the total number of employers undertaking *Train to Gain* activities (12% compared to 88% of provider-led employers). Further evidence (shown in Table 2) also presents the available findings for provider-led employers.

The National Audit Office report (NAO, 2009)⁸, based on survey evidence from the Sweep 4 Evaluation from the Learning and Skills Council (June 2009)⁹, suggested that, for broker-

⁷ Learning and Skills Council (2010) *Train to Gain Employer Evaluation: Sweep 5 Research Report*

⁸ National Audit Office (2009) *Train to Gain: Developing the skills of the workforce*

⁹ Learning and Skills Council (June 2009), *Train to Gain Employer Evaluation: Sweep 4 Research Report*.

led employers, approximately 50% of employers who accessed training through *Train to Gain* would have arranged similar training in the absence of the programme. However, these estimates of deadweight and additionality include those employers who have not (even) committed to training through *Train to Gain* (representing 39% of the sample¹⁰). As such, these employers would not experience any impact from *Train to Gain*. Consequently, if we look at only those employers who were committed to training through *Train to Gain*, and are thus impacted by it, the estimates of deadweight and additionality would be **22%** and **78%**¹¹ respectively (see Table 1).

More generally, Table 1 presents evidence from Sweep 1 to Sweep 5 of the evaluation. Looking at the most recent data (Sweep 5), the evaluation found that of those employers who had committed to training through *Train to Gain* via the brokerage service, **24%** had not experienced an increase in quality, level or volume of training compared to before. The authors infer that these employers may be using *Train to Gain* as a substitute for training that they would have offered in any case. Therefore, this **24%** could be an estimate for deadweight loss with the remaining 76% providing an estimate of additionality. Since Sweep 2, using this measure amongst committed employers, the estimate for deadweight loss has risen by 6 percentage points (from 18% to 24%), although this estimate still remains lower than the estimate of deadweight in Sweep 1 (27%).

	Sweep 1	Sweep 2	Sweep 3	Sweep 4	Sweep 5
	%	%	%	%	%
Pure additionality	31	31	32	34	31
Quantitative additionality only*	6	6	7	6	7
Qualitative additionality only*	2	3	4	3	3
Both quantitative and qualitative additionality	33	42	38	35	36
Total additionality	73	82	80	78	76
Substitution / Deadweight	27	18	20	22	24

Note: This only includes those employers who are committed to training through *Train to Gain*. Therefore, it excludes the employers where TTG will have no impact on training provision because they have not committed to training through TTG.

* These concepts are explained in more detail in section 2.

Source: Learning and Skills Council (2010) *Train to Gain* Employer Evaluation: Sweep 5 Research Report

While the information reported in Table 1 refers to broker-led providers who had committed to training through *Train to Gain*, Table 2 presents data for provider-led employers and broker-led employers who had committed to training through *Train to Gain* via the brokerage service and had actually started training their staff at the time of interview.

These estimates may be a better measure of the additionality/deadweight of the brokerage service rather than the participation of employers in *Train to Gain* more generally. This is because not all of those employers who had committed to training through *Train to Gain*

¹⁰ The fact that almost 40% of the sample contacted via the skills brokerage service did not commit to training through *Train to Gain* may be a signal of relative inefficiency of the skills brokerage service, but does not contribute to the deadweight loss associated to training activities undertaken through TTG.

¹¹ Calculated as $47\% / (1 - 39\%) = 78\%$

via the brokerage service had actually started training their staff at the time of interview. Consequently, limiting the analysis to only those employers who had staff training at the time of interview may provide a better measure of additionality of the participation funding in *Train to Gain*. Furthermore, it seems reasonable only to include firms who were actually drawing on *Train to Gain* participation funding (i.e. those who actually had staff undertaking such training) in measuring the extent of deadweight loss associated with such funding.

When looking only at these employers who **had staff undertaking training at the time of interview**, the estimates indicate that there is **93%** additionality in broker-led training provided through *Train to Gain*, compared to an estimate of **95%** for provider-led employers. In terms of the sample of employers, approximately 88% of employers are provider-led, which implies that the overall estimate of additionality in the *Train to Gain* programme is approximately **95%**. Consequently, this analysis suggests that the estimate of deadweight at employer level from the *Train to Gain* programme is approximately **5%**, which is low in comparison to other programmes considered. Over two fifths of the additionality can be classed as 'pure' additionality, where employers accessing training through *Train to Gain* had no recent history of training in the 12 months prior to the survey.

Table 8: Summary of additionality effects associated with the Train to Gain service			
	Sweep 1 Provider-led employers	Sweep 5 Broker-led employers (Taken up TTG training)	Combined Sweep 1 Provider-led and Sweep 5 Broker-led
Base (unweighted)	3,750	1,704	5,454
Additionality effect	%	%	%
<i>Pure additionality</i>	40	29	39
<i>Quantitative additionality only</i>	7	9	7
<i>Qualitative additionality only</i>	4	5	4
<i>Both quantitative and qualitative additionality</i>	44	50	45
Total additionality	95	93	95
Substitution / Deadweight	5	7	5

Note: These estimates only include those employers who actually took up *Train to Gain* training

Source: Learning and Skills Council (2010) *Train to Gain Employer Evaluation: Sweep 5 Research Report*

However, there are potential differences in the estimate of deadweight loss and additionality depending on the level of the analysis (i.e. employer level or employee level). To assess the individual level estimates of additionality of *Train to Gain*, it would be most useful to look at learner level data. However, the evaluation of *Train to Gain* undertaken at learner level (LSC (2010)) did not address additionality specifically and we are therefore unable to translate employer level estimates of additionality from the employer evaluation into individual level estimates of additionality of *Train to Gain* for two main reasons.

The differences occurring at employer and employee level are best illustrated through an example. At employer level, a firm is classed as exhibiting quantitative additionality if **at least one** employee is being trained under *Train to Gain* who would have not been trained in the absence of the programme. For example, imagine a firm where 20 employees are being trained under *Train to Gain* but 19 of these employees would have received training anyway. Due to the existence of the employee who would have not have received training

in the absence of the programme, this firm would be classified as exhibiting quantitative additionality. In reality the majority of workers training under *Train to Gain* in this firm are deadweight because they would have been trained anyway. Although at employer level, the firm is classified as providing 100% additionality, at employee level the estimate of quantitative additionality would be equal to the proportion of workers trained under *Train to Gain* who received training that they would otherwise had not received (in this example, this corresponds to 5%).

An employer is classified as contributing to pure additionality when **all workers** training under *Train to Gain* would not have received training in the absence of the programme. However, at employer level we are unable to distinguish between firms that have trained one worker to firms that have trained 100 workers under *Train to Gain*. As such, at the employer level these firms would be treated identically, and would be classified under the pure additionality category. However, at the individual level, there would also be a distinction between firms based on the number of extra employees trained.

Despite these issues, it may be able to provide individual level estimates of additionality using other results from the Sweep 5 Employer Evaluation. In this evaluation, provider-led and broker-led employers were asked the proportion of employees who undertook a Level 2 course through *Train to Gain* would have undertaken this qualification in any case. Results from this question give us an estimate of individual level deadweight equal to 33% for provider-led employers and 12% for broker-led employers. However, some caution needs to be exercised when drawing conclusions about the number of additional employees trained when using employers as survey respondents as they were advised to provide an approximate number in their response.

In conclusion, the evidence suggests that 93-95% of employers trained more than they would have done in the absence of *Train to Gain* (either more training, or training of better quality), with around 67% of qualifications additional to that which would have occurred in the absence of the programme.

Employer Training Pilots

The Employer Training Pilots (ETP) were established in September 2002 (as a precursor to *Train to Gain*) to test the effectiveness of:

- free and subsidised training to employees without a level 2 qualification;
- wage compensation to employers for giving time off to train; and
- improved access to information, advice and guidance¹².

The pilots were administered by the Learning and Skills Council and local Business Links in different areas across the UK in two Phases. Phase 1 was established in September 2002 in Derbyshire, Essex, Wiltshire & Swindon, Birmingham & Solihull, Tyne and Wear

¹² Hillage et al (2006), Employer Training Pilots: Final Evaluation Report, Report for the Institute for Employment Studies

and Greater Manchester. In September 2003, Phase 2 pilots were undertaken in Leicestershire, Kent and Medway, East London, Berkshire, Shropshire and South Yorkshire.

Abramovsky et al (2005)¹³ compared the level of training in a selection of Phase 1 and Phase 2 pilot areas with training outcomes in selected control areas (Bedfordshire and Sussex). To estimate the impact on employers, the authors used a 'difference in differences' methodology that compared the change in training activity in the pilot areas 'before and after' the introduction of the ETP, with the equivalent 'before and after' change in the control areas, controlling for a range of other local and socioeconomic characteristics. The analysis looked at whether, over time, training provision increased to a greater extent in pilot areas than in control areas due to the ETP and thus provides an estimate of the effect of the ETP.

The estimated effects of ETP on the take-up of training among eligible employers were used to understand more about the level of deadweight and additionality. In first-wave pilot areas, the effects of ETP on all workplaces were estimated to be between 0.4 and 0.6 percentage points¹⁴, which implied that the ETP increased the percentage of eligible employers providing ETP type training by between 0.4 and 0.6. The number of employers participating in the ETP as a proportion of the estimated total eligible population in the area (the penetration rate¹⁵) was approximately 4% at the end of August 2003. Therefore, between **10%** and **15%**¹⁶ of the training represents quantitative additionality while the remaining **85-90%** represents deadweight. This level of deadweight is relatively high compared to other programmes. However, these estimates of additionality may be subject to sampling error and the true effect may lie in a broader range¹⁷. Perhaps more significantly, the validity of such an approach is highly dependent on the extent to which other local and socioeconomic characteristics can control for changes in training in the pilot and control areas. To the extent that unobserved factors are driving these changes, this will result in measurement error being introduced into the results.

The results from Abramovsky et al (2005) are included in the evaluation of the Employer Training Pilots undertaken by Hillage et al (2006)¹⁸ alongside their own findings from a

¹³ Abramovsky et al (2005) *The Impact of the Employer Training Pilots on the Take-up of Training Among Employers and Employees*, Report for the Institute for Fiscal Studies

¹⁴ Depending on whether qualification-based definition of training (involving workplaces that report employing at least one individual who was qualified below level 2) or occupation-based definition of training (involving workplaces employing at least one worker in an occupational category associated with 'low qualification' jobs) were used.

¹⁵ Penetration rate is defined as the number of participants as a proportion of the estimated total eligible population in the area.

¹⁶ $(0.4/0.04) = 10\%$; $(0.6/0.04)=15\%$

¹⁷ was estimated based on the performance of the first year of the first two waves of Pilots (in 10 areas) and compared with 'control groups' who did not have access to funding. The study found overall additionality lay between 0 per cent and 35 per cent.

¹⁸ Hillage et al (2006), *Employer Training Pilots: Final Evaluation Report*, Report for the Institute for Employment Studies

survey of employers (2005) in the Phase 2 pilots. The results show **83%** of respondents would have offered some form of training in the absence of ETP (although again we are unaware to the extent to which the privately funded training would have been comparable with the publicly funded training). Hard-to-reach organisations were less likely to have offered training without ETP (**69%**) compared to those who were not hard-to-reach (**88%**).

The authors also looked in to different types of additionality and deadweight, and estimated that 40% of the training provided could be classified as quantitative additionality (i.e. where employers said they would have trained fewer employees in the absence of ETP (see next section for a full discussion on the alternative definitions and measures of deadweight and additionality). In addition, the results indicate that approximately 20% of firm respondents would have trained employees to a lower level qualification (qualitative additionality). In contrast, over two thirds would have trained employees to the same qualification level, and 89% of employers said they would have trained the same type of employees.

Overall, the authors suggest that **29%** of the training provided by the employer participants of the Employer Training Pilots could be considered pure deadweight, since they would have trained the same number of employees and the same actual employees to the same level in the absence of the scheme.

Modern Apprenticeships

Anderson and Metcalf (2003)¹⁹ evaluate the additionality of the Modern Apprenticeship programme using the NIESR 2002 Survey of Modern Apprenticeship Employers. This study found that, on average, apprentices would have been provided with similar training in the absence of the Modern Apprenticeships programme in **48%** of cases. This represents a **48%** deadweight associated with Modern Apprenticeships and implies **52%** additionality and compares to an estimate of pure deadweight loss (i.e. substitution) of approximately **5-7%** for those employers who had taken up training through *Train to Gain* and **24%** (i.e. substitution and deadweight) for those employers who had committed to *Train to Gain* (but had not undertaken training at the time of interview).

The authors also undertook an assessment of the deadweight and additionality associated with different levels within the Modern Apprenticeship programme (i.e. Advanced Apprenticeships (AMAs) and Foundation Apprenticeships (FMAs)). It appears that there is a greater incidence of deadweight loss with the former (**53%**) compared to the latter (**44%**), supporting the view that there may be distributional issues within firms associated with the provision of training.

Apprentice Grant for Employers

The Apprentice Grant for Employers was announced in December 2009 and consisted of a grant of £2,500 to employers who established new Apprenticeships for young unemployed people aged 16 or 17. The grant was payable in two instalments: £1,500 at the start of the Apprenticeship and £1,000 after 12 weeks. There was a particular focus on small and medium sized employers that were either interested in employing an apprentice for the first

¹⁹ Anderson, T. & Metcalf, H (2003), Modern Apprenticeships Employers: Evaluation Study, for the Department for Education and Skills

time or who were taking on an additional apprentice over and above their normal intake. The programme was temporary, with a target of 5,000 apprenticeship places. Funding for the grant was provided by the Department for Work and Pensions while the National Apprenticeship Service marketed and administered the programme and the Department for Education incurred the off-site training costs. Employers paid the minimum Apprentice wage²⁰.

Using employer survey data, BMG Research²¹ found that there may have been moderate deadweight associated with the provision of the grant of around **16-21%**²². In other words, employers would have taken on these apprentices in around 16-21% of cases in the absence of the grant. In addition to this, responses from employers suggest that the grant had a significant displacement effect, with the survey evidence suggesting that 38% of employers would have taken on older apprentices if the grant had not been available²³.

However, of those who said that they would have taken on apprentices anyway (16%) in the absence of the grant, 42% had not had other apprentices, and of those who said they would have taken on older apprentices if AGE had not been available (38%), 62% had not had apprentices before. Consequently, it seems reasonable that if these employers had not been subject to the marketing efforts of the AGE programme, they may not have actually taken on apprentices. If we accept this argument, it would suggest that the deadweight figure of **16-21%** could be reduced by around half and the displacement figure of 38% could be reduced to an even greater extent. When considering all of these figures, it should be remembered that these estimates consider the deadweight associated with a specific grant supporting apprenticeship training, rather than the apprenticeship programme more generally.

Small Firm Training Loans

The main aim of the Small Firms Training Loans (SFTL) scheme is to assist small firms with the development and finance of their training plans. An evaluation of SFTL by Maton (1999)²⁴ included a survey question asking firms if training would have occurred anyway without SFTL. The author found that the minimum deadweight for Small Firm Training Loans to be approximately **35%**.

²⁰ BMG Research (2011) An evaluation of the Apprentice Grant for Employers (AGE) programme, prepared for the National Apprenticeship Service

²¹ BMG Research (2011) An evaluation of the Apprentice Grant for Employers (AGE) programme, prepared for the National Apprenticeship Service

²² Depending on how the survey question was phrased

²³ However, the true deadweight and displacement effects may have been less than these figures suggest. The AGE apprenticeships created by the grant programme were real, whereas the alternatives (which employers say they would have pursued) were hypothetical and it may be difficult to estimate the strength of this hypothetical element.

²⁴ Maton, K. (1999) *Evaluation of Small Firms Training Loans*, UK Research Partnership Ltd.

Investors in people

In some wider pieces of research not directly related to education and skills, but illustrating the existence of deadweight in other government interventions, York Consulting (2001)²⁵ reported results of a consultation with employers on the Investors in People costs and activities. The service was provided under the support of the Training and Enterprise Councils (TEC) and covered training and development activities divided across four different stages (commitment, planning, action and evaluation). Given that the accreditation in Investors in People was only achievable through the TEC route, the extent of deadweight should be measured considering whether similar actions to those implemented through the service would have taken place in the absence of public sector support and whether employers were willing to pay (or if they did pay for some services) the full rate for the TEC services. The findings showed that the Investors in People service was associated with a deadweight loss of approximately **30%** and that 70% of employers would have been unlikely to have made the equivalent improvements to their training and development activities as those achieved under Investors without the support from the TECs²⁶. Of the 30% of employers who indicate that they would have made improvements anyway, approximately 16% would have required a longer timeframe to implement these changes. In addition, 21% of employers would have implemented some but not all of the changes without the assistance of the TEC. In terms of willingness to pay for the services provided, 63% of the surveyed employers reported they would have been willing to pay for all or some of the services they received.

However, the sample of employers that were used in this survey included a large number of Investors Champions who are likely to have had a particularly positive experience of Investors in People. Therefore, the true level of deadweight may be higher than this if the sample were expanded to include less enthusiastic employers.

1.2.4 Subsidies for individuals

Education Maintenance Allowance

Turning to other policies within the education and skills arena focused on encouraging training at the individual level rather than the firm level, the Education Maintenance Allowance (EMA) is a financial scheme aimed at keeping students from low-income households in education after they reach statutory leaving age. According to a survey conducted by the Department for Education (2010), approximately **12%** of young people in receipt of EMA say they would not have participated in the education or training course had they not received this financial support. This implies a relatively high deadweight loss (approximately **88%**), which corresponds to the proportion of young people receiving EMA that believed they would have participated in the courses they were undertaking even if they had not been in receipt of EMA.

²⁵ York Consulting (2001) Research on the costs of investors in people and related activities, report for the Department for Education and Skills

²⁶ Note that the employers were asked whether they would have made the improvements that contributed to enhance business performance (arising out of the Investors process) without the support of the TEC. The sources of improvement are considered to be general (business performance etc) and specific (training and development). There is no additional information on the exact nature of either the general or specific improvements made over and above those mentioned previously.

However, Chowdry and Emmerson (IFS 2010)²⁷ note how the impact on participation is not the only outcome of EMA that matters. EMA generated other benefits such as better attendance, more time devoted to study and a transfer of resources to low-income households with children. Therefore, despite a high estimate of deadweight loss, the beneficial effect of the spending on those whose behaviour was affected by EMA offset the costs of EMA²⁸. In other words, the authors conclude that despite the observed level of deadweight loss, the benefits from the additional participation in EMA outweighed the costs of the programme (including the deadweight loss), thereby providing a justification for proceeding with the programme.

Career Development Loans

In 2001, the Department for Education and Skills undertook an evaluation of Career Development Loans (CDL). The main aim of CDLs is to help those individuals who want to undertake vocational learning but cannot afford to finance it themselves. The support takes the form of unsecured deferred repayment bank loans. Using results from a survey of applicants, Wells and Murphy (2001)²⁹ estimate that between **52%** and **55%** of Career Development Loans (CDL) were used to fund learning that would otherwise not have taken place. This implies a deadweight loss of approximately **45-48%**. These figures were calculated by asking successful applicants of CDLs a series of direct questions relating to deadweight loss, such as whether they would have gone ahead with their learning course without a CDL and how they would fund their learning in the absence of a CDL.

Individual Learning Accounts

Owens (2001)³⁰ conducted an evaluation of the Individual Learning Account (ILA), which was introduced to support adult education, through telephone interviews of over 1,000 ILA holders. The analysis found that in the absence of ILA, **44%** of account holders would have paid for their courses anyway.

The New Deal

The New Deal for Young People was designed to decrease youth unemployment by helping young people who have been unemployed for more than six months find a job and providing work experience and/or training to those who are unable to find work. Anderton et al (1999)³¹ analyse the impact of the New Deal on unemployment outflows using a general matching function approach. To estimate deadweight loss, the authors calculate the difference between the number of individuals who left the Gateway route up to November 1998 alongside estimates of additional outflows from unemployment from the results of their model. On average, the analysis implied a deadweight loss of

²⁷ <http://www.ifs.org.uk/publications/5370>

²⁸ Previous work by the IFS (Dearden et al. 2009) on EMA found that the higher wages recipients will enjoy in the future exceed the costs of providing EMA.

²⁹ Wells, C and Murphy, K (2001), *Career Development Loans: Survey of successful and unsuccessful applicants*, Diagnostics Social and Market Research

³⁰ Owens, J (2001), *Evaluation of Individual Learning Account – Early views of customers and providers: England*, York Consulting Ltd., DfES Research Report 294

³¹ Anderton et al (1999) *The New Deal for Young People: Early Findings from the Pathfinder Areas*, reports for the National Institute of Economic and Social Research

approximately **50%** (with an upper bound estimate of **71%** and a lower bound estimate of **27%**).

Quasi-experimental estimates of deadweight loss

There are a limited number of studies which have attempted to estimate deadweight loss using a quasi-experimental method. To achieve an appropriate estimation strategy of the deadweight loss associated with the provision of training vouchers to adult learners, a large primary data collection exercise was initiated in a quasi-experimental setting. Specifically, Wolter and Messer (2009)³² conducted a large scale field experiment in Switzerland in 2006 whereby vouchers for adult training were given to a sample of 2,400 randomly chosen individuals (with no restriction on the content of adult education module they could select). The authors used a control group approach to find the estimate of the deadweight loss associated with the provision of a subsidy (in the form of a voucher) to a treatment group of individuals and comparing their training choices with a suitable comparison group. The treatment group was randomly selected among those who had taken part in the Swiss Labour Force Survey in the past, while the comparison group was made of respondents of the Swiss Labour Force Survey with similar characteristics to those receiving the treatment. Neither group was aware of the experimental setting. Information was gathered through the Swiss Labour Force Survey and (for the treatment group) through additional data collected during the experiment. Redemption rates were positively associated with the value of the voucher and both gender and prior education levels were found to be significant factors affecting the redemption rates, with women and more educated individuals more likely to redeem the voucher. The main findings from the analysis highlighted that the deadweight loss associated with the programme was around **60%** on average and increased with the level of education already attained by individuals, reaching almost **90%** for people with a university education. For individuals with upper secondary schooling (academic or vocational), the estimate of deadweight loss was approximately **57%**. This compared to around **65%** for those individuals whose highest education and training attainment was upper secondary vocational and **29%** for individuals whose highest education and training was upper secondary academic. Deadweight was estimated to be approximately **38%** for individuals with a prior attainment level corresponding to that associated with the minimum school leaving age.

The discussion above illustrates that there have been relatively few estimates of deadweight loss and additionality calculated using quasi-experimental methods, due to the difficulties in establishing a robust counterfactual (i.e. an assessment of what might have happened in the absence of publicly funded training). In the literature we have reviewed, we have summarised the main findings in Table 3 overleaf.

³² Messer, D and Wolter, S. C (2009), *Money Matters – Evidence from a Large-Scale Randomized Field Experiment with Vouchers for Adult Training*, CESifo Working Paper No. 2548

Table 9: Summary of evidence of deadweight loss					
Source	Country	Programme	Method	Type of Deadweight	Estimate
Subsidies for organisations					
Train to Gain					
Learning and Skills Council (2010)	UK	Train to Gain	Employer level survey	Deadweight (brokerage service)	24%
				Deadweight (broker- and provider-led) ³³	5-7%
National Audit Office (2009)	UK	Train to Gain	Employer level survey ³⁴	Deadweight (similar training to that arranged under Train to Gain)	50%
Employer Training Pilots					
Abramovsky et al (2005)	UK	Employer Training Pilots	'Difference in differences'	Deadweight	85-90%
Hillage et al (2006),	UK	Employer Training Pilots	Surveys of 1,500 employers involved in the Phase 2 pilots	Pure deadweight	29%
				Qualitative Deadweight	66%
				Displacement/substitution	89%
				Total deadweight	83%
Modern Apprenticeships					
Anderson and Metcalf (2003)	UK	Modern Apprenticeship programme	Telephone survey of 1,500 Modern Apprenticeship employers	Deadweight (on average)	48%
				Deadweight AMAs	53%
				Deadweight FMAs	44%
Apprentice Grant for Employers					
BMG Research (2011)	UK	Apprentice Grant for Employers	504 grant-assisted employers were interviewed by telephone	Deadweight	16-21%
				Displacement	38%
Small Firm Training Loans					
Maton, K. (1999)	UK	Small Firm Training Loans	Survey	Minimum deadweight	35%
Investors in People					
York Consulting (2001)	UK	Investors in People	14 case studies with TECs and 57 consultations with employers	Pure deadweight	30%
				Partial deadweight ³⁵	21%
Subsidies for individuals					

³³ Looking only at employers who had staff training through Train to Gain at time of interview

³⁴ Learning and Skills Council (June 2009), *Train to Gain Employer Evaluation: Sweep 4 Research Report*

³⁵ Partial = implemented some but not all of the changes without the assistance of the TEC

Table 9: Summary of evidence of deadweight loss					
Source	Country	Programme	Method	Type of Deadweight	Estimate
Education Maintenance Allowance					
Department for Education (2010)	UK	Education Maintenance Allowance	Survey of 2,029 young people who completed Year 11 in 2008 or 2009	Pure deadweight	88%
Career Development Loans					
Wells, C and Murphy, K (2001)	UK	Career Development Loans	Survey of 676 successful applicants of Career Development Loans	Deadweight	Approx. 45-48%
Individual Learning Account					
Owens, J (2001)	UK	Individual Learning account	Interviews of 1,150 ILA holders.	Deadweight	44%
The New Deal for Young People					
Anderton et. al (2009),	UK	New Deal for Young People	Using estimates of additional outflows (from the authors model) and the number of individuals who left Gateway and the claimant count	Deadweight	Approx. 50% (27% - 71%)
Quasi-experimental estimates of deadweight loss					
Messer and Wolter (2009)	Swiss	Vouchers for adult training	Sample of 2,400 randomly chosen individuals.	Average Deadweight	Approx. 60%
				<i>Compulsory education only</i>	38%
				<i>Secondary school academic qualification</i>	29%
				<i>Secondary school vocational training</i>	65%
<i>University education</i>	91%				

Source: London Economics' analysis

1.3 Analysis of training trends using the Labour Force Survey

In this section we present time trends of training and education related activities at individual level using data from the Labour Force Survey (LFS) between 1993 and 2009. Even if the structure of the LFS does not allow any robust estimates of deadweight loss or additionality per se, an analysis of the trends of training related variables over time could provide useful insights on the extent to which different public policies introduced in the period considered have had an impact on training activities over time.

Specifically, the charts in the following pages present the trend over time for the following series:

- Apprenticeships³⁶;
- Government funded training schemes³⁷;
- Job related training undertaken in the last four weeks, in aggregate and divided in job related training for the employed and job related training for the unemployed³⁸; and
- Training disaggregated by the source of funding³⁹.

It should be noted that LFS data are collected quarterly and therefore in the following charts data are presented by quarter. However, quarterly data (represented by dots) may show a high degree of variability due to seasonal patterns and we decided to introduce a polynomial approximation of the quarterly series (represented by a continuous line). All data are grossed up to represent national estimates (for England only). For the relevant series we also present the time trends of the indicator as a proportion of total population of working age.

Figure 3 and Figure 4 provide detail on the time trend for the take up of apprenticeships between 1984 and 2009, along with some of the more recent policy changes. Data are presented at both aggregate level and disaggregated by relevant age bands⁴⁰. Figure 3 illustrates the significant decline in apprenticeship take up between 1984 and 1994 that coincided with the removal of government and levy funding (which may indicate that

³⁶ variables *appren*, *appr04* and *appr08* in the LFS

³⁷ variables *scheme*, *sch98a* *sch98b* *schm99* *schm04* *schm08* in the LFS

³⁸ Using variables *ed4wk* and *futur4*. From the LFS User Guide (vol. 3): variable *ed4wk* “applies to all respondents aged 16-69 who are in employment or in receipt of education/training and who have taken part in job-related education/training in the 3 months prior to the reference week”. Variable *futur4* “applies to all men 16-64 and all women 16-59 who are not at school to whom *ed4wk* does not apply. This variable refers to education or training connected with a job which the respondent might be able to do in the future”.

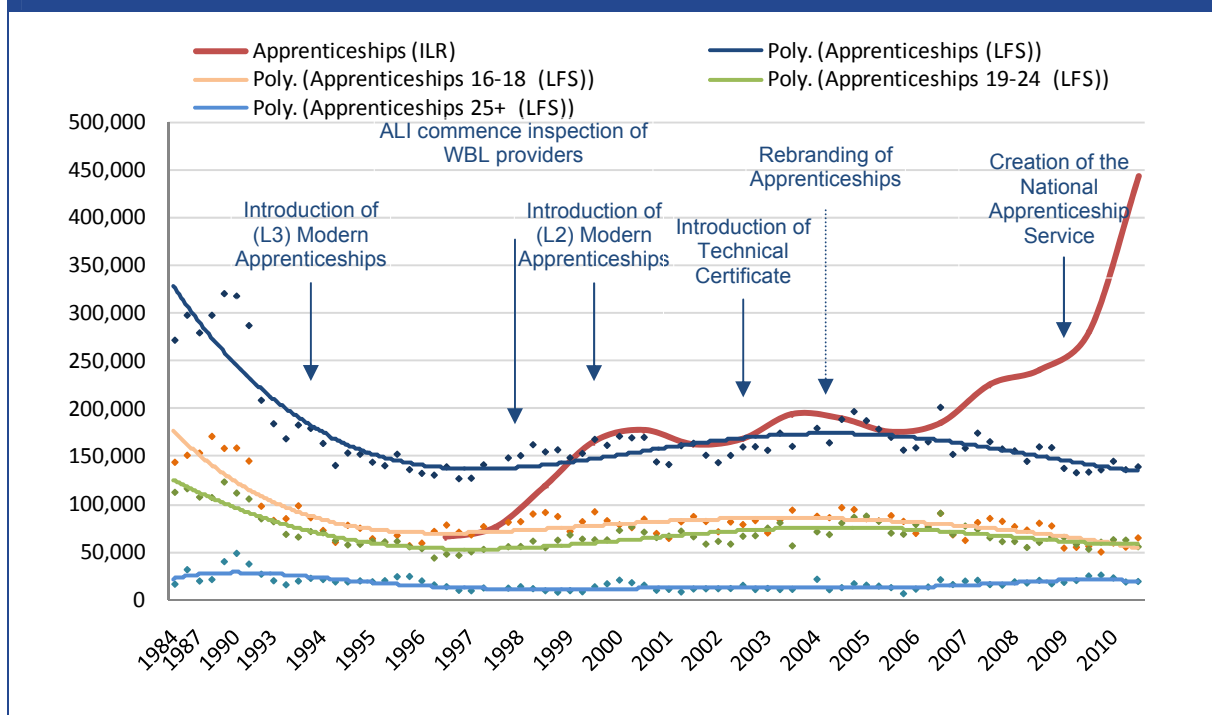
³⁹ Using variables *trnfee0* and *trnfee1*. Note that the variables on training funding are collected on selected quarters only and are currently available in the standard edition of the LFS between 1993 and 1996, then one quarter in 1998 and one quarter in the years between 2006 and 2008.

⁴⁰ Figure 6 only as apprenticeships are subject to different funding regimes according to age

apprenticeship provision is associated with a relatively low level of deadweight loss). The time trend also seems to reflect the changes in the apprenticeships policy introduced since 1995, with the number of apprenticeships being undertaken increasing after 1996. After a peak in 2005, based on information from the Labour Force Survey, the number of apprenticeships being undertaken has apparently declined in recent years. The pattern for apprenticeships undertaken by 16-18 and 19-24 year olds are roughly similar and in line with the overall figure, while the trend for 25+ apprenticeships (which in general are not government funded and represented by the lowest line) seems to be flatter and illustrating an opposite trend. In particular, the number of apprenticeships undertaken by those aged 25+ appears to be slightly declining (with exceptions) between 1996 and 2005 and increasing in more recent years.

Note that there is some degree of uncertainty in relation to the information regarding apprenticeships using the Labour Force Survey. In particular, although the recent trend appears to be downward, using information from the Individualised Learner Record (which covers only publicly-funded apprenticeships), the opposite trend emerges. Presented as bold red line in Figure 3, the total number of apprenticeship starts appears to have increased substantially in recent years, with the number of starts in the 2011/12 academic year standing at approximately 442,000 compared to approximately 279,900 in the academic year 2009/10 (with the largest recent increase in starts occurring amongst those aged 25+). This significant upward trend in the popularity of publicly funded apprenticeships displayed in the ILR has coincided with the substantial increase in government funding for apprenticeships and the creation of the National Apprenticeship Service and may again indicate that extent of deadweight loss associated with apprenticeships is relatively low.

Figure 6: Apprenticeships – time trend 1984-2010

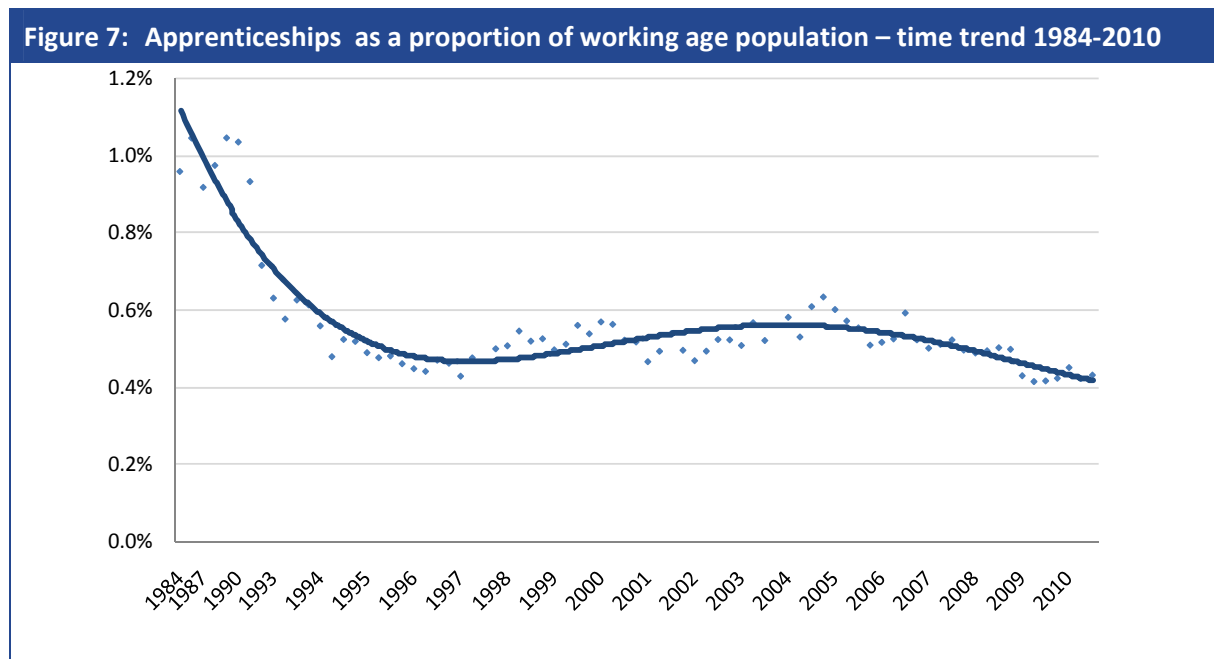


Note: Variables used: appren, appr04, appr08. Dots represent actual values; continuous lines represent the nth order polynomial approximation of the series. Information not available in 1997 Q4 and 2004 Q1. Data refer to Q2 only for all years pre-1993.

Source: London Economics using 1993-2009 Labour Force Survey data

The mismatch between the different data sources is a cause for concern, as there is no fundamental reason why there should be such a significant divergence between the two measures; however, it does appear to be the case that a large proportion of individuals undertaking apprenticeship qualifications are not aware of the fact, which may result in a reduction in the estimate of apprenticeship training generated from self-reported surveys (such as the Labour Force Survey). Specifically, there is some evidence to suggest that the issue of recollection amongst apprentices is much lower than for employers, and for instance, research from the 2007 Apprenticeship Pay Survey has suggested that as many as 87% of apprentices in the Retail sector (i.e. a sector not traditionally covered by apprenticeship training) were unaware of the fact that they are enrolled in apprenticeship qualifications⁴¹.

In Figure 4, using the Labour Force Survey, we have also presented the number of apprentices as a proportion of the total working age population. The information suggests that following the trend in absolute number, there was an initial decline in the proportion of individuals in receipt of apprenticeship training, followed by an increase to 2005, with a subsequent decline from 2006 onwards.



Note: Variables used: appren, appr04, appr08. Actual values. Working age population: 16-64. Information is not available in 1997Q4 and 2004Q1. Data refer to Q2 only for all years pre-1993.

Source: London Economics using 1993-2009 Labour Force Survey data

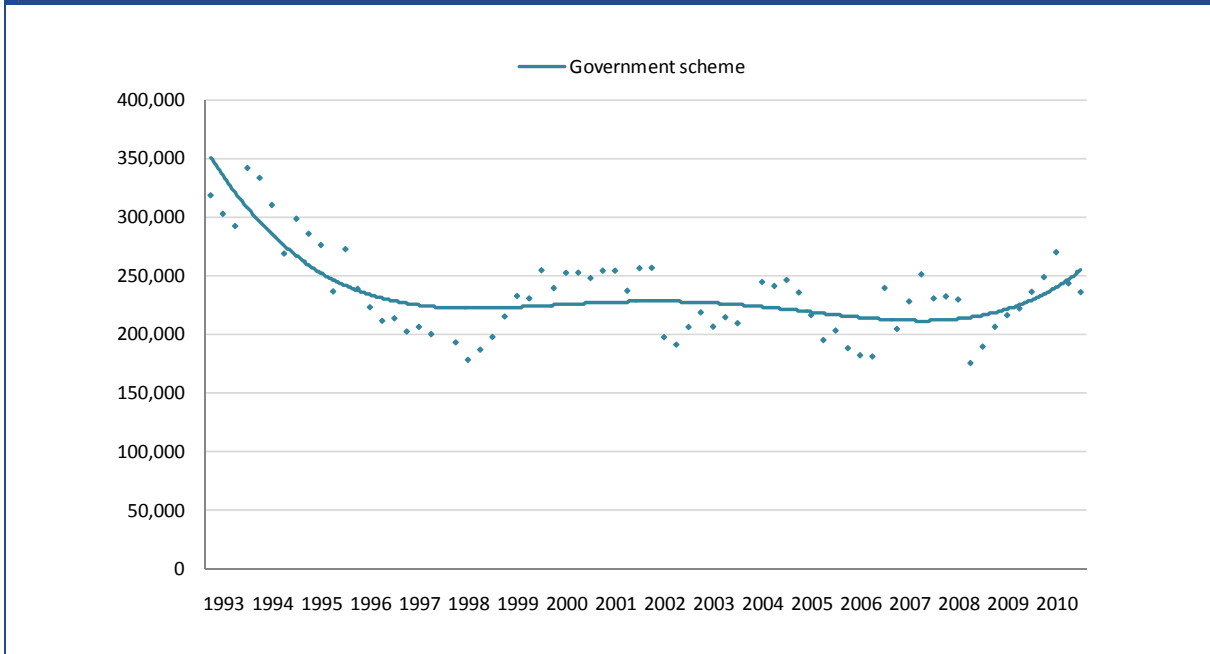
Figure 5 and Figure 6 present the trend over time for the number of individuals undertaking government funded training schemes (using the Labour Force Survey). After an initial steep decline between 1993 and 1998, the two series seem to have followed a cyclical pattern during the years, with peaks in 2000/2001, 2004 and in 2007/2008 and declines in intervening years. Between 1998 and 2008, the number of individuals on government

⁴¹ Eligibility was checked at the start of the interview to understand whether respondents were eligible for further questioning as follows: "First of all, can I just check are you currently working as an apprentice?". Just over a third (35 per cent) of people contacted said 'no' even though their record with the LSC suggested otherwise. Eligibility varied considerably by industry sector from 13 per cent in Retailing to 70 per cent in Electro-technical

http://www.bis.gov.uk/assets/biscore/corporate/migratedD/publications/D/DIUS_RR_08_05

funded training schemes has ranged between 190,000 and 250,000 corresponding to between 0.6% and 0.9% of the working age population. Since 2008, there has been a gradual increase in both the number of individuals undertaking government funded training schemes (as well as the proportion of working age individuals).

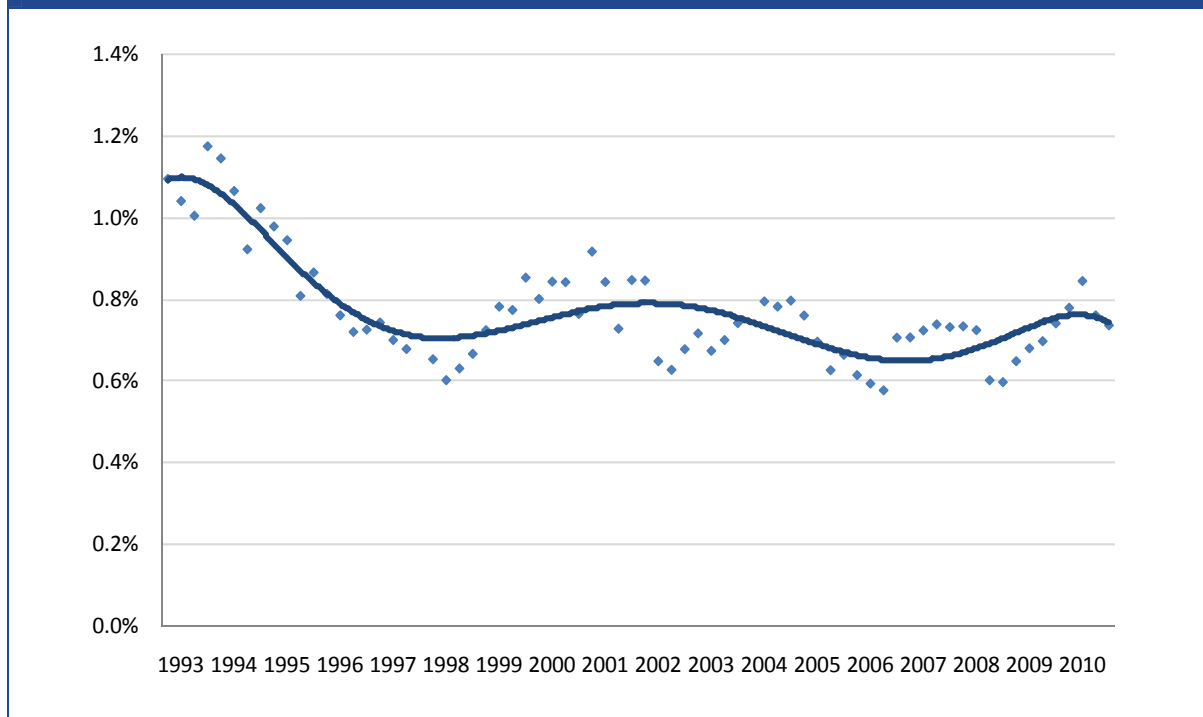
Figure 8: Government funded training schemes – time trend 1993-2010



Note: Variables used: scheme, sch98a sch98b schm99 schm04 schm08. Dots represent actual values; continuous lines represent the 4th order polynomial approximation of the series. Information not available in 1997Q4 and 2004Q1.

Source: London Economics using 1993-2009 Labour Force Survey data

Figure 9: Government funded training schemes as a proportion of working age population – time trend 1993-2010

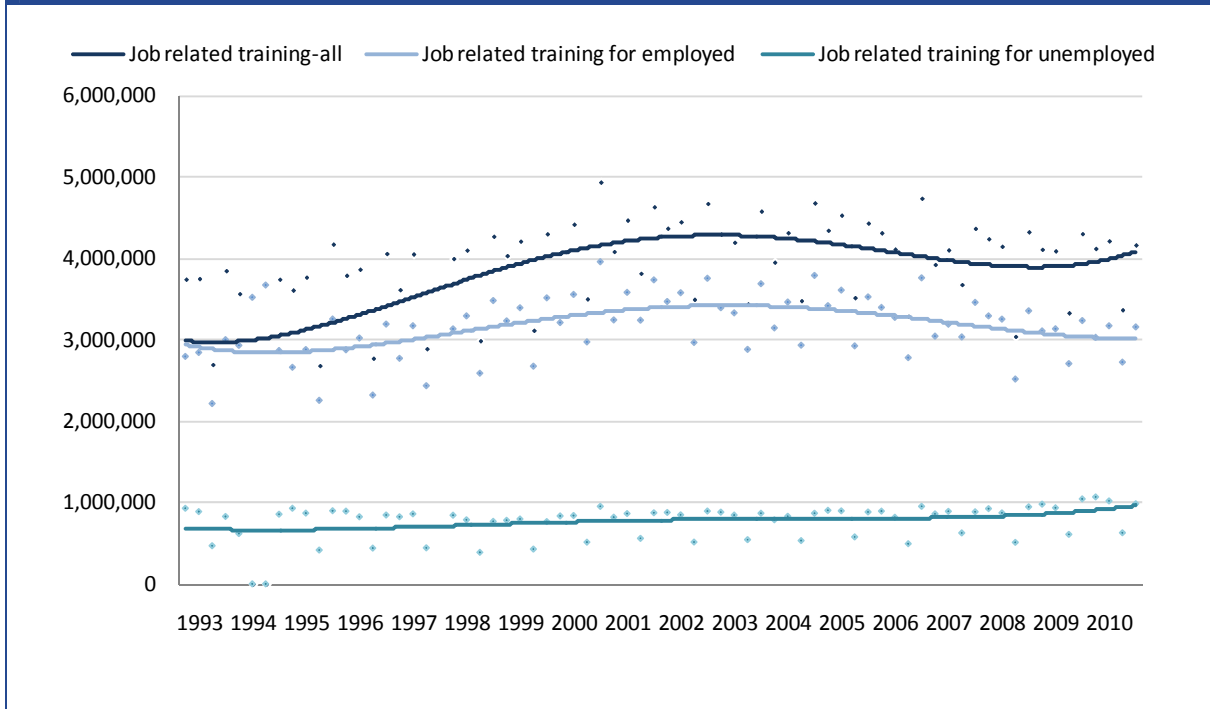


Note: Variables used: scheme, sch98a sch98b schm99 schm04 schm08. Actual values. Working age population: 16-64. Information not available in 1997 Q4 and 2004 Q1.

Source: London Economics using 1993-2009 Labour Force Survey data

In Figure 7, we present the trend for job-related training (overall and further divided into training for the employed and unemployed). The seasonal pattern is particularly strong for these series⁴². Overall the total number of individuals undertaking job related training has increased from less than 3 million in 1994 and remained above 4 million since 2000. This corresponds to around 12-13% of the working age population. The number of working age individuals in receipt of training has shown an upward trend between 1993 and 2003, with a slight decline after 2005 compared to the peak values. While the trend has been driven by job related training for the employed, which is now undertaken by more than 3 million individuals, the number of individuals undertaking job related training for the unemployed has shown a recent upward trend, and exceeded 1 million individuals in the final quarter of 2009 (for the first time over the entire period).

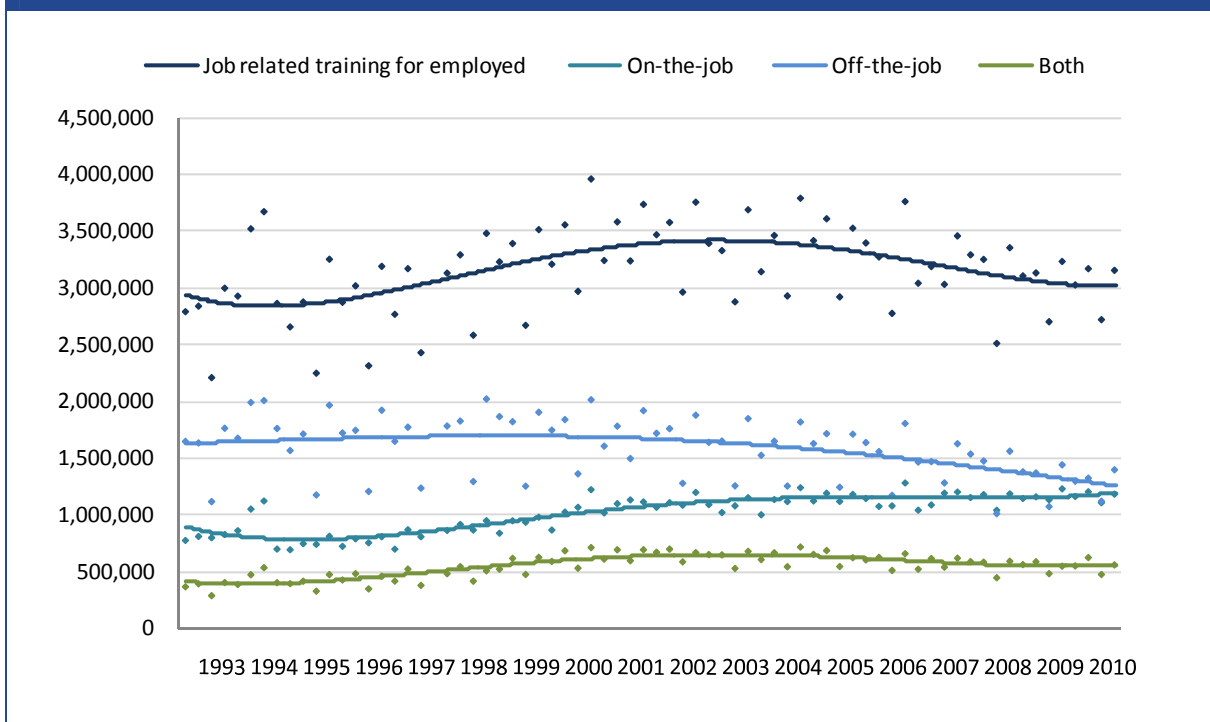
⁴² The third quarter (corresponding to the summer months from July to September) consistently lower than the other quarters

Figure 10: Job related training - time trend 1993-2010

Note: Variables used: ed4wk, futur4. Dots represent actual values; continuous lines represent the 4th order polynomial approximation of the series. Information not available in 1994Q2, 1994Q3 and 1997Q4.

Source: London Economics using 1993-2009 Labour Force Survey data

Job related training for the employed can be of three forms: on-the-job training, off-the-job training or a combination of the two. In Figure 8, we describe the trends for the different job related training activities. Traditionally, while off-the-job training has been the main component over the period, accounting for at least one half of total job related training, it has steadily declined since 2002. Conversely, the number of individuals undertaking on-the-job training has consistently increased over the years, and the gap between the two series has narrowed, reaching a minimum at the end of 2009. The information from the Labour Force Survey is again a little surprising as we would have expected an increase in both on-the-job and off-the-job training following the introduction of programmes such as *Train to Gain*; however, the decline in off-the-job training may simply be as a result of some employee reporting error in relation to the exact location of the job related training received.

Figure 11: Job related training for employed - time trend 1993-2009

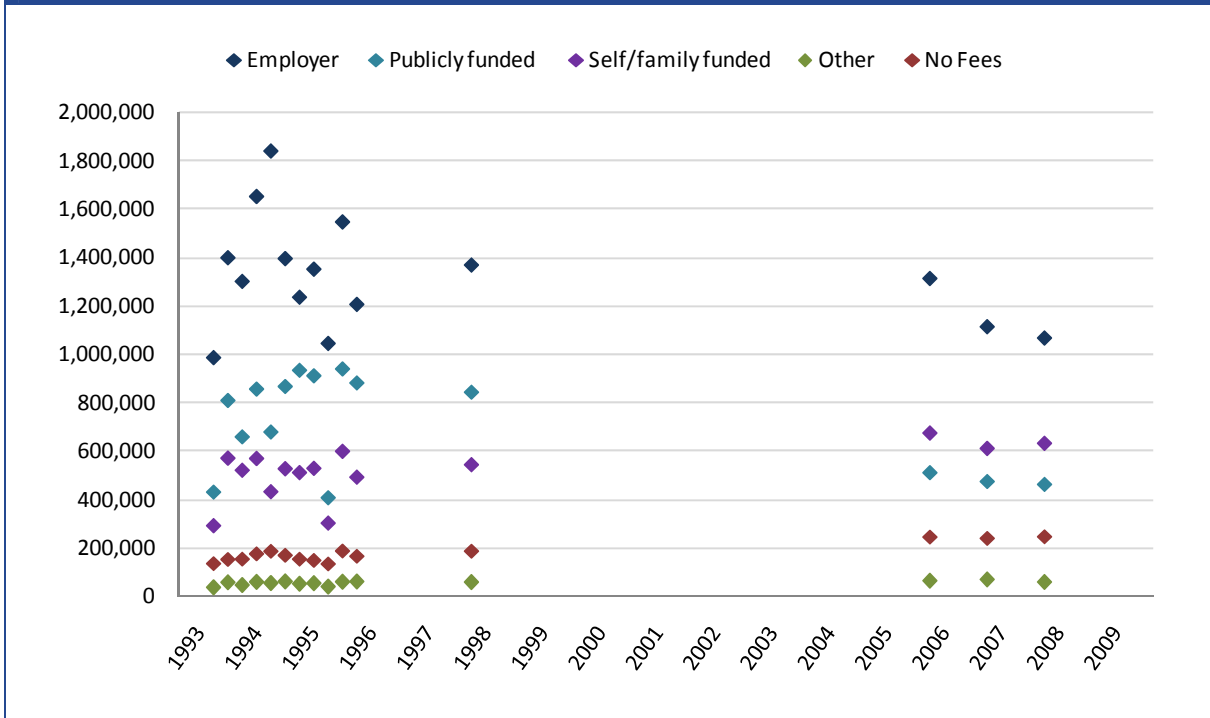
Note: Variables used: ed4wk, jobtrn. Dots represent actual values; continuous lines represent the 4th order polynomial approximation of the series. Information not available in 1997Q4.

Source: London Economics using 1993-2009 Labour Force Survey data

Finally, Figure 9 presents data on training funding sources. However, data is collected in selected quarters only and, more importantly, is missing for all years after 1998 apart from the first quarters of 2006, 2007 and 2008. Looking at these last three quarters, we can see that employer sponsored training may have declined over the period; however, still accounts for the majority of training being undertaken (around 1.2 million). The number of individuals using own or family funds to cover training fees stands at around 600,000, while the number of individuals receiving publicly funded training is between 450,000 and 500,000.

The LFS data relating to the source of training funding is clearly inadequate and the 'results' presented above should be treated with caution. In reality, there may be no trend in the data but it is impossible to say given the number of years of data missing from the analysis.

Figure 12: Source of training funding - time trend 1993-2009



Note: Variables used: trnfee. Markers represent actual values. Information not available in all other quarters.
Source: London Economics using 1993-2009 Labour Force Survey data

2 Conceptual Framework

In economic terms, deadweight loss is a reduction in net economic benefits resulting from an inefficient allocation of resources. In the context of government schemes such as those used in Further Education and training, 'deadweight' is the term applied to the extent to which identified outcomes would have been achieved anyway, in the absence of the government intervention. However, the concept of deadweight loss (and the corollary definition of 'additionality') is not entirely straightforward and it is necessary to define the concepts of deadweight and additionality along a spectrum ranging from 'pure' deadweight loss at one end and 'pure' additionality at the other (with a number of different grades or levels of deadweight and additionality in between). This is presented in Figure 10. First, we consider a few issues relating to the evidence for potential government intervention below.

Economic rationale for policy intervention

It is important to note that the analysis presented here solely refers to the concepts of **deadweight loss** and **additionality**, and not the **economic value** generated by the provision of education and training. In other words, although it may be the case that a government training intervention is associated with a degree of deadweight loss (and as presented in Section 1, all interventions will have some degree of deadweight loss), the economic benefits generated by the training to the individual and the Exchequer may be great enough to still warrant that intervention. As such, it may be optimal for the government to invest in the training programme associated with relatively high deadweight rather than an intervention that produces significantly lower economic benefits but with more limited deadweight loss associated with it. In other words, the existence of deadweight per se is an insufficient reason for government intervention not to take place.

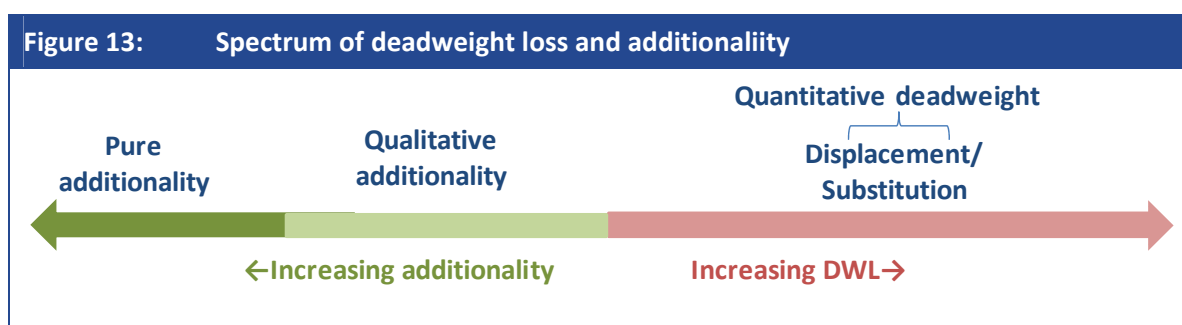
Secondly, in the absence of government intervention, the provision of privately funded training may suffer from distributional issues. There is some evidence to indicate that it is individuals already in possession of relatively high levels of qualifications that are more likely to receive further employer funded education and training, with those in possession of lower level or no formally recognised qualifications more likely to be overlooked (Dearden (1998)⁴³). Following the introduction of a government subsidised programme aimed at those with low or no qualifications, employers may reorganise their training profile (away from those with intermediate level qualifications to those with lower levels). As such, there may be some deadweight incurred, but despite this, the policy intervention may result in significant aggregate economic value across the skills spectrum (which would justify the policy intervention).

In addition, there is substantial evidence of the existence of positive externalities associated with the investment in education and training (Galindo Rueda and Haskel (2005)⁴⁴, Battu et al (2003)⁴⁵, Metcalfe and Sloane (2007)⁴⁶). Externalities relate to the

⁴³ Dearden, L. (1998), 'Ability, families, education and earnings in Britain', Institute for Fiscal Studies, Working Paper no. 98/14,

⁴⁴ Galindo-Rueda, F. and Haskel, J. (2005). 'Skills, Workforce Characteristics and Firm-level Productivity: Evidence from the Matched ABI/Employer Skills Survey', *SSRN eLibrary*

situation where the enhanced training provided to one worker increases not just their own productivity, but also potentially raises the productivity levels of co-workers through workers' interactions (such as imitation, learning-by-doing, social pressure or leading-by-example). In the absence of the government intervention, where labour can freely move between firms, there is an incentive for firms to under-invest in education and training for their workforce. As such, the government can play a role in moving the economy to a higher skills level and capturing these external effects.



Source: London Economics

Definitions of deadweight and additionality

Returning to the definition of the various elements of deadweight and additionality from a firm level perspective, at one end of the spectrum, there is **pure additionality** or **quantitative additionality**, which refers to the training received by individuals that would not otherwise have received any training.

At the other end of the spectrum, **displacement** occurs when the *same workers* that would have gained some comparable form of training receive the publicly funded training instead (at no **net** economic gain). **Substitution** occurs when there is a change in the profile of the employees that receive the training. Some workers that would have received privately funded training no longer receive any training and are replaced by different workers on the publicly funded programmes (who would not have received any training otherwise). In the case of quantitative deadweight loss, although there is an increase in skills for some individuals, in aggregate, there is no net increase in the level of skills acquisition (although there may still be a rationale for government intervention in these circumstances). We define the total crowding-out effect of privately funded training (**displacement** plus **substitution**) as **quantitative deadweight loss**.

In between these extremes, but still delivering additional value, there is **qualitative additionality** and **qualitative deadweight loss**, where public and private training are not perfectly substitutable. In this case, publicly funded training might move an individual to a higher level of attainment or result in an employer providing better quality training than would otherwise be the case (**qualitative additionality**), although the original training that is replaced is considered **qualitative deadweight loss**.

⁴⁵ Battu, H., Belfield, C.R. and Sloane, Peter J. (2003). 'Human Capital Spillovers within the Workplace: Evidence for Great Britain', *Oxford Bulletin of Economics and Statistics*, 65(5), p.575-594.

⁴⁶ Metcalfe, R. and Sloane, Peter James (2007). *Human Capital Spillovers and Economic Performance in the Workplace in 2004: Some British Evidence*, Institute for the Study of Labor (IZA).

Note that qualitative additionality occurs under a number of circumstances. For instance, it might be the case that the individual receives more training (either in terms of the volume of training or the level of training (i.e. the nominal qualification level)); however, it may also be the case that individuals receive training that is nominally at the same level as that training that may have been undertaken in the absence of publicly funded training but incorporates the basic level of training, as well as a number of other elements of training at the same level. A particular example would be the acquisition of an Intermediate apprenticeship comprising a NVQ Level 2, a technical certificate comprising a theoretical grounding, and a Key Skills element (numeracy and literacy) compared to a stand-alone NVQ Level 2. Clearly, given the fact that both a Foundation apprenticeship and a NVQ Level 2 are both considered to be Level 2 qualifications within the National Qualification Framework, the acquisition of a Foundation apprenticeship involving these additional elements would result in a significant degree of qualitative additionality (that may be difficult to identify from firm level data). The various elements are presented in Figure 11.

Figure 14: Component definitions of deadweight loss and additionality from a firm perspective

	Element	Description	Deadweight Loss	Effect on Skills
	Accreditation	Simple skills accreditation	Pure deadweight loss	No increase in skills
Quantitative Deadweight Loss	Displacement	The same (or equivalent) training would have occurred anyway in the absence of government funding. The same employees would have been trained	Crowding-out effect, quantitative deadweight loss	Increase in skills occurring but no additionality (equivalent training at firm level would have occurred anyway).
	Substitution	The same (or equivalent) training would have occurred anyway in the absence of government funding, but different employees would have been involved	Crowding-out effect, contributing to quantitative deadweight loss.	Increase in skills occurring but no additionality (equivalent training at firm-level would have occurred anyway).
	Qualitative Additionality	The employee receives better quality training compared to what would have happened without government funding	Partial additionality, some training would have happened anyway.	Additional increase in skills is taking place, but that is only partial
	Quantitative Additionality	A higher number/proportion of employees received training thanks to government funding.	The increase in the number/proportion of employees receiving training is pure additionality.	Additional increase in skills is taking place.

Source: London Economics

In parallel to these concepts, there is **certification** or **accreditation** where individuals already have the skills/competencies, but simply accredit or certify these skills. It is important to note that the accreditation and certification of existing skills can still be economically valuable even if it does not enhance human capital by increasing the level of skills in the economy. In particular, it might be the case that the introduction of government subsidised training within a rigorous qualification framework can provide workers with identifiable and portable qualifications better reflecting their skills. Increasing the

transparency of skills and qualification acquisition can reduce the costs and uncertainty associated with hiring decisions, resulting in lower costs for employers in the future⁴⁷.

In a practical sense, how might the conceptual framework operate? There are two levels to consider: the firm level and the individual level. The reason for the distinction is that the various elements of deadweight loss and additionality that may occur at individual level may not necessarily occur (or be identifiable) when considering the problem at firm level (as discussed in Section 1). In Figure 12 we present a list of possible cases following the introduction of public funding. The list is not exhaustive and does not consider cases when the same (positive) level of privately funded training takes place before and after the introduction of the subsidy.

Figure 15: Application of conceptual framework

Suppose Firm 1 has two employees, A and B (with similar characteristics and starting training with no formally recognised qualifications). There are only two qualifications – Level 1 and Level 2 (L1 and L2) - with L2 implying better quality learning (either higher level learning or including additional modules of learning compared to L1

Case	No Public Funding	Public Funding	Effect on skills
Quantitative DWL (displacement)	Employee A is trained at L2 No training for B	Employee A is trained at L2 No training for B	A L2 L2 B L0 L0
Quantitative DWL (substitution)	Employee A is trained at L2 No training for B	No training for A Employee B is trained at L2	A L2 L0 B L0 L2
Qualitative additionality	Employee A is trained at L1 No training for B	Employee A is trained at L2 No training for B	A L1 L2 B L0 L0
Qualitative additionality*	Employee A is trained at L1 No training for B	No training for A Employee B is trained at L2	A L1 L0 B L0 L2
DWL+Additionality	Employee A is trained at L2 No training for B	Employee A is trained at L2 Employee B is trained at L2	A L2 L2 B L0 L2
Pure additionality	No training for A No training for B	Employee A is trained at L2 Employee B is trained at L2	A L0 L2 B L0 L2

Key to relevant symbols

- Additional increase in skills is taking place (2 levels)
- Additional increase in skills is taking place (1 level)
- No increase in skills, and no public funding involved
- No increase in skills, and private funding is substituted with public funding
- Negative effect on skills (1 level)
- Negative effect on skills (2 levels)

Source: London Economics

⁴⁷ See Conlon (2001) for a discussion of the role of employer uncertainty as a possible explanation for the difference in earnings between the academically and vocationally trained.

In particular, consider one example of **qualitative additionality*** (fourth row), which occurs when there is a change in the profile of the employees that receive publicly funded training and the level of training received, compared to what might have happened in the absence of publicly funded training. In this example, worker A now receives no training and worker B receives training at Level 2. At individual level, we see both substitution (for worker A equivalent to one skills level) and qualitative additionality (worker B equivalent to one skill level). However, at firm level, we only see qualitative additionality (equivalent to one skill level) and this identical outcome might be identified in other training circumstances (i.e. row 3), where the same employee (A) receives additional training with no change in circumstances for worker B. In both cases, the aggregate level of training has increased by one level, although the training received by individual workers is very different. In other words, multiple combinations of employee level training outcomes will not be identified uniquely at firm level (i.e. the same outcome at firm level will be recorded) and therefore the extent to which deadweight or additionality might be estimated depends on the level at which the analysis takes place.

2.1 General firm level measurement and data issues

Two main issues undermine the possibility of assessing the extent of additionality generated through the provision of publicly funded training. These are:

- How to identify the counterfactual; and
- The availability of detailed information on training decisions

2.1.1 Understanding the counterfactual

At each point in time we are unable to observe the same firm having access and not having access to publicly funded training and the firm's subsequent training decisions in the two different states of the world. We therefore need to identify a suitable counterfactual in the absence of a randomised experiment (where similar firms access/do not access public funding and the relevant outcomes are compared). The *overall* population of firms not engaging in publicly funded training might not be a good counterfactual (as there may be some firm level unobservable characteristics that limit the comparability of the two groups). Therefore, to apply the conceptual framework at even the most basic level, we need to identify comparison firms that are similar to those treated, but who do not access publicly funded training. In general this is undertaken through a **Propensity Score Matching** method.

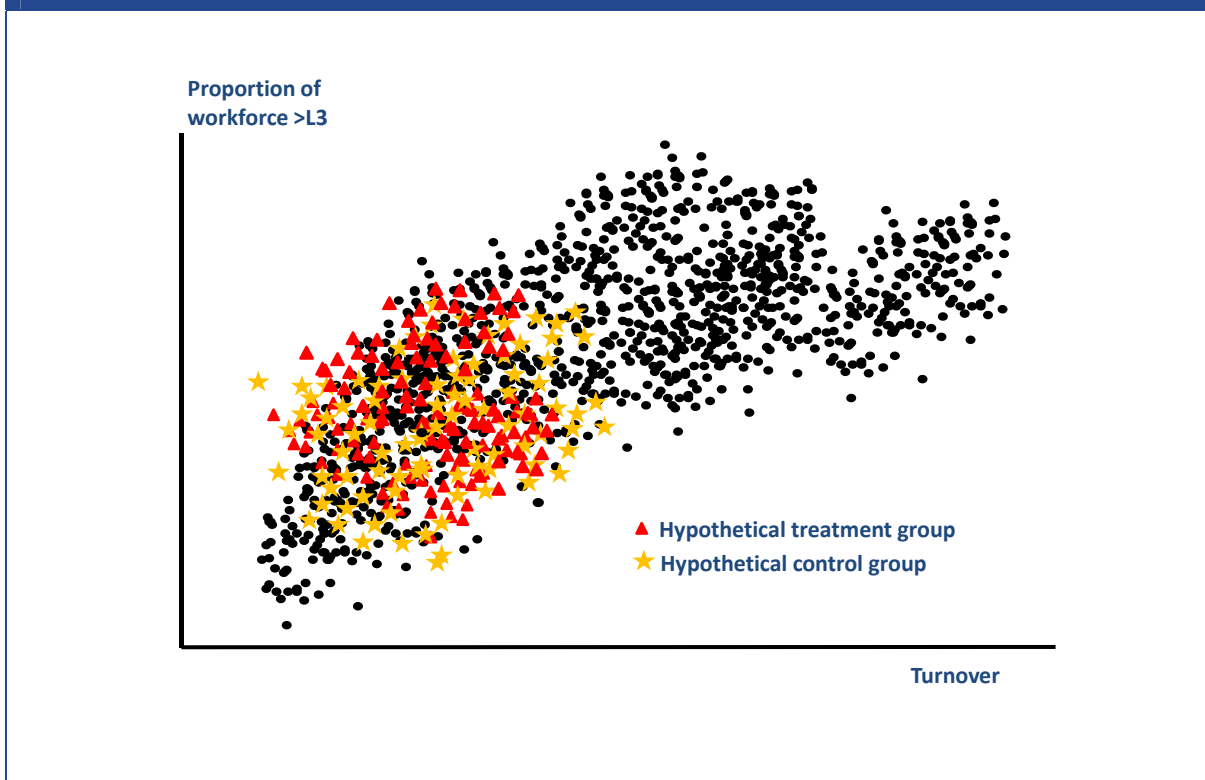
2.1.2 Propensity Score Matching

As previously mentioned, the key research requirement in this analysis is to robustly assess the deadweight loss associated with publicly funded training by considering what might have happened in the absence of a particular skills and training funding stream, controlling for all other factors. The sample of firms that may engage in publicly funded training (whether in a workplace or College based setting) may not be representative of all firms given the fact that selection may have taken place (at least) on the basis of some other factors (such as the size of the firm, the sector of the firm within the economy, or the current occupational or qualification structure within the firm).

Therefore, there is little point in comparing those firms that availed in publicly funded training (represented with red triangles in Figure 13) with all other firms (represented with black circles), as it is clear that there may be other factors that are driving training take-up at any point in time. It might be found that those firms engaging in work based training (for instance) are associated with lower than average turnover; however, this might be as a result of entirely different factors that might be affecting these firms simultaneously. To ensure a proper comparison, it is essential to determine the primary characteristics of those firms in receipt of the publicly funded training and create a comparison group based on those same observable characteristics at firm level (represented by gold stars in Figure 13).

It is crucial to note that a Propensity Score Matching approach on the available firm level characteristics may omit a number of potential unobserved firm level characteristics that influence firms' training habits. For example, the variables included may not necessarily cover all the dimensions of management quality and style, which may influence training policy within the firm. The potential limitation of the propensity score matching approach needs to be remembered throughout the remainder of the report.

Figure 16: Representation of propensity score matching



Source: London Economics

In this sub-section, we address the nature of the information required to estimate the different concepts of deadweight loss and additionality.

2.1.3 Availability of detailed information on firm level characteristics

Given the first stage of the analysis involves undertaking a Propensity Score Matching model, it is crucial to be able to adequately control for as many differences between the treatment and control firms that might drive the decision to participate in publicly funded

training and the level of training provided. In addition to various observable firm level characteristics⁴⁸, one important issue in this respect relates to the general skills profile of the firm. The reason for this is because the current level or distribution of skills within firms (and the specific 'location' of skills gaps within the organisational structure⁴⁹) may drive the decision to engage in training. For instance, it may be the case that firms with low existing levels of skills (i.e. a high volume producer with low product sophistication) may be inherently more likely to engage in government funded training at Level 2 compared to a firm where the majority of workers are already qualified at undergraduate degree level. In addition, it may also be the case that the funding is available only to employees in firms within a particular age-band or with an existing level of skills. An example of this funding eligibility restriction in relation to apprenticeships and *Train to Gain* is presented in Figure 14.

Figure 17: Eligibility criteria for alternative government funded training initiatives

Funding stream	Level/Type	Age	Funding Mechanism
Apprenticeships	L2,L3,L4	16-18	100% of the training costs publicly funded
Apprenticeships	L2,L3,L4	19-24	50% of the training costs publicly funded
Apprenticeships	L2,L3,L4	25+	Only specified cases are publicly funded
Train to Gain	L2 Literacy and Numeracy	Any	100% of the training costs publicly funded
Train to Gain	NVQ 2	Any	100% of the training costs publicly funded
Train to Gain	NVQ3&NVQ4	All	Co-funded
Train to Gain	NVQ3	19-25	100% of the training costs publicly funded

Source: London Economics

Therefore, some proxy of the firm's skills profile is required, such as the occupational structure of the firm (proportion of professionals/ associated professionals, semi-skilled, skilled manual etc), alongside some imputed assessment of the level of skills or qualifications associated with the various occupations (if actual skills profiles are unavailable).

It is also important to understand the economic or skills circumstances the firm faces. Specifically, to compare like with like, we also need information on the extent to which the treatment and control firms face skills shortages (for instance). In other words, rather than just controlling for firm level characteristics, we also need to control in some way for firm level conditions that are faced across treatment and counterfactual firms.

⁴⁸ Such as number of employees, turnover, profitability, single site/multisite, SIC Code, Public/Private/NFP, Ownership structure and region of incorporation (postcode).

⁴⁹ In general, this level of detail in relation to the skills profile of firms is unavailable.

2.1.4 Availability of detailed information on training intervention

The second piece of information that is required to undertake a detailed assessment of deadweight loss and additionality relates to the source of funding associated with each episode of training or each learning aim. The existence of this information improves the degree to which qualitative deadweight loss and additionality may be estimated. Using information on the source of funding as a pre-requisite, a Propensity Score Matching approach can be adapted repeatedly to assess the extent of deadweight loss and additionality depending on the mode of training (i.e. work-based learning or College based learning) or any other training characteristic that might be of interest.

2.1.5 Availability of detailed information on training decisions

Clearly, the better the quality and comprehensiveness of data available, the more precise the estimates of deadweight loss and additionality might be achievable. Apart from the numerous gradations of deadweight loss and additionality, given the previous discussion relating to the potential identification issues depending on whether we consider deadweight and additionality at a firm level or an individual level, the most valuable type of data source consists of matched **firm level** and **employee level data**. It is only with matched firm-employee level data that complete estimates of quantitative deadweight (i.e. including **displacement/ substitutability**) might be achieved. In practice, there is no matched employer/employee datasets currently available that would allow us to undertake this form of analysis. As such, we are unable to observe which employees are receiving which training, but only aggregate measures at firm level of the number of employees trained and the characteristics of training. We are therefore unable to assess the extent to which training is additional at individual level. The majority of the information that is available for the estimation of deadweight loss and additionality exists at firm level only.

In addition to the data challenges relating to the estimation of displacement and substitution, to assess **accreditation** or **certification**, it is also necessary to have an information source containing reliable information relating to *prior attainment* or skills. Given the fact accreditation is defined as the acquisition of a qualification where an employee is already in possession of those skills, the only means of identification of accreditation is the comparison of skills before and after the intervention at an employee level. As far as we are aware, there is no data available at a firm level that allows for an estimate of the incidence or extent of this form of deadweight loss. If prior attainment is unavailable, any result will be an **overestimate** of the **additionality** associated with government funded training.

The next issues that warrant consideration relate to the information available concerning the education and training provided by the firm to its employees, and in particular, information relating to the number of employees that are in receipt of training⁵⁰; the nature or **quality** of the training in terms of the level of qualification; the number of hours of

⁵⁰ Or the **proportion** of employees if information is available on the total number of employees employed by the firm

training or the intensity/effort associated with the training programme; and the **components** of the training programme⁵¹.

Specifically, when attempting to estimate the concept of **pure additionality**, a straightforward comparison of the proportion of workers in receipt of training (only) between treatment and control firms may indicate that the volume of training has increased; however, this may not account for some element of displacement, substitution or accreditation, and thus may provide an overestimate of the extent of additionality and an underestimate of the extent of deadweight loss. In this example, only matched employer-employee data will identify the extent of displacement and substitution, while only matched employer-employee data containing employee prior attainment will identify the extent of accreditation or certification.

Compounding this, the **quality** of the training funded through public and private sources may be fundamentally different. If the quality of publicly funded training exceeds the private training that no longer takes place, there may be an element of **qualitative additionality** that has not been identified. Therefore, rather than considering just the number or proportion of employees in receipt of publicly or privately funded training, the quality or scope of the training received is crucial in determining qualitative additionality. The absence of detailed training information will potentially **underestimate the true level of additionality** associated with publicly provided training and skills acquisition. As previously discussed, the nature of the training information required includes the level of the training (if it results in a formally recognised qualification), the package of training and skills that might be rolled up in a training programme, and potentially (in the absence of the level of qualification) an alternative proxy of quality (such as the number of hours of training).

2.1.6 Comparison of different learning activities

One potential difficulty with any analysis associated with the information relating to training involves the fact that some episodes of training may encompass other episodes of training but appear to be at the same level with the National Qualification Framework. This issue presents itself especially in relation to apprenticeship training. For instance, an intermediate apprenticeship comprises a NVQ at Level 2, a technical certificate involving a theoretical grounding, and a Key Skills element (numeracy and literacy). Clearly, the acquisition of an apprenticeship involving these additional elements of training would result in a degree of qualitative additionality (that may be difficult to identify from firm level data). Therefore, a simple assessment of the qualitative additionality incorporating just the highest level of qualification or learning aim may completely miss the additional or complementary education and skills attained by individual through the technical certificate and the Key Skills module.

⁵¹ For instance, programs that contain multiple modules of training and skills acquisition rolled up into a more general qualification (e.g. apprenticeships)

2.2 How does this tie together? What data is need to produce 'acceptable' estimates

In Figure 15, we have presented the nature of the information needed to undertake 'ideal' estimates of the various elements of deadweight loss and additionality. As we move from left to right across the figure, the comprehensiveness of the information increases from basic information at a firm level incorporating the characteristics and circumstances of the firm ('Tier 1' information) to information that consists of matched firm-employee incorporating employee-level training profiles and employee level prior attainment ('Tier 5').

The figure also classifies the tier of information according to whether it is suitable for subsequent identification of decomposed deadweight loss and additionality estimates. In particular, according to each component of deadweight loss and additionality, the information tier is classified as being:

- **“Required but not sufficient”**, whereby the data tier indicated is needed to undertake the analysis but more comprehensive information is also needed to complete the analysis;
- **“Required”** implying that this is the tier and comprehensiveness of the information necessary and sufficient to undertake the analysis; and
- **“Not required”** implying that this tier of information or its comprehensiveness is over and above what is needed to undertake the modeling the particular component of deadweight loss or additionality.

Figure 18: Theoretical data requirements

Increasing comprehensiveness of information →					
Tier of information needed for estimation of DWL/additionality					
	Tier1: Firm Level characteristics and 'circumstances' (for PSM)	Tier2: Level 1 plus Basic aggregate training information (no. employees, hours)	Tier3: Level 1 plus detailed training information (no. employees, hours, level, type, attainment)	Tier4: Level 3 plus Matched firm-employee level data – individual training profiles	Tier5: Level 4 plus employee level prior attainment
Accreditation	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required
Displacement	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required	Not required
Substitution	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required	Not required
Qualitative DWL	Required but not sufficient	Required – estimate improves with more comprehensive data			Not required
Qualitative additionality	Required but not sufficient	Required – estimate improves with more comprehensive data			Not required
Pure additionality	Required but not sufficient	Possible overestimate – estimate improves with more comprehensive data			

Required but not sufficient	Implies that this information is necessary for the estimation, although in isolation, may not be sufficient (i.e. information is too weak/ not detailed enough)
Not required	Implies that this information is unnecessary for the estimation – superfluous to requirements if more detailed information is available
Required	Implies that this information is necessary and sufficient for the estimation of the associated element of deadweight loss/ additionality

Source: London Economics

In the next section, we illustrate the extent to which the various data sets considered as part of this analysis contain the various elements of information and illustrate the extent to which robust estimates of deadweight loss and additionality might be achievable.

2.3 Individual level measurement and data issues

As mentioned in section 2.1.3 when discussing the potential differences between the components of deadweight loss and additionality at firm and individual level, in this section we describe the data requirements and measurement issues relating to individual level data. There may be a fundamental need to look at individual level data in addition to firm level data because some learning streams are not employer-based. It should be noted that the assessment of individual level data, in the absence of a quasi-experimental intervention (such as Wolter and Messer (2009)), is likely to offer fewer opportunities to researchers to assess the extent of deadweight loss and additionality compared to the assessment of data at firm level or using matched employee-firm level data.

As in the previous section relating to firm level data, we discuss the general data requirements for assessing deadweight loss and additionality, and the increasing comprehensiveness of data required. As with the assessment of firm level data and the need for matched firm-employee level data to estimate substitution, displacement and accreditation, the presentation in this section commences with individual data – but as before requires the additional matched firm level data to achieve the same estimating strategy (i.e. data requirements converge albeit from different starting points).

2.3.1 Matching information

As with the assessment of the extent of deadweight loss at firm level, any analysis of deadweight loss or additionality at individual level requires a like-for-like comparison. Therefore, it is necessary to generate a group of individuals in receipt of publicly funded training (either directly or through their employer) and undertake a similarly structured Propensity Score Matching analysis based on observable individual level characteristics⁵². This is the most basic data requirement.

2.3.2 Source of funding

As with the consideration of firm level deadweight loss, it is crucial to have some indication of the source of training funding. This provides one of the fundamental variables upon which the treatment group may be identified (and subsequently the control group). However, whereas an employer may have relatively comprehensive information on the source of funding for a training programme, there may be some uncertainty as to whether the training provided through an employer is actually funded by the employer or by the government (either partially or totally) and simply provided through the employer (or on the employer premises). At an individual level, respondents may be uncertain as to the specific funding streams involved, and this will undoubtedly weaken the robustness of any results produced.

2.3.3 Training information

Again, it is crucial to have some understanding of the training episode undertaken by the individual. As before, the more comprehensive the information on training (whether trained, the level of training, the qualification attained, the number of hours of training etc), the more robust will be the estimates of deadweight loss and additionality. However, in addition to the information on the nature of the training episode, it is also important to have some understanding of the specific content of the training received between the treatment and counterfactual groups.

When considering the existence of deadweight loss, the key question remains as to what might have happened in the absence of government funded training. Therefore, for those individuals that are employed and in receipt of government funded training through their firm, we need to understand to what extent comparable training might have been undertaken that was either self-funded or funded directly through an employer.

2.3.4 Data disaggregation

There are many different modes of training delivery and it might be the case that there are different levels of deadweight loss associated with each one. There is no (theoretical) limit on the number of treatment groups (and matched control groups) that can be generated, so if more information is available on the mode of training (i.e. Work based learning, College based learning, apprenticeships etc), a finer assessment of the extent of deadweight loss by mode can be assessed. This represents a need for additional data variables.

⁵² such as age, gender, qualification level, ethnic origin, household composition, accommodation details, marital status, number of dependent children, employment status, legal status of employer (public, private, NFP), and size of employer

2.3.5 Quasi-experimental approach relating to funding discontinuities

Given the issues relating to the comparability of self funded and publicly funded training and the potential accuracy of responses relating the source of funding, the most meaningful approach to estimating the existence of deadweight loss and additionality might be to consider a quasi-experimental approach that relies on programme discontinuities (i.e. funding arrangements that ‘naturally’ split the data into discrete blocks, the comparison of which provides a quasi-experimental assessment of firm behaviour). Taking an example in relation to apprenticeships, it is possible for firms to receive full funding for providing an apprenticeship for individuals aged between 16 and 18, compared to 50% funding for individuals aged between 19 and 24. In this way, by comparing the outcomes of individuals across different age groups (i.e. individuals aged 18 and 19 where there is different funding available from government) may provide an indication of the extent of what actually occurs following a reduction in public funding from 100% of training costs to 50%. However, there are some key limitations associated with such an approach in the case of apprenticeships: the main limitation is that we would expect firms to adjust the age structure of their workforce in response to changes in the eligibility rules for publicly funded training. Moreover, even the simple announcement of the policy is likely to have an impact on the recruitment strategy implemented by firms⁵³. The second fundamental issue is related to the fact that, for co-funded apprenticeships, in most cases FE Colleges do not collect the fee from employers and, thus, such an analysis would not be entirely meaningful for co-funded apprenticeships.

2.3.6 Labour Market Status

Given the discussion about the quasi-experimental approach, one of the key variables required for undertaking an assessment of deadweight loss and additionality is the labour market status of the individual. Specifically, there are a number of training programmes that are by definition available only to those individuals that are either employed (or unemployed). In the case of individuals in employment and in receipt of government funded training, the control group will need to consist of individuals that are also in employment and eligible (potentially) for the training (where the assessment of deadweight involves the comparison the levels of privately funded comparable training between the two groups).

However, in the case of training for the unemployed, a further complication arises. Specifically, a number of training programmes for the unemployed have either a compulsory element of training involved or require a period in unemployment to become eligible. The fact that training programmes may be compulsory limits the extent to which any estimate of deadweight loss for the unemployed is meaningful, but also may require longitudinal data to better identify labour market status over time.

⁵³ Evidence from the NESS indicates that in around 37% of the cases apprenticeships are offered mainly or exclusively to specific new recruits, while in 16% of cases are offered mainly or exclusively to existing staff and in 44% of cases are offered to both.

2.4 Modelling deadweight loss and additionality

2.4.1 Firm Level Data Sources

We have undertaken an assessment of some of the data sources that might be suitable for estimating the deadweight loss associated with Further Education and Training. At the employer level, we have assessed the National Employer Skills Survey (NESS) and the Employer Perspectives Survey (EPS) and some basic information is presented in Table 7 and Table 9 on the nature of the variables contained these data sets – broken down according to whether they are matching variables (see section 2.1.3); the nature and structure of the training interventions (section 2.1.4); and variable information on training engagement and training undertaken (section 2.1.5).

National Employers Skills Survey

The National Employer Skills Survey (NESS) collects data about the skills of the workforce of firms in England. The survey has been conducted every two years since 2001. The survey was established because of concerns about apparent skills-shortages and gaps in workforce knowledge that were affecting firm performance in the UK. In particular, the Government was interested in whether these skills-shortages were dampening economic performance, and whether policy interventions were required to address these shortages. The aim of NESS is therefore to provide robust and reliable information from employers about skills deficiencies and workforce development to serve as a common basis to develop policy and assess the impact of skills initiatives. The survey coverage falls into three major categories

- hard-to-fill vacancies
- skills gaps
- workforce training and development

These firm-level data can be combined with other sources of business micro-data, and have been successfully linked to the Inter-departmental Business Register (IDBR). This allows observations to be combined with, for example, productivity data from the *Annual Business Inquiry*⁵⁴. This allows researchers to investigate the effects that skills shortages have on other areas of businesses (such as productivity, innovation, R&D etc). The survey was designed to incorporate employers across all sectors of business activity in England. ‘Employers’ were defined as establishments (individual sites) rather than enterprises. Some enterprises may therefore be represented in the survey by more than one of their sites. The sample for the survey was drawn from Experian’s National Business Database. Some elementary information on the coverage, sample and methodology are presented overleaf:

⁵⁴ The linking of the NESS with the ABI has been found to be problematic in a number of studies (Haskel and Galindo-Rueda (2005, ‘Skills, Workforce Characteristics and Firm-level Productivity: Evidence from the Matched ABI/Employer Skills Survey’, *SSRN eLibrary*) and results in relatively small sample sizes.

Coverage:

Time Period Covered: 2007-2009 (every two years)

Country: England

Spatial Units: Anonymised postcodes

Observation Units: Institutions/organisations

Universe Sampled:

Location of Units of Observation: National

Population: Employers in England registered for VAT and/or PAYE in 2007 - 2009.

Methodology:

Time Dimensions: Repeated cross-sectional study

Sampling Procedures: One-stage stratified or systematic random sample

Number of Units: Approximately 80,000 for the main survey; 7,000 for the follow-up costs survey.

Method of Data Collection: Telephone interview

NESS Data Assessment

In this section we follow the structure outlined in Figure 15 and try to identify which relevant variables are available in the NESS and assess what we might be able to measure with the available variables and indicators.

A preliminary step consists of ensuring that the information on training activities and sources of funding (whether training is provided using private or public funds or a combination of the two) is available in the NESS. As detailed in Table 7, the NESS contains a detailed series of questions on training (e.g. the number of employees receiving on-and-off-the job training; the type of training received and whether that led to nationally recognised qualifications; the type of staff receiving training; an assessment of training providers; barriers to training; an awareness of participation in government training initiatives (*Train to Gain, Skills Pledge, National Skills Academies*); and a dedicated section on apprenticeships.

Below we present the list of variables available in the NESS to match firms in the treatment (those receiving some form of publicly funded training) and the counterfactual group (similar firms according to a specified set of variables, but not using publicly funded training). We then describe in detail the training related variables collected in the NESS.

Matching variables

First of all we need to have relevant information on firms' characteristics to construct and pair the treatment and counterfactual groups.

The matching procedure consists of pairing one observation in the treatment group with one or more observations in the counterfactual group according to a specified set of observable characteristics. The definition of the matching variables is therefore crucial: we need to control for all relevant variables influencing training choices (the **Conditional Independence Assumption**), but at the same time the matching procedure requires having at least one match for the treated observation among the non-treated observations (the existence of a **Common Support Region**). Therefore, it should be noted that the final set of matching variables can be subject to some adjustments (concerning also the level of detail of each variables, for example using sector rather than detailed SIC codes or collapsed rather than disaggregated variables) in order to find a balance between comprehensiveness of the information set and applicability of the matching strategy.

The set of matching variables can be divided into general information on firm characteristics, information on the firm's internal organisation and business strategy, occupational and skills structure, the firm's recruitment activities and the skills shortages and gaps the firm may be facing.

General firm characteristics identify establishment size (number of employees), industrial sector of activity (2-digit SIC code or sector of activity at aggregate level), geographic location (identified using Local Authority or region), organisation type (public, private, non-for profit), information on ownership and legal structure (whether the establishment is part of a larger organisation or whether the establishment is a PLC, and the number of owners).

A second set of variables relates to the firm's internal organisation and business strategy with a series of variables in the NESS capturing the type and volume of services or products offered by the establishment and how their strategy compares to other competitors in the same industry. One variable indicates the volume (for establishments in the manufacturing sector) or range of services (for establishments in the service sector) offered by the establishment compared to competitors in the same industry. Another relevant variable captures the overall firm's product market strategy (based on assessing to what extent the firm bases its competitive strategy on factors such as price, innovation and quality). It is also important to compare firms with similar targets and regions of operation, and a variable in the NESS reports the primary geographical area of activity (local, regional, national or international). A further relevant information point is the internal organisational structure of each firm, which can be proxied using variables recording whether the establishment has a budget, a training plan or a budget for training activities.

A series of questions in the NESS identify the firm's occupational and qualification structure, measured by the proportion of different types of staff employed, and the proportion of staff with a qualification at degree level and above or level 3 and above.

While we expect firms in the treatment and counterfactual group to be similar in the characteristics outlined above, training decisions are also likely to be explained by other factors. In fact, the identification strategy relies on two similar firms also having a similar

“taste” or “need” for training. In other words, firms might experience different rigidities in the labour market and suffer from different levels of skills shortages that could lead to different attitudes towards training. The NESS contains a variety of information on recruitment activities, hard to fill vacancies and skills gaps that might be included in the information set.

However, there might be some residual characteristics conditioning firms’ training decisions we are unable to control for, which could render the selected observation(s) in the comparison group a poor counterfactual to what would have happened to the treated firm in the absence of publicly funded training. The presence of a series of variables on firms’ barriers to training might be helpful in identifying firms that would have liked to train or provided more training but were unable to do so. In particular, there are two questions on barriers to training: the first, which is asked to all firms that did not provide any form of training, while the second is asked to all firms that have provided training, but would have liked to provide more training for their staff⁵⁵. While public funding provision is unlikely to overcome some of the specified barriers (such as lack of time), it might nonetheless have an effect on other barriers faced by firms (such as excessive cost of training courses). Therefore, information on barriers to training faced by firms could also be used to identify those firms that felt the “need” to provide training (or more training) to staff, but were unable to do so for circumstances for which the provision of public funding can have an effect (such as lack of funds).

Arguably, this information should be combined with information on awareness of government initiatives on training: if a firm was aware of the existence of public funding and felt they needed more training, why didn’t they make use of public funds (we are assuming that the matched observation in the counterfactual group is similar to the treated observation, which means they should have access to public funding). However, especially for apprenticeships, it is possible that a firm has heard of the initiative without having a detailed knowledge of the potential funding opportunities.

Even if the matching procedure successfully identifies observations from the counterfactual group to match with the treated observations, there is always the possibility that treated firms are more proactive with respect to training provision and government initiatives. However it is difficult to assess that without further knowledge on how they got to know and made use of the different government initiatives (especially *Train to Gain*, where firms are cold contacted by a skills broker or training provider).

Outcome (training) variables

The NESS provides detailed information on the number of employees receiving training, the type, level and length of training, details on the provider and also a set of variables on involvement in government initiatives. However the NESS is not a matched employer/employee dataset and therefore does not contain information on training at the individual level. In other words, we observe the number of employees receiving training

⁵⁵ These questions in the NESS are unprompted and all mentioned responses are coded. As presented in the subsequent analysis, the variables relating to barriers to training were not entirely suitable for use in the Propensity Score Matching model and as such were not incorporated. Note however that there were minimal differences in the results of the Propensity Score Matching model when these variables were included or omitted from the model specification.

and the characteristics of training at firm level, but we are unable to identify who is receiving the training provided. Another key limitation is the absence of detailed information on the extent of training undertaken through public funding. In fact, although the NESS contains detailed information on the number of employees undertaking apprenticeships at different levels, it only contains a simple question on the involvement in the *Train to Gain* initiative, with no further details on the number of employees trained and the level within the National Qualification Framework trained towards.

General information on training

The NESS contains a set of variables on training activities undertaken by firm staff in the previous 12 months. The set of questions report whether the firm has funded or arranged any off-the-job or on-the-job training in the previous 12 months; the total number of employees trained (combining off-the-job and on-the-job training); the number of staff in different occupations receiving training; the average length of training per member of staff receiving training; the number of staff trained towards a nationally recognised qualification and the qualification level (Level 1 to Level 4 and above); a series of questions on training providers (Further Education Colleges, universities or other); and a set of questions on barriers to training.

Information on government funded training initiatives

The last block of questions in the section on workforce training and development are dedicated to assessing the awareness of and involvement in government initiatives. More specifically, the first set of questions on government funded training relates to awareness of and involvement in the following initiatives: *Train to Gain*, *Skills Pledge* and *National Skills Academies*. As already mentioned, we have no further detail on the number of employees trained or the type of training provided through these government funded initiatives.

Finally, there is a detailed series of questions on awareness of Apprenticeships overall and at different levels (Advanced, Higher and Adult Apprenticeships for those aged 25 plus); the number of staff undertaking apprenticeships (disaggregated by age 16 to 18, 19 to 24 and 25 and above); and whether the firm offers apprenticeships but no member of staff is currently undertaking one. There are also additional questions on what type of staff the apprenticeships are offered to (existing staff or specific recruits), or expectations and motivations for apprenticeship provision over the next 12 months.

Table 4 presents general information on training contained in the NESS: in total, almost half of the surveyed firms provide both off-the-job and on-the-job training to some of their staff, with around 12% providing off-the-job-training only and 16% on-the-job training only. Overall, around 60,000 firms (three quarters of the sample) provide some sort of training to their employees.

Table 10: NESS - Training arranged or funded in the last 12 months			
	Number of respondents	% of total respondents	Average number of employees trained
Training status			
Provide both off-the-job and on-the-job training	37,989	48.0%	32.3
Provide off-the-job training only	9,251	11.7%	6.4
Provide on-the-job training only	12,488	15.8%	13.1
Provide neither off-the-job nor on-the-job training	19,424	24.5%	-
Total	79,152		24.3

Note: Combination of questions E4A, E4B and E4C

Source: NESS (2009)

Table 5 provides details on awareness of and involvement in government initiatives on training and learning. Overall almost two thirds of firms have heard of the existence of the *Train to Gain* initiative, while around 30% and 40% (respectively) are aware of the existence of *The Skills Pledge* and *The National Skills Academies*. Around 15% have been actively involved with *Train to Gain* in the past, while 6% have made *The Skills Pledge* and 3% have engaged with a *National Skills Academy*. The majority of companies that have made *The Skills Pledge* (70%) and engaged with a *National Skills Academy* (66%) have also used *Train to Gain* funding. Overleaf, we review the characteristics of the different initiatives and their potential impact on training.

In Table 6 we provide summary information on awareness of and involvement in government funded apprenticeships. Only 8.5% of surveyed firms reported not to have heard of government funded apprenticeships, while almost half of firms are aware of the existence of apprenticeships, but have no detailed knowledge of specific forms of apprenticeships.

In terms of active involvement in the apprenticeship initiative, almost 9 out of 10 firms were not offering apprenticeships at the time of the survey, while 6% had staff undertaking apprenticeships and a further 5% were offering apprenticeships but had no members of staff currently undertaking one. Funding related to apprenticeships varies with age and in Table 6 we present the number of firms training at least one employee of different age bands (16-18, 19-24 and 25+). More than 70% of firms were providing apprenticeships to at least one member of staff aged 16-18 and a similar proportion were providing apprenticeships to staff aged 19-24. Only 7% of firms engaged in apprenticeships were not providing at least one apprenticeship to either 16-18 or 19-24 year olds. Less than 50% of firms having staff undertaking apprenticeships were providing an apprenticeship to staff aged 25 or more.

Table 11: NESS - Awareness of and involvement in government initiatives on training

	Awareness	%	Involvement	%
Government Initiative				
<i>Train to Gain</i>	52,039	65.7%	12,142	15.3%
<i>The Skills Pledge</i>	24,295	30.7%	4,558	5.8%
<i>The National Skills Academies</i>	31,261	39.5%	2,434	3.1%
Total	79,152			

Note: Questions E27 to E31C. Awareness: "have you heard of X?"; Involvement: "Has your establishment been actively involved with X in the last 12 months"?

Source: NESS (2009)

Table 12: NESS - Awareness of and Involvement in Apprenticeships

	Awareness		Involvement		
	Obs.	%	Obs.	%	
Advanced Apprenticeships only	6,662	8.4%	Have staff currently undertaking Apprenticeships	4,602	5.8%
Adult Apprenticeships only	7,859	9.9%	<i>Have staff aged 16-18 undertaking apprenticeships</i>	3,286	71%
Higher Apprenticeships only	723	0.9%	<i>Have staff aged 19-24 undertaking apprenticeships</i>	3,358	73%
Advanced and Adult Apprenticeships	6,452	8.2%	<i>Have staff aged 25 or above undertaking apprenticeships</i>	2,190	48%
Adult and Higher Apprenticeships	1,684	2.1%	Currently offer Apprenticeships, but have no staff undertaking one	3,701	4.7%
Advanced and Higher Apprenticeships	789	1.0%	Do not have/do not offer Apprenticeships	70,849	89.5%
Advanced, Adult and Higher Apprenticeships	10,286	13.0%			
No specific form of Apprenticeship heard of	37,966	48.0%			
Not heard of Government-funded Apprenticeships	6,731	8.5%			

Note: Questions E32 to E38.

Source: NESS (2009)

Table 13: Data availability – NESS	
Variable name	NESS
	Matching variables
Number of employees	A1
Sector/SIC Code	NEWSECTOR/SIC07_2
Geographic Location (Region/Local Education Authority)	REGION/LEA
Public/Private/NFP	A4 (A5)
Occupational Structure	D1/D1A/D1B/D1C
Qualification structure	E8/E9
High volume producer/wide range of services	F1_1/F1_2
Product Market Strategy (collapsed variable summarizing price competition, Innovation and product sophistication)	F1_qual(F1_3/F1_4/F1_5)
Dominant sales location	F1A
Ownership structure	A6/F8/F9
Organisational Structure	E1A/E1B/E1ANY
Recruitment activities, skills shortages and hard to fill vacancies	VAC_STAT/SSV/C4/C5
Skills gaps	DG2ANY/DG2_TOT
Barriers to training	E23/E24A/E24B
Government training initiatives (awareness)	E27
Awareness of apprenticeships	E32
	Outcome variables
Employer funded/arranged off-site training	E4A
Employer funded/ arranged on-site training	E4B
Employer used FE College for training	E21
Employer used HEI for training	E21E
Employer used other providers for training	E22A
Involvement in Train to Gain	E28
Staff engaged in apprenticeships	E34i/E34ii
Number employees engaged in training	E4C
Occupation receiving training	E5/E5A
Length of training	E5B
Training leading to nat. rec. qualification	E7
Level and type of qualification	E7cii
Formal assessment	E13
Reasons for non use of FE Colleges	E21D
Reasons for non use of HEIs	E21F
Reasons for non training	E23
Staff engaged in apprenticeships	E36/E37/E38

Source: LE elaboration of the NESS

Conclusions

The NESS contains detailed data at firm level on firm characteristics, occupational and skills structure, information on a firm's organisational structure, skills gaps, and details on training activities and workforce development. Crucially, the NESS also contains information on involvement in government training and learning initiatives. However, for

our proposed analysis, the training information provided in the NESS presents two key limitations:

- The NESS is not a matched employee/employer dataset on training undertaken;
- There is no detailed information on the number of staff trained (and the level of training) through government initiatives such as *Train to Gain*.

In Figure 16, we present an assessment of what elements of deadweight loss we can estimate using information available in the NESS: the absence of matched employer/employee information makes it impossible to identify accreditation and which part of quantitative deadweight loss is attributable to displacement and substitution. However, it may be possible to estimate pure additionality, and to some extent qualitative additionality and deadweight (especially in relation to apprenticeship training).

Figure 19: Assessment of the National Employers Skills Survey

National Employers Skills Survey					
Increasing comprehensiveness of information →					
Tier of information needed for estimation of DWL/additionality					
	Tier1: Firm Level characteristics and 'circumstances' (for PSM)	Tier2: Tier 1 plus Aggregate training information (no. employees, hours)	Tier3: Tier 1 plus detailed training information (no. employees, hours, level, type, attainment)	Tier4: Tier 3 plus Matched firm-employee level data – individual training profiles	Tier5: Tier 4 plus employee level prior attainment
Accreditation	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required
Displacement	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required	Not required
Substitution	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required	Not required
Qualitative DWL	Required but not sufficient	Estimate improves with more comprehensive data		Required	Not required
Qualitative additionality	Required but not sufficient	Estimate improves with more comprehensive data		Required	Not required
Pure additionality	Required but not sufficient	Estimate improves with more comprehensive data		Required	Not required

Required but not sufficient	Implies that this information is necessary for the estimation, although in isolation, may not be sufficient (i.e. information is too weak/ not detailed enough)
Not required	Implies that this information is unnecessary for the estimation – superfluous to requirements if more detailed information is available
Required	Implies that this information is necessary and sufficient for the estimation of the associated element of deadweight loss/ additionality
Shaded Cell	Implies that this level of information is available

Source: London Economics

2.4.2 Employers Perspectives Survey

Survey context

Between June and August 2010, the Employers Perspective Survey (EPS) was commissioned by UK Commission for Employment and Skills (UKCES) to 'explore employers' engagement with the skills, employment and business support systems in the

four countries in the UK⁵⁶. The EPS was developed from previous employer surveys conducted by the Sector Skills Development Agency. In addition, it is designed to complement the NESS because the EPS has an external focus, examining employer awareness and use of external support, whereas the NESS “seeks to understand employers’ skills challenges and their response to these challenges” and therefore has an internal focus. As such, we would not expect to be able to retrieve the identical information from the NESS and EPS. The specific aims of the EPS were to:

- Identify the context in which employers are operating in terms of structure, decision making, changes and challenges
- Determine the level of engagement and satisfaction with government services in the areas of: Business Support, Recruitment, Skills and Training, and Qualifications
- Determine whether employers are getting the support they need, whether from government sources or otherwise.

Methodology

The EPS is a ‘large-scale, representative, UK-wide, employer survey’ of 14,390 employers, conducted by telephone. The sample was designed to be representative of the UK employer population as a whole. Interviews were conducted at an establishment level, rather than an organisational level. The interview was with the most senior person at the site with responsibility for human resources.

2.4.3 EPS Data Assessment

The EPS is a United Kingdom wide survey, whereas the NESS is focused solely on England, therefore in the following sections we only look at the sample of English employers. In the following tables, this restricts the sample to 9,432 employers (Table 8).

Country	Number of employers	Percentage
England	9,432	65.6%
Northern Ireland	990	6.9%
Scotland	1,981	13.8%
Wales	1,987	13.8%
Total	14,390	100.0%

Source: EPS (2010)

Table 9 shows the potential matching and outcome variables available in the EPS that would be required to undertake a preliminary analysis of deadweight loss. We discuss the most relevant of these in the following sections.

⁵⁶ UKCES (2011) UK Employer Perspectives Survey 2010, Evidence Report 25 January 2011

Table 15: Data availability – Employers Perspective Study	
Variable name	EPS
	Matching variables
Number of employees	A1
Singlesite/Multisite	A2/A3
SIC Code	A5
Public/Private/NFP	A7
Qualification structure	B7/B8
Dominant sales location	A8
Engaged in training	(D2A/D2B)
	Outcome variables
Employer funded/arranged off-site training	D2A
Employer funded/ arranged on-site training	D2B
Employer used FE College for training	D12A
Employer used HEI for training	D12B
Employer used other providers for training	D12C/D12D
Government training initiatives (awareness)	E11(A,C,D,F,G,H)
Involvement in Train to Gain	E11/E12_4
Awareness of apprenticeships	E16
Staff engaged in apprenticeships	E17/E18
Training leading to nat. rec. qualification	D3
Level and type of qualification	D6
Reasons for non use of FE Colleges	D15
Reasons for non use of HEIs	D15
Reasons for non training	D4
Importance of government support	E19B
Staff engaged in apprenticeships	D6

Matching variables

The matching variables in a propensity score matching model are used to generate a series of treatment and counterfactual groups, where the treatment groups consist of firms that may have engaged or availed of some form of publicly funded training while the control group have the same observable characteristics but do not engage in publicly funded training. We look at the available matching variables from the EPS in more detail below.

Our assessment is that there is reasonable information available in terms of matching information. In particular, there is reasonable information relating to the number of employees (**A1**), whether the firm operates on a single site/multi-site (**A2/A3**), organisation type (**A7**), the qualification structure within the firm (**B7/B8**), and region of incorporation. In addition, in terms of outcome variables, one of the most important outcome variables from the EPS that we would be interested in is whether firms engage in training or not, and what training programmes they might be involved in. In terms of undertaking training, the

relevant variables for this are **D2A** (off-the-job training), **D2B** (on-the-job training) and **TRAIN** (both off-the-job and on-the-job training). However, there are limitations in the level of detail contained in the data set relating to the training undertaken by employers. In particular, considering the relevant variables relating to whether on-the-job or off-the-job training is being undertaken, Table 10 illustrates that for each of these variables allow employers to answer either 'Yes', 'No' or 'Don't Know'. Therefore, each of these variables can only take values 1 or 0 once we have omitted the 'Don't know' responses. As such, although this type of training variable can be used for matching firms, it does not assist us in determining the extent of deadweight loss or additionality as we only know whether the employer has trained some employees or not, **not** how many employees have been trained.

Table 10 shows that two thirds of organisations (66.9%) have arranged or funded off-the-job training in the last 12 months, whilst for on-the-job training, this increases to almost three quarters of businesses (74.7%). Over 80% of establishments engage in either on- or off-the-job training for their employees.

Table 16: Training arranged or funded in the last 12 months – EPS 2010		
	Number of respondents	Percentage
Off-the-job training (D2A)		
Yes	6,311	66.91%
No	2,968	31.47%
Don't know	153	1.62%
Total	9,432	100.00%
On-the-job training (D2B)		
Yes	7,041	74.65%
No	2,277	24.14%
Don't know	114	1.21%
Total	9,432	100.00%
Either type of training (TRAIN)		
Train	7,757	82.24%
Do not train	1,675	17.76%
Total	9,432	100.00%

Note: Question D2A: Now thinking about the ways in which you may develop your workforce, over the past 12 months have you arranged or funded any off-the-job training or development for employees at this site? By off-the-job training we mean training away from the individual's immediate work position, whether on your premises or elsewhere? Question D2B: And have you arranged or funded any on-the-job training and development over the last 12 months?

Source: EPS (2010)

One of the government programmes that we are interested in looking at in this project is *Train to Gain*. The EPS asks employers some questions on *Train to Gain*, for example their awareness of the programme and whether they have used or been involved with *Train to Gain* in the past 12 months. However, similarly to the basic training variables above (**D2A**, **D2B** and **TRAIN**), we only know whether the employer has used *Train to Gain* (or is aware of *Train to Gain*), but **not** the number of employees that have been put through or trained as part of the scheme. Some of the information contained in the EPS is presented overleaf.

Almost two thirds of the English organisations surveyed in the EPS were aware of the *Train to Gain* programme (Table 11). However, of these 6,225 respondents, only 1,567 (25%) had used or were involved in the *Train to Gain* programme in the past 12 months (Table 12).

Table 17: Awareness of Train to Gain – EPS 2010

	Number of respondents	Percentage
Aware of TTG	6,225	66.0%
Not aware of TTG	3,207	34.0%
Total	9,432	100.0%

Note: Question E11D: Which of the following schemes and initiatives have you heard of...: *Train to Gain*?

Source: EPS (2010)

Table 18: Involvement with Train to Gain in the past 12 months – EPS 2010

	Number of respondents	Percentage
Yes	1,567	16.6%
No	7,670	81.3%
Don't know	195	2.1%
Total	9,432	100.0%

Note: Question E12_4: Have you used or been involved with *Train to Gain* in the past 12 months?

Source: EPS (2010)

Of those organisations that have arranged or funded either on-the-job or off-the-job training in the last 12 months, 70.7% (5,485) have heard of the *Train to Gain* programme. However, only 1,512 of those organisations (19.5%) have used or been involved in *Train to Gain* in the last 12 months (Table 13).

Table 19: Awareness and engagement with Train to Gain – EPS 2010

	Train	Do not train	Total
Have you heard of Train to Gain?			
Yes	5,485	740	6,225
No	2,272	935	3,207
Total	7,757	1,675	9,432
Have you used or been involved with Train to Gain in the last 12 months?			
Yes	1,512	55	1,567
No	6,065	1,605	7,670
Don't know	180	15	195
Total	7,757	1,675	9,432

Note: Question E11D: Which of the following schemes and initiatives have you heard of...: *Train to Gain*?;

Question E12_4: Have you used or been involved with *Train to Gain* in the past 12 months?

Source: EPS (2010)

Apprenticeships

The EPS also asks employers some questions on apprenticeship programmes, for example, their awareness of apprenticeships, whether they have any staff undertaking an apprenticeship at their site, and whether they currently offer apprenticeships at their site. However, similar to the variables relating to general training and *Train to Gain*, the apprenticeship variables will only allow the identification of whether the employer has

employees on apprenticeships or not (for example), **not** the actual number of employees (or proportion) that are undertaking apprenticeships. Again, we present some of this information from the survey overleaf.

Just over 60% of establishments have heard of apprenticeships (Table 14) and of these, less than one quarter (23.6%) have staff currently undertaking an apprenticeship at their site (Table 15).

Table 20: Awareness fo apprenticeships – EPS 2010

	Number of respondents	Percentage
Heard of apprenticeships	5,730	60.75%
Not heard of apprenticeships	3,702	39.25%
Total	9,432	100.00%

Note: Sum of the answers to E16: Have you heard of...?

Source: EPS (2010)

Table 21: Engagement in apprenticeships– EPS 2010

	Number of respondents	Percentage
Yes	1,354	23.63%
No	4,327	75.51%
Don't know	49	0.86%
Total	5,730	100.00%

Note: Question E17: Do you currently have any staff undertaking Apprenticeships at this site?

Source: EPS (2010)

Of the 4,327 organisations that currently do not have any staff undertaking apprenticeships at their site, only 13.2% offer apprenticeships (Table 16).

Table 22: Offer of apprenticeships at this site – EPS 2010

	Number of respondents	Percentage
Yes	572	13.22%
No	3,688	85.23%
Don't know	67	1.55%
Total	4,327	100.00%

Note: Question E18: Do you currently offer Apprenticeships at this site? (this question is only asked to those that answered 'No' to question E17).

Source: EPS (2010)

Of those organisations that have arranged or funded either on-the-job or off-the-job training in the last 12 months, 64% (4,970) have heard of apprenticeships. However, only 1,298 of those organisations (26.1%) have staff currently undertaking apprenticeships at their site (Table 17).

Table 23: Training and apprenticeships incidence – EPS 2010			
	Train	Do not train	Total
Have you heard of Apprenticeships?			
Yes	4,970	760	5,730
No	2,787	915	3,702
Total	7,757	1,675	9,432
Do you currently have any staff undertaking Apprenticeships at this site?			
Yes	1,298	56	1,354
No	3,626	701	4,327
Don't know	46	3	49
Total	4,970	760	5,730

Note: Sum of the answers to E16: Have you heard of...? Question E18: Do you currently offer Apprenticeships at this site? (This question is only asked to those that answered 'No' to question E17).

Source: EPS (2010)

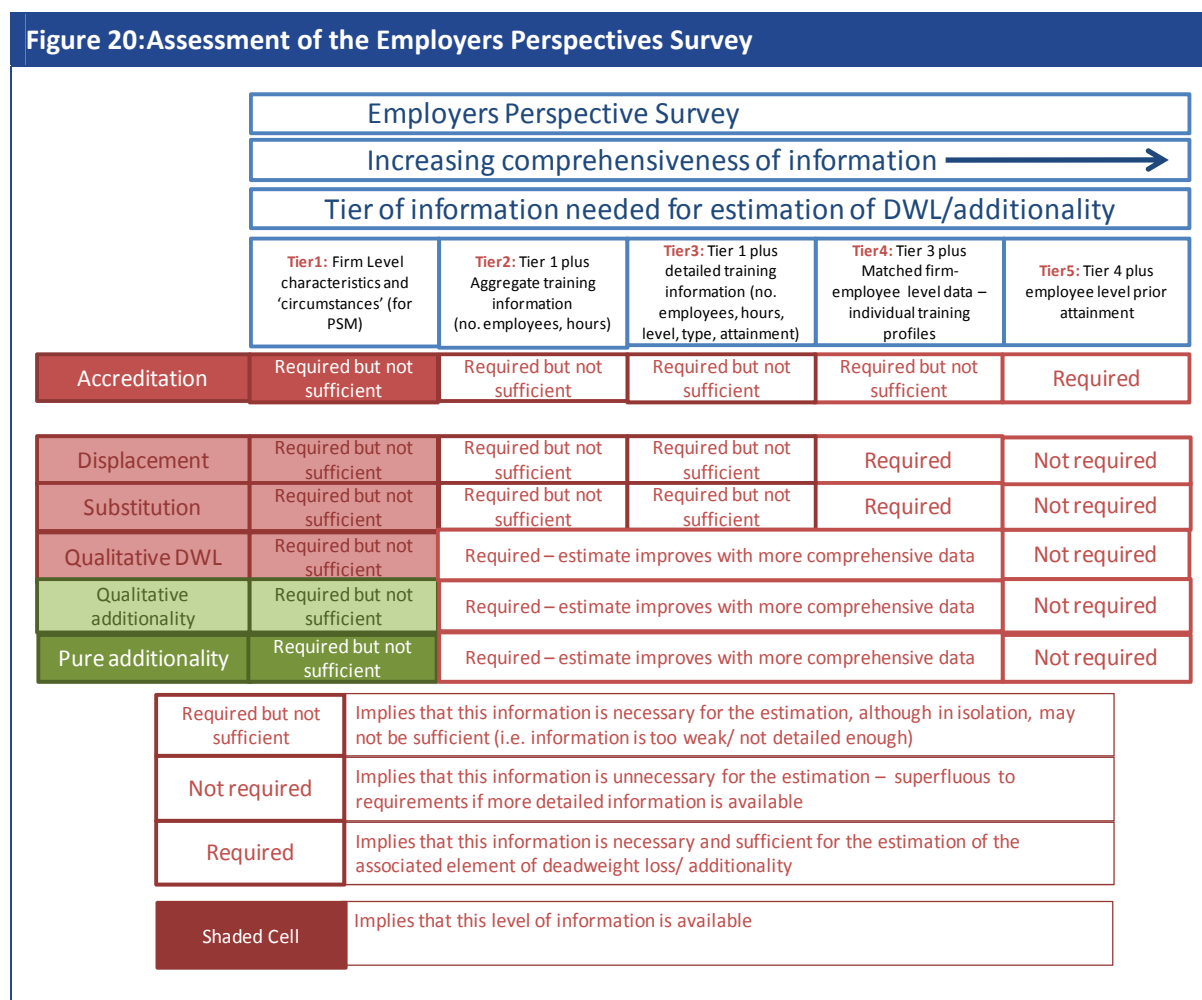
Conclusion

After an initial analysis of the data for the possibility of estimating deadweight loss and additionality, we conclude that we do not have sufficient information on:

- Some matching variables (such as occupational structure) or whether the employer suffers from skills shortages (though this point is less important);
- The **number** of employees (or **proportion**) who undergo training, are involved in *Train to Gain* or are on an apprenticeship (which is crucially important for deriving any estimate of deadweight loss);
- Combined with this, the qualification level of the training provided, the number of hours of training and the associated funding source are missing (which are important for finer estimates of qualitative deadweight loss and additionality).

In Figure 17 we show that we are unable to estimate any elements of deadweight loss using information available in the EPS. Firstly, the absence of matched employer/employee information makes it impossible to identify accreditation and which part of quantitative DWL is attributable to displacement and substitution. In addition, there is not enough detail contained in the EPS to be able to produce a robust estimate of pure additionality and deadweight or qualitative additionality and deadweight.

Due to this lack of detail, we are unable to assess the proportion of employees in the treatment and counterfactual groups that have been in receipt of publicly and privately (firm) funded training. With the tier of information available, we believe that the EPS would not be a valuable data set to use in this project.



Source: London Economics

2.5 Individual Level Data Sources

2.5.1 Labour Force Survey

The Labour Force Survey (LFS) is a quarterly sample survey of households living at private addresses in the United Kingdom. Its purpose is to provide information on the UK labour market that can then be used to develop, manage, evaluate and report on labour market policies. It is conducted by the Office for National Statistics. The LFS is intended to be representative of the whole population of the UK. The population covered is all people resident in private households, all persons resident in NHS accommodation and young people living away from the parental home in a student hall of residence or similar institution during term time (these latter groups are included in the LFS sample specifically to improve the coverage of young people). The sample design currently consists of about 55,000 responding households in Great Britain every quarter, representing about 0.2% of the population. A sample of approximately 2,000 responding households in Northern Ireland is added to this, representing 0.3% of the Northern Irish population, allowing United Kingdom analyses to be made.

Each quarter's LFS sample of UK households is made up of five "waves", each of approximately 11,000 private households. Each wave is interviewed in five successive quarters, such that in any one quarter, one wave will be receiving their first interview, one

wave their second, and so on, with one wave receiving their fifth and final interview. Thus there is an 80% overlap in the samples for each successive quarter.

Households are interviewed face to face at their first inclusion in the survey and by telephone, if possible, at quarterly intervals thereafter, and have their fifth and last quarterly interview on the anniversary of the first.

Coverage:

Time Period Covered: Quarterly: 1992 – present (Jan-Mar, Apr–Jun, Jul–Sep, Oct – Dec)

Country: United Kingdom

Spatial Units: Postcode Address File

Observation Units: Households and individuals

Universe Sampled:

Location of Units of Observation: National

Methodology:

Time Dimensions: Repeated cross-sectional study; Roll-forward (for one wave only)

Sampling Procedures: Each quarter's sample is made up of five waves. Respondents are interviewed for five successive waves at three-monthly intervals and 20% of the sample is replaced every quarter. The LFS is intended to be representative of the whole population of the UK

Number of Units: Approx 52,000 responding UK households per quarter.

Method of Data Collection: Face-to-face (Wave 1) and telephone interview (Waves 2-5)

2.5.2 LFS Data assessment

Training for the employed

Our analysis of the Labour Force Survey suggests that substantial amounts of information are available on a range of personal and socioeconomic and employment outcomes that would allow for the generation of a control group. In particular, the information on respondents' personal characteristics is routinely available from the LFS, as well as detailed information on the training undertaken that would allow for the analysis of training outcomes at both an aggregated and disaggregated level. This is presented in the table overleaf.

Table 24: Data availability – Labour Force Study	
Variable name	LFS
	Matching variables
Sex of respondent	sex
Age of respondent	age
Marital status	marstt
Nationality	ntnlty
Ethnic Group	eth01
Government Office region	govtor
Urban/ rural indicator	urind
Age of oldest dependent child aged under 16	fdpch16
Household economic activity	heacomb
Accommodation details	ten1
Basic economic activity	ilodefa
Occupational Code	soc2km
Working in public private/sector	public
Industry in main job	indm92m
Number of employees at workplace	mpnr02
Region of place of work	regwkr
Highest Qualification	hiqua18
Age completed FT education	edage
	Outcome variables
Highest qualification training leads to	hitqua8
Apprenticeship as part of main on the job training	appsam
Highest qualification current studying towards	qulhi4
Type of qualification being studied for	qulhi
Whether enrolled on an education course	enrol
Current education received	cured
Job related training in last 13 weeks	ed13wk
Education and training offered	trnopp
On or off the job	jobtrn
Main place of training	trsite7
Who pays for training?	trnfee(1-5)
Length of training	trnlen
Time spent on training on the job	tronjb
Type of adult learning	adlearn7

Although this would appear relatively positive, and despite the fact that there is no substantive firm level information (in relation to training), the availability of data and its usefulness needs to be caveated. Specifically, there is limited information contained in the LFS in relation to whether the training was undertaken through a particular training route (such as *Train to Gain*). Secondly, although the various components of information are available, and in sufficient detail at individual level, there is still the issue in relation to what the comparison of outcomes between the treatment and control group actually delivers (as we cannot observe individuals in similar firms).

To undertake a meaningful analysis, an approach we considered was to assess the existence of deadweight loss associated with different specific policy interventions for which there is information available.

Government employment and training programme

In particular, the variable SCHM08 (Government employment and training programme), which is asked to all individuals of working age in the UK irrespective of employment status⁵⁷, has the following response values⁵⁸:

- (1) Work-based Learning for Young People (GB only; Aged 16-25)
- (2) New Deal (Aged 18+ only)
- (3) Work based learning for adults/training for work (GB only)
- (10) Job skills (NI only)
- (15) Worktrack (NI only)
- (21) Entry to Employment
- (50) Any other training scheme
- (66) None of these
- (97) Just 16 and no response this time

Using this information alongside a range of other training variables⁵⁹, supported by additional information on the exact eligibility of the various schemes, would allow for a quasi-experimental comparison of the incidence of privately funded training across relatively tightly defined treatment and control groups spanning eligibility cut-offs. For instance, the LFS could be used to identify those individuals aged between 22 and 25 in employment in receipt of government funded training. A 'control' group of employed individuals aged between 26 and 28 with similar personal and socioeconomic characteristics could be generated. Comparing the extent of privately funded training across the two groups would provide a very high level estimate of the degree of deadweight loss potentially associated with the training programme. Depending on the degree of information available in relation to the exact nature of the publicly and privately

⁵⁷ Available from Jan-Mar 2008 (alongside its predecessors SCHM04 (available from spring 2004) and SCHM99 (from Spring 1999))

⁵⁸ Those on a Government Training programme (categories (1), (3), (21) for GB) do not count as being in employment, while most of those in category (2) are unemployed/inactive. The question is asked to all those in working age, but mainly applies to unemployed

⁵⁹ HITQUA8 (highest qualification training leads to), APPR8 (whether in possession of or working towards an apprenticeship), MODAPP4 (whether apprenticeship is part of Modern apprenticeship), APPSAM (whether apprenticeship part of main job), QULNOW (whether working towards a qualification now), ED13WK (job related training or education in last 13 weeks), NEWQUL (whether education will lead to a qualification), JOBTRN (Education and training on or off the job), TRSITE (Main place of training), TRNFEE (Who pays for training), TRNLEN (Length of training course), TRURP (Purpose of most recent course or instruction)

funded training, **and the extent to which the respondents are in employment**⁶⁰, a more precise estimate of qualitative deadweight loss, qualitative additionality and pure additionality might be possible though this was considered to be beyond the scope of this research work.

Training for the unemployed

The analysis above predominantly relates to those individuals that are in employment and compares the extent of employer funded training between the treatment and control groups. In terms of training for the unemployed, subject to the caveats presented in section 2.3.6, a similar type of analysis might be achievable if sufficient information exists in relation to the nature of government training programmes for the unemployed. In particular, the variable NDTYPE4 (New Deal participants) provides information on the nature of the New Deal training that an individual might be in receipt of as follows:

- (1) New Deal for Disabled people
- (3) New Deal for lone parents
- (4) New Deal for young people (Aged 16-24 only)
- (5) New Deal for 25+ (Aged 25+ only)(6) New Deal for 50+ (Aged 50+ only)
- (7) New Deal for partners?
- (8) None of the above
- (9) Don't know

In addition, the information in NEWDEA4 (Type of New Deal option) also provides data on the nature of the intervention (e.g. still on Gateway, working with an employer, in full time study etc). As with training for the employed, and depending on the extent to which information exists on non-compulsory training, it may be possible to exploit this information to understand whether there is any crowding out of self funded study; however in reality, the possibilities are remote. This potential element of analysis was considered to be beyond the scope of the current analysis.

We summarise our assessment of the data source below (Figure 18). With the absence of matched employer/employee information in the LFS it is not possible to identify accreditation and which part of quantitative DWL is attributable to displacement and substitution. Furthermore, although there may be enough information available in the LFS to potentially estimate some of the other measures of additionality and deadweight (for instance, using a quasi-experimental approach based on different training programmes), we believe that the difficulties of establishing an appropriate control group would render any analysis relatively meaningless in a conceptual sense.

⁶⁰ See footnote 58 – otherwise this analysis may come under the next section 'training for the unemployed' and the use of individual level data to estimate additionality/ deadweight loss may not be possible

Figure 21: Assessment of the Quarterly Labour Force Survey

Labour Force Survey					
Increasing comprehensiveness of information →					
Tier of information needed for estimation of DWL/additionality					
	Tier1: Individual level personal, socioeconomic labour market and basic training information (not source of funding) for PSM	Tier2: Tier 1 plus source of funding for PSM	Tier3: Tier 2 plus detailed training information (source hours, level, type, location)	Tier4: Tier 3 plus Matched firm-employee level data – individual training profiles	Tier5: Tier 4 plus employee level prior attainment
Accreditation	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required
Displacement	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required	Not required
Substitution	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required	Not required
Qualitative DWL	Required but not sufficient	Estimate improves with more comprehensive data		Required	Not required
Qualitative additionality	Required but not sufficient	Estimate improves with more comprehensive data		Required	Not required
Pure additionality	Required but not sufficient	Estimate improves with more comprehensive data		Required	Not required

Required but not sufficient	Implies that this information is necessary for the estimation, although in isolation, may not be sufficient (i.e. information is too weak/ not detailed enough)
Not required	Implies that this information is unnecessary for the estimation – superfluous to requirements if more detailed information is available
Required	Implies that this information is necessary and sufficient for the estimation of the associated element of deadweight loss/ additionality
Shaded Cell	Implies that this level of information is available

Source: London Economics

2.5.3 National Adult Learning Survey

The National Adult Learning Survey (NALS) series is predominantly used to consider a wide variety of aspects of adult participation in learning. The 2005 survey is the fourth in the NALS series to be published; the previous surveys were carried out in 2002, 2001 and 1997. The survey, conducted between October 2005 and February 2006 included 4,983 computer-assisted personal interviews with adults aged 16 or over in England, Wales and Scotland.

The NALS series has traditionally used a broad definition of learning in order to be able to capture a wide variety of learning experiences. Two broad categories of learning, taught and self-directed, are used in the NALS series. A series of questions was asked in NALS 2005 to establish whether respondents had undertaken any of a range of different types of learning in the previous three years or since leaving continuous full-time education (CFT), whichever was shorter. In addition to the distinction between Learning is taught or self directed, Learning is classified as **vocational** if it was:

- Related to the respondent's job at the time of starting the learning, or
- Started in order to help with a future job, or
- Started in order to help with voluntary work.

Learning is considered **non-vocational** if it was:

- Not related to the respondent's job at the time of starting the learning, and
- Not started in order to help with a future job, and
- Not started in order to help with voluntary work

The core topics included in NALS 2005 and in earlier NALS were:

- Levels of participation in different types of adult learning, that is: taught, self-directed, non-vocational, and vocational
- The subject and mode of learning and how much time people spend on different learning activities
- Motivators, benefits and outcomes of learning
- Guidance and advice on learning
- Obstacles and incentives to learning
- Key socio-demographic indicators (e.g., gender, age, ethnicity)

An important innovation in NALS 2005 is the inclusion of questions from the European Adult Education Survey (AES). The new survey topics introduced in NALS 2005 to accommodate European comparisons include **sources** of funding and support for taught learning (i.e., employers, individuals or their families)

In terms of the usefulness of the information in NALS, there is some degree of personal and socioeconomic data that might allow for a matching process, although the extent of information is substantially less comprehensive than the information in the Labour Force Survey and with a much lower number of observations. There is also some information in relation to the number of training courses that might have been undertaken in the last three years, alongside some additional information on the nature, content, hours spent, source of tuition fees and other costs of training, training provider, and motivations for undertaking one of the training courses (selected at random during the interview). The primary variables are presented overleaf.

Table 25: Data availability – individual level data sets	
Variable name	NALS
	Matching variables
Sex of respondent	SEX
Age of respondent	BG6
Nationality	NATION1
Ethnic Group	ETHNSC
Urban/ rural indicator	BG3
Household economic activity	HHWHO
Basic economic activity	BG15
Number of employees at workplace	EMPNUM
Highest Qualification	^HIQUAL
Age completed FT education	LEFTFT1/2/3
	Outcome variables
Highest qualification training leads to	FL3QU (Block)
Highest qualification current studying towards	FL3QU (Block)
Whether enrolled on an education course	FL1 (Block C)
Type of qualification being studied for	FL1 (Block C)
	SINGLE LEARNING ACTIVITY
Current education received	SLACOMP
Compulsory/voluntary	SLAJOBN
Job related training in last 12 months	SLAPRV
On or off the job	SLAPRV
Main provider of training	SLA9X/SLA10X/SLA11X
Who pays for training?	SLA9X/SLA10X/SLA11X
Length of training	SLAHR5/T1STRY/T1ENDY
Whether on a Government employment and training programme	GST

Source: National Adult Learning Survey

However, as discussed in the previous section relating to the assessment of the Labour Force Survey, the potential comparison of outcomes between the treatment and counterfactual group may have limited meaning if we remain uncertain as to how comparable the treatment and control groups might be. In particular, if there is a group of individuals who have been engaged and completed a publicly funded learning (assuming they are aware of the public funding), an assessment of the differences in the self funded (or employer funded) learning outcomes between the treatment and control group would continue to rely on the assumption of comparability across learning aims for any sensible interpretation (and the ability to observe individuals in similar firms). Even if the comparability issues could be controlled for by incorporating information on the motivations for learning, given the fact that the total sample is less than 5,000, the uncertainty around the estimates would render them meaningless.

In Figure 19 we show that we are unable to estimate any elements of deadweight loss using information available in the NALS. Firstly, the absence of matched

employer/employee information makes it unviable to identify accreditation and which part of quantitative DWL is attributable to displacement and substitution. In addition, there is not enough detail contained in the NALS to be able to produce a robust estimate of either pure additionality and deadweight or qualitative additionality and deadweight.

Figure 22: Assessment of the National Adult Learning Survey

National Adult Learning Survey					
Increasing comprehensiveness of information					
Tier of information needed for estimation of DWL/additionality					
	Tier1: Individual level personal, socioeconomic labour market and basic training information (not source of funding) for PSM	Tier2: Tier 1 plus source of funding for PSM	Tier3: Tier 2 plus detailed training information (source, hours, level, type, location)	Tier4: Tier 3 plus Matched firm-employee level data – individual training profiles	Tier5: Tier 4 plus employee level prior attainment
Accreditation	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required
Displacement	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required	Not required
Substitution	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required	Not required
Qualitative DWL	Required but not sufficient	Required – estimate improves with more comprehensive data Fundamental weakness as a result of sample size			Not required
Qualitative additionality	Required but not sufficient				Not required
Pure additionality	Required but not sufficient				Not required
Required but not sufficient	Implies that this information is necessary for the estimation, although in isolation, may not be sufficient (i.e. information is too weak/ not detailed enough)				
Not required	Implies that this information is unnecessary for the estimation – superfluous to requirements if more detailed information is available				
Required	Implies that this information is necessary and sufficient for the estimation of the associated element of deadweight loss/ additionality				
Shaded Cell	Implies that this level of information is available				

Source: London Economics

3 Modelling at firm level

As discussed extensively in Section 2 of the report, there are two main issues associated with estimation of additionality and deadweight loss:

- The identification of a suitable counterfactual; and
- The availability of comprehensive information on training and firm characteristics.

In the absence of a randomised experiment (counterfactual) or a matched employer/employee dataset (data requirement), we use the following identification strategy to match treated observations with suitable untreated observations and assess to what extent we can soundly measure the different elements of additionality and deadweight. The modelling outlined in this section relies on information available in the NESS, which is the most comprehensive source available at firm level.

3.1 Identification of the appropriate counterfactual – general discussion

We use variables available in the NESS to match treated observations with one or more untreated observations in the comparison group. The two key assumptions underlying a matching strategy are the **Conditional Independence Assumption**, which ensures that we have all the relevant information characterising the selection rule and the decision to participate or not in the programme, and the existence of a Common Support Region, which implies that we can find a match for each treated observation among the non-treated (the region defined by the set of observable characteristics represented among the treated is also represented among the non-treated).

The underlying matching assumptions ensure that differences in the outcome variable are explained by participation in government training initiatives. However we need to ensure that neither assumption (Conditional Independence Assumption and the existence of a Common Support Region) is violated. **We are therefore reliant on the assumption that the observable characteristics used in the matching procedure fully describe the decision to participate in government initiatives and that we have at least one match for each treated observation** (see section 3.4.3).

Clearly the main risk is that there is some unobservable component explaining the decision to participate in government initiatives on training we are unable to control for. One factor is firms' "taste" or perceived "need" for training, which we try to proxy using a series of variables on recruitment activities, skills gaps, barriers to training⁶¹ etc. These variables might be used in conjunction with information on training awareness, as similar firms might have a different participation status with respect to publicly funded training due to the fact that the untreated observation was not aware of the existence of publicly funded training.

⁶¹ See footnote 55 for additional information

However, a different awareness might also indicate a different level of pro-activity with respect to training and government funded initiatives. It is difficult to assess whether awareness of a training initiative also involves detailed knowledge of the potential opportunities for the firm, or just general awareness of the existence of the initiative. This might be the case for apprenticeships, where more than 90% of firms have heard of the initiative, but almost 50% are only aware of the existence of the initiative, but haven't heard of specific forms of apprenticeships. The *Train to Gain* initiative, where firms are cold-contacted, might theoretically provide a better scope for matching similar firms with similar skills and training needs where one firm is unaware of the existence of the programme.

The final set of observable characteristics to be used will cover the areas outlined above, but the choice of the specific variables (and the form of the variables) will be subject to some fine-tuning to ensure the existence of a Common Support Region. There is no way to test the non-violation of the *Conditional Independence Assumption*, and even after controlling for all observable characteristics, there might still be some unobservable characteristics explaining training that we are unable to control for. In that case, our estimate of additionality will probably be biased compared to the "true" level of additionality. The sign of the bias will depend on the characteristics of this unobservable component. If the bias depends on treated companies having higher motivations towards training, we will probably overestimate additionality (it is likely that the same firm would have trained a higher number of employees than the counterfactual in the absence of government initiatives). On the other hand, if the main motivation for training is explained by the presence of a public subsidy, we might underestimate the level of additionality generated by the presence of a government initiative.

3.2 Identification of the appropriate counterfactual – variables used

To match treated observations with one or more untreated observations in the comparison group, we used variables related to firm level characteristics available in the NESS, shown in Table 20 overleaf (with the results of the estimating process presented in Section 3.4.3).

Table 26: Matching variables	
Variable name	NESS
Number of employees	A1B6
Sector	NEWSECTOR
Geographic Location (Region)	REGION
Whether establishment is part of a larger organisation	A6
Whether establishment is a PLC	PLC
Number of owners/partners	OWN
Product Market Strategy (collapsed variable summarising price competition, Innovation and product sophistication)	F1qual
High volume producer/wide range of services	F1_1_2
Dominant sales location	F1A
Business plan, training plan or budget for training	BUSST
Staff qualified to level 3 or above as a proportion of total number of employees	E89PR
Vacancy status	VACT_STAT1
Hard to fill vacancies	SSV1
Skills gaps	SKGAP
Skill gap density among all staff	D2GD_TOTB

Source: London Economics elaboration of the NESS

This set of matching variables can be divided into different subsections including: general information on firm characteristics, information on the firm's internal organisation and business strategy, occupational and skills structure, the firm's recruitment activities and the skills shortages and gaps the firm is facing.

General information on firm characteristics

The selection of general firm characteristics we use to match firms includes establishment size, based on the number of employees split up in to 6 bands (**A1B6**), industrial sector of activity (**NEWSECTOR**) and geographic location (**REGION**). Other matching variables include those related to ownership and legal structure, whether the establishment is part of a larger organisation (**A6**), the number of owners or partners the establishment has (**OWN**) and whether the establishment is a PLC (**PLC**).

We also considered using the variable **A4**, which identifies organisation type (whether the establishment is public, private or not for profit) but have decided to omit this variable from our match because it leads to collinearity⁶² when included.

Information on the firm's internal organisation and business strategy

The second selection of matching variables is related to the firm's internal organisation and business strategy. We include variables related to product market strategy (**F1qual**); volume or range of services offered by the establishment compared to competitors (**F1_1_2**); dominant sales location (**F1A**); and internal organisational structure of the firm

⁶² Collinearity occurred because the establishments in the treatment and control groups were all private firms.

(using the variable **BUSST**, which records whether the establishment has a budget, a training plan or a budget for training activities).

Occupational and skills structure

We match establishments by skills structure using **E89PR**, which provides information on the number of employees with a qualification of higher than Level 3 as a proportion of the total employees. We created this variable by generating the variable **E89**, which is the total number of staff with Level 3 or above qualifications, and dividing it by the total number of employees (**A1I**)⁶³.

The identification strategy also relies on two similar firms having a similar “taste” or “need” for training. To control for this, we use vacancy status (**VAC_STAT1**); hard to fill vacancies (**SSV1**); skills gaps (**SKGAP**); and skill gap density among all staff (**D2GD_TOTB**) as matching variables. Skill gap density among all staff is calculated as the number of employees who are not fully proficient as a proportion of all employees.

Barriers to training

In addition, we considered using variables on barriers to training as a proxy for a firm’s “taste” or perceived “need” for training. Including these variables might be helpful in identifying firms that would have provided more training but were unable to do so for reasons unaffected by or unrelated to the existence of publicly funded training. However, when we used the barriers to training variables we felt were appropriate (such as external courses being too expensive (**E23F**), or managers lacking the time to organise training (**E23G**)), they had no impact on our results, and therefore we omitted them from the final Propensity Score Match model specification.

3.3 Data availability in relation to training – general discussion

As mentioned previously, we do not have access to a matched employer/employee dataset with information on training activities. The primary measures available in the NESS identify:

- Whether firms have provided or arranged some form of training (off- or on-the-job);
- The number of employees receiving training;
- Training characteristics (length, whether training leads to a nationally recognised qualification and the level of the qualification);
- Information on training providers;
- A set of questions assessing involvement in government training initiatives (*Train to Gain*, The Skills Pledge and the National Skills Academies), but no details on the number of employees trained through those initiatives (or the level of training achieved);

⁶³ We also considered using the proportion of different types of staff employed as a matching variable. However, decided not to make use of it because it made no difference to the results.

- Details on involvement in government funded Apprenticeships including the number of employees undertaking an apprenticeship in different age bands (16-18, 19-24 and 25+).

The key questions here are how the different initiatives can have an impact on training and how we can compare training achieved through government initiatives to other forms of training⁶⁴.

3.4 How to identify the treatment group – stage 1

First of all we need to define the treatment group, i.e. the group of firms receiving publicly funded training. We consider firms engaging in apprenticeships and *Train to Gain* as receiving publicly funded training. Given the different characteristics and the different detail of information available in the NESS on the two initiatives, we build **two** treatment groups, one formed of those firms engaging in apprenticeships and one formed of firms engaging in the *Train to Gain* initiative.

3.4.1 Apprenticeships

We looked at a treatment group consisting of those firms with at least one apprentice (of any age) and excluded those firms who engage in *Train to Gain* from both the treatment and counterfactual groups. The justification is that firms involved in *Train to Gain*, but not offering Apprenticeships may have fundamentally different training needs or age-skills structure and are likely to be an unsuitable counterfactual for firms providing Apprenticeships⁶⁵.

Moreover, we are not able to distinguish between privately and publicly funded training for *Train to Gain* firms, given that the NESS only reports involvement in the *Train to Gain* programme, but not the numbers of employees being trained through *Train to Gain*. This fact potentially blurs the precision of the counterfactual.

⁶⁴ A description of the various government initiatives might provide a guide on what impact the initiative might have on firms' training:

Train to Gain – Firms are cold contacted, either by a skills broker or by a provider. The skills broker or provider identifies skills gaps and training needs and when training is needed, identifies learners eligible for training. Courses can be fully (basic skills and NVQs at level 2) or partially funded (higher level NVQs). A summary description of the Train to Gain funding framework is described in Figure 17.

- *The Skills Pledge* – The Skills Pledge is an organisation's voluntary public commitment to training its staff; actual funding for training courses is provided through *Train to Gain*;

- *The National Skills Academies* – National Skills Academies are led by employers with the aim of delivering specialised skills to employees and learners in specific sectors. The Academies support a range of training in different environments, including NVQs, BTECs and Apprenticeships. In the first three years of operation, a National Skills Academy can be funded by government with the expectation that the employer matches this funding.

⁶⁵ The concept of deadweight loss/additionality adopted throughout this report refers to the comparison of firm outcomes where there is public funding with the scenario where only privately funded education and training may take place. In particular, there may be some degree of qualitative additionality associated with publicly funded apprenticeships (compared to privately funded NVQs) given the additional technical certificate and Key Skills qualifications included in apprenticeships. However, the comparison of publicly funded apprenticeships and publicly funded NVQs (through *Train to Gain* for instance) does not capture this element of qualitative additionality, as the fundamental assessment of additionality requires the comparison of outcomes in the *presence* and *absence* of publicly funded training.

If we were to include firms undertaking Apprenticeships and *Train to Gain* in the treatment group and *Train to Gain* firms in the counterfactual, we would be comparing treated firms (making use of apprenticeships and possibly *Train to Gain*) with a combination of treated (in receipt of publicly funded training through *Train to Gain*) and untreated firms (in receipt of no forms of publicly funded training). Because we do not know the number of employees participating in *Train to Gain*, we have no way of knowing whether the treatment firms use *Train to Gain* for a small element of their training needs while those *Train to Gain* firms in the counterfactual group use *Train to Gain* for a significant extent (partly because they may not provide Apprenticeships). This would bias any results. Similarly, including *Train to Gain* firms in the counterfactual only, would result in an analysis where we compare the treatment effect of government funding of skills with only a partial counterfactual (as some firms are exposed to at least some undefined element of government skills funding through *Train to Gain*). This again would limit the methodological soundness of the results.

In our Propensity Score Match for apprenticeships, we define the variable **APPR**, which has a binary response, and equals 1 when firms have at least one apprentice of any age (and zero otherwise), as the dependent variable.

However, apprenticeships are fully funded for learners aged between 16 and 18, co-funded (50%) for learners aged between 19 and 24 and only funded in specified cases for learners aged 25 or over⁶⁶. Therefore, it seems reasonable to also look at a treatment group which only includes firms engaged in 16-18 and 19-24 apprenticeships and consider separately those only engaging in apprenticeships for employees aged 25 or over (which is a small proportion of the total number of firms providing apprenticeships, standing at around 7%). In this case we define APPR2, a binary variable which equals 1 when firms have at least one apprentice aged under 25 (and zero otherwise) as the dependent variable.

To try and estimate quantitative and qualitative deadweight and additionality, we use different outcome variables in the analysis. This is described in more detail in section 3.5.

3.4.2 Train to Gain

Under *Train to Gain*, firms receive funding covering 100% of training costs for level 2 qualifications, while level 3 and level 4 qualifications are partially funded (level 3 qualifications are fully funded for 19-25 year olds). We define the treatment group as those firms that have been actively involved in *Train to Gain* in the last 12 months (variable **TTG**) and exclude those firms who engage in apprenticeships from both the treatment and counterfactual groups, so we can look at the effect of *Train to Gain* independently from apprenticeships.

As mentioned in section 3.1, information on training awareness may need to be excluded from both the treatment and counterfactual groups. This is because similar firms may have a different participation status with respect to publicly funded training due to the fact that the untreated observation was unaware of the existence of publicly funded training.

⁶⁶ <http://www.apprenticeships.org.uk/Employers/Other-Questions.aspx#Question23>

Firms offering, but not currently providing, apprenticeships were not included in the treatment group since they did not use publicly funded training, however, they may not be an appropriate counterfactual either, given that their involvement with apprenticeships suggests that they were fully aware of potential opportunities, but decided not to use them given their current training needs and skill structure. In other words, the fact that they are offering apprenticeships but there is no employee currently undertaking one suggests that their current training needs or age and skill structure are different from those of firms with at least one employee undertaking an apprenticeship.

Consequently they were removed from both the treatment and counterfactual groups for apprenticeships and *Train to Gain*. To do this we created a variable (**EXCLUDE**), which removes the following establishments from the treatment and counterfactual groups:

- Firms indicating that they have been involved in *Train to Gain* in the last 12 months, but have not trained any employees to a Nationally Recognised Qualification in the last 12 months;
- Firms indicating that they currently have staff undertaking apprenticeships, but indicating that they have no apprentices;
- Firms indicating that they offer apprenticeships, but say they have no apprentices.

3.4.3 How good were the Propensity Score Matches?

Apprenticeships: Despite the various data limitations, the Propensity Score Matching process worked well and was robust to a number of different specifications. To highlight this, in Table 21, we have produced summary results for the difference between the propensity score for the treated sample and the nearest neighbour (i.e. control group). These results show that the difference between the propensity score was very small, with the mean difference in probability standing at 0.0000364 (i.e. 4/1,000ths of a percentage point) with largest probability gap being only 0.0171886 (i.e. less than 1.7 percentage point difference in the predicted probability of being in the receipt of the treatment). These estimates suggest a good match overall.

Train to Gain: For the analysis of *Train to Gain*, the Propensity Score Match was equally reliable. As before, in Table 22, we have produced summary results for the difference between the propensity score for the treated observation and the nearest neighbour. These results show that the difference between the propensity score was very small, with the mean difference in probability standing at 0.0000332 (i.e. 3/1,000ths of a percentage point) with largest probability gap being only 0.01118590 (i.e. less than a 1.1 percentage point difference in the predicted probability of being in the receipt of the treatment).

Table 27: Summary results for the difference between the PSM score for the treated and control groups (apprenticeships)

Percentile of gap (and propensity score for treatment)	Gap	Smallest
1% (0.037582)	0	0
5% (0.036102)	0.00000004	0
10% (0.046801)	0.00000012	0
25% (0.020624)	0.00000045	0
50% (0.055197)	0.00000135	
		Largest
75% (0.092192)	0.00000467	0.0046123
90% (0.135836)	0.00001860	0.0095481
95% (0.162259)	0.00005060	0.0118191
99% (0.321504)	0.00043480	0.0171886
Observations	2,340	
Sum of Weight	2,340	
Mean	0.0000364	
Standard Deviation	0.0004974	
Variance	2.47e-07	
Skewness	26.75828	
Kurtosis	800.72	

Source: LE analysis of the NESS 2009

Table 28: Summary results for the difference between the PSM score for the treated and control groups (TTG)

Percentile of gap (and propensity score for treatment)	Percentiles	Smallest
1% (0.187201)	0	0
5% (0.105343)	0.000000025	0
10% (0.142403)	0.000000433	0
25% (0.113687)	0.000001970	0
50% (0.090754)	0.000005640	
75% (0.149617)	0.000014700	0.00584830
90% (0.403611)	0.000045700	0.00725800
95% (0.393507)	0.000090900	0.00738830
99% (0.504512)	0.000432800	0.01118590
Observations	6,337	
Sum of Weight	6,337	
Mean	0.0000332	
Standard Deviation	0.0002501	
Variance	6.25e-08	
Skewness	27.40575	
Kurtosis	952.9229	

Source: LE analysis of the NESS 2009

In Annex 3, we also present detailed information on the summary statistics associated with the various treatment and counterfactual groups, which highlight the similarities between the various groups of firms. We also provide some information on the sensitivity of the Propensity Score Matching process according to different model specifications and the inclusion and exclusion of different covariates. Given the evidence and the reliability of the econometric matching process, we have some degree of confidence that the subsequent analysis is based on solid foundations.

3.5 Impact of publicly funded training on learning activities - stage 2

Once we have identified the treatment group, we need to establish the potential impact of publicly funded training on learning activities. Below we review the indicators available in the NESS on which the government funded initiatives are likely to have some impact. These will represent our outcome variables in the propensity score match.

- Apprenticeships will have an effect on both off-the-job and on-the-job training activities and the number of employees trained towards a Nationally Recognised Qualification at level 2 or level 3 (with a very small number of level 4 qualifications).
- *Train to Gain* should affect the overall number of employees receiving training, off-the-job and on the-job training activities, and the number of employees trained towards a qualification at Level 2, Level 3 and Level 4.

Outcome variables

Table 23 (overleaf) shows the variables available in the NESS that we considered using as outcome variables in our Propensity Score Match.

Table 29: Training variables – NESS	
Variable	Description
A1I	Overall number of employees at point in time
E4A	Whether establishment has funded or arranged any off-the-job training
E4B	Whether establishment has funded or arranged any on-the-job training
E4ANY	Whether establishment has funded or arranged either on-the-job or off-the-job training
E4ALL	Whether establishment has funded or arranged both on-the-job or off-the-job training
E4CI	Number of staff trained over past 12 months (point estimate)
E4CB	Number of staff trained over past 12 months (banded)
E4CDER	Number of staff trained over past 12 months (combining point estimates and banding mid-points)
E7I	Number of staff trained towards a Nationally Recognised qualification over past 12 months (point estimate)
E7B	Number of staff trained towards a Nationally Recognised qualification over past 12 months (banded)
<i>E7CDER</i>	Number of staff trained towards a Nationally Recognised qualification over past 12 months (combining point estimates and banding mid-points)
<i>E5DER</i>	Proportion of training arranged for health & safety or induction training
E21	Employer used FE College for training
E21E	Employer used HEI for training
E22A	Employer used other providers for training
E28	Involvement in Train to Gain
E34i/E34ii	Staff engaged in apprenticeships
E5B	Length of training
E7cii	Level and type of qualification
E36/E37/E38	Staff engaged in apprenticeships
Cleaned variables	
<i>Appr_total</i>	Total number of apprenticeships
<i>Trained_total</i>	Number of staff trained over past 12 months
<i>Trained_nrq</i>	Number of staff trained towards a Nationally Recognised qualification over past 12 months
<i>Trained_pro p</i>	Proportion of employees receiving training

Note: the use of italics denote variables derived by London Economics. Source: London Economics' analysis

However, as discussed below, we came across a number of issues with the data, and therefore had to solve these problems before deciding upon which outcome variables to use to help us establish the potential impact of publicly funded training on learning activities.

3.6 Data issues

There are a series of issues associated with training data collected by the NESS. Below we outline the main issues we have encountered:

- Firstly, there is some discrepancy between the definition of the variable A1I (total number of employees) and the various training variables. The question on the number of employees (**A1I**) asked establishment managers how many staff they currently employed at their establishment. However, the questions relating to the number of employees trained overall and those trained to a Nationally Recognised Qualification (NRQ) asked about the number trained over the last 12 months.

Consequently when a firm has trained employees who have since left, this could result in the number of employees trained being greater than the number of employees currently employed. The 2011 questionnaire of the NESS also introduced an additional question, enquiring whether the number of employees has increased, decreased or stayed constant compared to 12 months before.

- In a small number of cases the total number of employees receiving training is less than the total number of employees receiving training towards a NRQ. This is a small mismatch due to the use of point estimates and banding midpoints.
- One question in the NESS asked to report the proportion of training arranged in relation to Health & Safety and induction training. This type of training is outside the scope for the current analysis and was removed from the overall measure of training. However we have many occurrences where the total number of trained employees after removing the volume of Health & Safety and induction training is less than the number of employees receiving training towards a NRQ⁶⁷.
- In a number of cases respondents were unable to identify the detailed structure of training in their firm. In fact, more than 32,000 firms reported an overall figure for the number of employees trained towards a NRQ, but around 6,000 of these firms were unable to identify at what level of the National Qualification Framework training took place. Moreover, for just over 10% of the cases the overall figure of employees trained towards a NRQ is less than the sum of those trained to a specific level (from Level 1 to Level 4), possibly signalling that the some employees received training to different levels. In another 10% of the cases the opposite is true: the reported number of employees trained towards a NRQ is greater than the sum of employees trained at the different levels, signalling that respondents were unable to exactly identify the detailed structure of training. Overleaf, we present the approach used to “clean” the 20% of cases where mismatches occurred.
- Finally, and most importantly for our purposes, there is a fundamental uncertainty associated to the treatment of the reported number of Apprenticeships undertaken at firm level. In the next pages, we investigate the nature and the extent of this issue in detail.

Apprenticeships and training in the NESS - nature and extent of the mismatch

According to data reported in the 2009 NESS, around 60,000 firms reported to have undertaken some form of training, corresponding to more than 75% of the total. Slightly more than 32,000 firms (around 40% of firms providing some form of training) reported to have trained at least one employee towards a Nationally Recognised Qualification (NRQ).

⁶⁷ For example a firm may train 20 employees overall, 10 of those trained towards a NRQ, and then report that 100% of training has been arranged for *health & safety* and *induction* training (which is not consistent with the fact that 10 employees have been trained towards a NRQ). It is likely that in these cases respondents report that all trained employees (or all employees in general) have also received *health & safety* or *induction* training rather than all training arranged by the firm was for *health & safety* or *induction*

In a separate section the NESS asks whether firms are offering Apprenticeships and the number of employees undertaking an Apprenticeship over the last 12 months. The results show that more than 4,200 firms had at least one employee undertaking an Apprenticeship in the period considered. However, almost 30% of these firms reported either not to have undertaken any form of training (8%) or not to have undertaken a specific form of training (off-the-job, 9%, or on-the job, 13%). Moreover in more than 30% of cases (1,276) the number of employees receiving training towards a NRQ is lower than the number of apprentices.

Given that training towards an apprenticeship includes both off-the-job and on-the-job training and also includes training towards a NRQ, it seems clear that a number of respondents considered apprenticeships to be additional to other forms of training being undertaken. However other respondents seem to include the number of apprenticeships in the training undertaken towards a NRQ, given that there is a close correspondence between the two numbers. The inconsistencies might be explained by the fact that questions on training and apprenticeships are asked in different sections of the NESS questionnaire and that does not seem to be any cross-validation of the reported responses across sections.

It is therefore unclear whether the number of apprenticeships undertaken should be considered additional to other forms of training or, rather, should be included in total training reported. The answer is likely to depend on the specific case, being related to how the respondent considered apprenticeships.

Table 30: Mismatch between reported training and Apprenticeships in the NESS				
Firms with employees undertaking apprenticeships	No form of training reported	No off-the-job training reported (only)	No on-the-job training reported (only)	Total
4,239	349 (8.2%)	370 (9.5%)	499 (12.8%)	1,233 (29.1%)
Cases where total training to a NRQ is less than total Apprenticeships (<i>Trained_nrq < Appr_total</i>)				
1,276 (30.1%)	349 (27.3%)	464 (36.4%)	477 (37.4%)	1,276 (30.1%)

Source: London Economics elaboration of the NESS

Moreover, and to complicate things even further, it is possible that some respondents identify apprentices with the number of non-fully qualified employees undertaking some form of training rather than employees trained towards formal apprenticeships. If this is the case their response will overestimate the number of apprenticeships undertaken at firm level and could also help explain why the number of apprenticeships being undertaken is greater than the number of employees receiving training towards a NRQ.

In fact, and to support the hypothesis that some respondents may not refer to formal apprenticeships when reporting the number of apprenticeships, more than 90% of all respondents indicate that they have heard of apprenticeships, but the proportion drops drastically when respondents are asked about awareness of specific types of apprenticeships. Table 25 presents awareness of different types of apprenticeships and while around 92% of firms have heard of Government funded apprenticeships, almost 50% have not heard of any specific type of formal apprenticeship. Moreover the reported proportions are not very dissimilar across the group of firms having at least one employee

undertaking an apprenticeship and the group of firms without any staff currently undertaking an apprenticeship.

Table 31: Awareness of Apprenticeships						
Awareness of:	No Apprenticeships		Apprenticeships		Total	
	No.	%	No.	%	No.	%
Advanced Apprenticeships	6,324	8.5%	338	7.3%	6,662	8.4%
Adult Apprenticeships	7,428	10.0%	431	9.4%	7,859	9.9%
Higher Apprenticeships	709	1.0%	14	0.3%	723	0.9%
Advanced and Adult Apprenticeships	5,925	7.9%	527	11.5%	6,452	8.2%
Adult and Higher Apprenticeships	1,611	2.2%	73	1.6%	1,684	2.1%
Advanced and Higher Apprenticeships	747	1.0%	42	0.9%	789	1.0%
Advanced, Adult and Higher Apprenticeships	9,475	12.7%	811	17.6%	10,286	13.0%
No specific form of Apprenticeships	35,600	47.8%	2,366	51.4%	37,966	48.0%
Not heard of Government Apprenticeships	6,731	9.0%	0	0.0%	6,731	8.5%
Total	74,550		4,602		79,152	

Note: **No Apprenticeships**=no member of staff is currently undertaking an Apprenticeship;

Apprenticeships=at least one member of staff is currently undertaking an Apprenticeship

Source: London Economics elaboration of the NESS

Unfortunately, without further investigation and cross-validation in the NESS questionnaire it is not possible to ascertain whether the number of apprenticeships were included or not in the overall training reported and whether the reported number of apprenticeships solely refer to training towards a formal apprenticeship or also include informal training undertaken by non-fully qualified employees.

Below we outline our approach to cleaning the training variable. Although we have considered various approaches, the high degree of uncertainty on how to treat the apprenticeship variable resulted in the adoption of a relatively simple approach. Refining the approach used might be possible (using for example information on training on-the-job or off-the-job or awareness of formal apprenticeships), but might not result in any more plausible estimate given the little or no information available on how respondents considered apprenticeships and total training.

Cleaning strategy

The strategy implemented starts from the variables reported in the NESS and aims to generate a “clean” variable for the number and proportion of employees receiving training (overall and towards a Nationally Recognised Qualification). The following steps were undertaken:

1. Reconcile the total number of employees receiving training and the total number of employees receiving training towards a NRQ (when the latter is larger than the former)
2. Generate a variable for total training undertaken, excluding the proportion of training. Consider total training to be equal to training towards a NRQ if the new measure of total training is smaller than training undertaken towards a NRQ.

3. Number of apprenticeships: as already mentioned, we have considered different approaches, making use of whether the respondent reported to provide training on-the-job, off-the-job or both (and possibly also using reported awareness of apprenticeships). However, given the high degree of uncertainty, we decided to employ a straightforward approach, considering apprenticeships as being additional to (or included in) training towards a NRQ when the number of apprenticeships was greater (smaller) than the number of employees receiving training towards a NRQ. In detail:
- I. $\text{Trained_nrq} \geq \text{appr_total} \implies$ **consider apprenticeships as being already included in the total number of employees being trained towards a NRQ and total training.**
 - II. $\text{Trained_nrq} < \text{appr_total} \implies$ **consider apprenticeships as being fully excluded from the measure of training towards a NRQ and total training (not reported in the number of employees being trained towards a NRQ and total training)**
 - III. Trained_total and $\text{trained_nrq} = 0$ and $\text{appr_total} > 0 \implies$ **apprenticeships are the only form of training being undertaken**
4. Divide the revised measure of **trained_total** by the overall number of employees – there is around 1,500 cases where **trained_total** > number of employees (mainly due to the fact that the training variables refer to training undertaken during the last 12 months, while the question on the number of employees refer to the point in time). Consider that the trained proportion is equal to one if the mismatch is small.

Further cleaning - Detailed structure of training towards a Nationally Recognised Qualification

As already mentioned, in around 20% of cases the figure reported for the total number of employees trained towards a Nationally Recognised Qualification (questions E7I and E7B in the NESS questionnaire) is different from the sum of the number of employees trained to different levels of the NQF (questions E7CII):

- I. *For slightly more than 10% of cases the number of those trained to a nationally recognised qualification is less than the sum of those trained to L1, 2, 3 and 4. Barring reporting error, this may happen when one employee receives more than one qualification at different levels (for example L3 and L2) in the same year, and therefore would be reported twice in training to specific levels but only once in the overall estimate.*
- II. *For another 10% of cases the number of those trained to a nationally recognised qualification is greater than the sum of those trained to L1, 2, 3 and 4. This may occur because some employers were able to identify the level of qualification for only some, and not all, of their trained employees.*

Case (I) means that the number of people qualified to a Nationally Recognised Qualification is less than the total number of people trained to Levels 1 through to 4. To try and resolve this issue, we decided to work backwards, starting at level 4, and allocating

employees to the higher levels until we reach the total number of people training towards a Nationally Recognised Qualification. For example a firm reporting to have trained 35 employees, but 10 employees to each Level (from 1 to 4) would have a mismatch of 5 employees (35 reported as the total number compared the sum of the figures reported for each level separately (40)). In this case we would allocate 10 employees each to L4, L3 and L2 and the remaining 5 employees to L1. We use this method because there could be some people that have received training to, for example, both Level 1 and Level 2 in the same year, and therefore would have been reported twice.

In case (//) we assumed that the proportions reported reflect the true proportions and just rescaled the number of employees trained to each level by a factor (greater than one) k such that the sum of the specific levels (scaled up) equals the total number of employees trained towards a NRQ.

Overleaf, we review in detail the different cleaning steps undertaken to reconcile the various information on training provided in the NESS.

Table 32: Data cleaning steps in the NESS		
Step	Issue	Action
PRELIMINARY STEPS		
Generate a new variable identifying training towards a NRQ (<i>trained_nrq</i>)		
	<i>Number of trained employees(E4CDER)>trained_nrq</i>	Replace <i>trained_nrq</i> = E4CI if the value for the overall number of employees receiving training is the point estimate and the number of <i>trained_nrq</i> is imputed (mid-point) and they belong to the same band (122 cases)
Generate a new variable identifying total training (<i>trained_total</i>) excluding H&S training		
	<i>Health & safety and induction training is not relevant for the current analysis</i>	Remove the proportion of training arranged for <i>health & safety</i> and <i>induction</i> training from <i>trained_total</i>
	<i>Trained_total<trained_nrq</i>	Replace <i>trained_total=trained_nrq</i> (15,339 cases for the new measure of <i>trained_total</i>)
APPRENTICESHIPS		
Are apprenticeships included or excluded from total training (and training towards a NRQ) already reported? Distinguish the following cases		
	<i>appr_total<=total_nrq</i>	Assume apprenticeships are part of total training towards a NRQ (and hence total training) – No Action (2,963 cases)
	<i>appr_total>total_nrq</i>	Assume apprenticeships are (fully) additional and add them to total training (992 cases)
	<i>trained_total=0&appr_total≠0</i>	Assume all training is undertaken through apprenticeships; replace <i>appr_total=trained_total</i> (349 cases)
PROPORTION OF EMPLOYEES RECEIVING TRAINING		
New variable identifying the proportion of employees receiving training (<i>trained_prop=trained_total/total number of employees</i>) – possible mismatch if the total number of employees is less than the number of employees receiving training (<i>trained_total</i>)		
	<i>Trained_prop>1</i>	Replace <i>trained_prop</i> to 1 if the difference between <i>trained_total</i> and total employees is less than 3 or if the ratio (<i>trained_prop</i>) is less than 1.1. Discard all other cases when <i>trained_prop>1</i> (430 cases)
DETAILED STRUCTURE OF TRAINING TOWARDS A NRQ		
Mismatch between the total number of employees trained towards a NRQ and the sum of the numbers reported for each level separately (L1-L4)		
	<i>Trained_nrq<sum(L1+L2+L3+L4)</i>	Allocate employees to the specific levels starting from L4. Numbers in excess are removed from the lower levels
	<i>Trained_nrq>sum(L1+L2+L3+L4)</i>	Rescale the number of employees trained to each level by the factor <i>k</i> (greater than one) equalling the two totals i.e <i>k</i> is such that <i>Trained_nrq=k*sum(L1+L2+L3+L4)</i>

Source: London Economics

3.6.1 What we might be able measure – stage 3

Using the variables described above, we introduce what it might be possible to measure using the NESS, assuming the right counterfactual can be correctly identified.

Quantitative additionality and DWL

We can consider the difference in the overall proportion of employees receiving training as a proxy for quantitative additionality (an overestimate), though subject to caveats. The variables on apprenticeships report the number of employees being trained, although we are unable to identify the number of employees receiving training through the *Train to Gain* initiative.

Therefore, we are only able to identify differences in the proportion of employees being trained between the apprenticeship treatment and counterfactual group⁶⁸ using the variable **Trained_prop** (under the assumption that the latter has correctly been identified). This would provide an (over)-estimate of quantitative additionality, but as explained in section 2, any model specification will be unable to identify accreditation, displacement or substitution resulting in an aggregate measure of deadweight loss.

For those firms in the *Train to Gain* treatment group, we can hypothesise that any additional training undertaken by the firm (relative to the control group) is through *Train to Gain*, thereby allowing for a very rough upper bound of the extent to that quantitative additionality may exist. However, again, we will not be able to estimate even an aggregate measure of deadweight loss, unless we assume that all training towards Nationally Recognised Qualifications is undertaken through *Train to Gain*.

Qualitative additionality

We were also interested in multiplying the average length of training (**Length**) and the number of employees trained as a proportion of the total number of employees (**Trained_prop**), to generate an effective amount of training provided for use as an outcome variable for the estimation of qualitative deadweight.

We see more opportunity in exploiting NESS information to generate an estimate of qualitative additionality/ deadweight loss. There are a number of possibilities in relation to apprenticeship training. Using the average length of training (**Length**) and the number of employees trained as a proportion of the total number of employees (**Trained_prop**), we generated an effective amount of training provided (Effective volume of training received or **Eff_vol**⁶⁹ as follows:

⁶⁸ The NESS also contains information on the proportion of training attributable to health & safety induction, which might be removed from the overall amount of training provided (given the point in relation to training comparability).

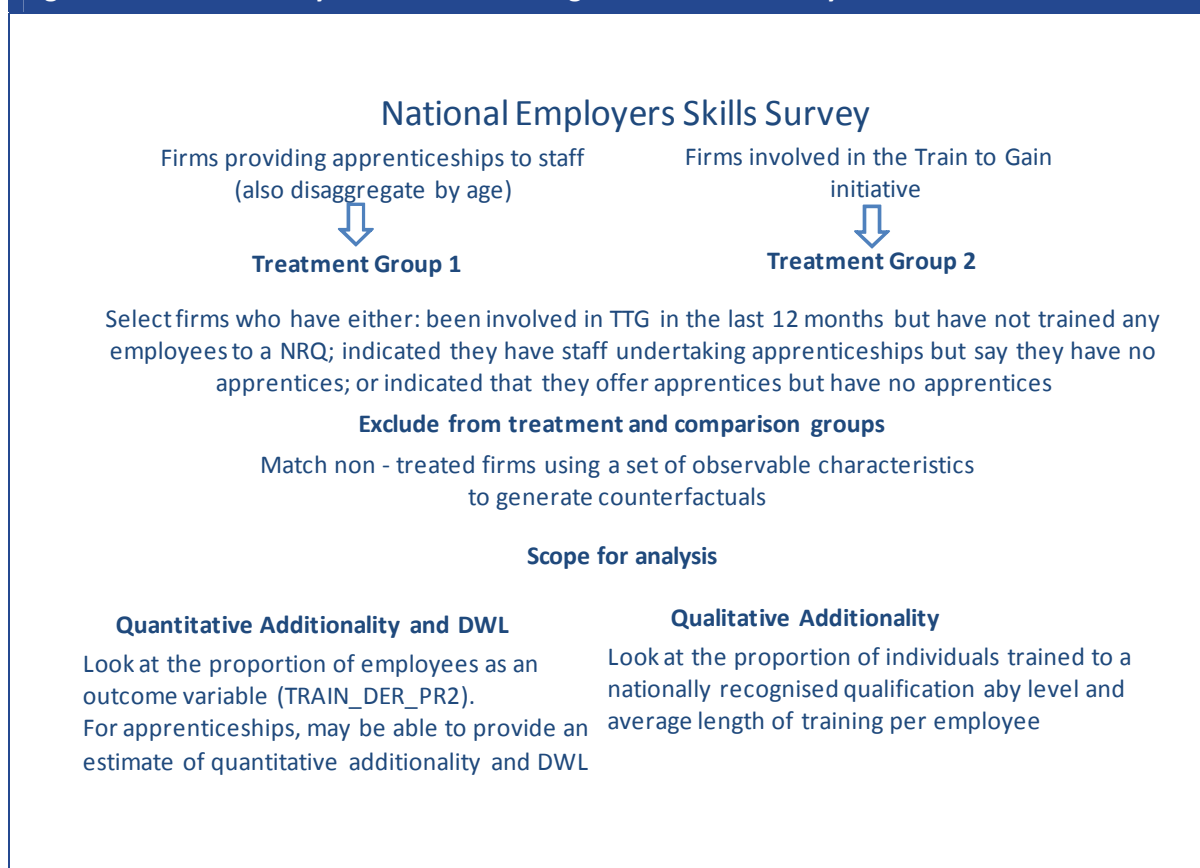
⁶⁹ Although we don't observe the level of Apprenticeships being undertaken, we do observe is the final structure of training – the number of people being trained to a national recognised qualification, and to different qualification levels. Moreover we also know that the vast majority of *Train to Gain* and Apprenticeships funding relates to Level 2 or Level 3 qualifications and we will try to focus on that when assessing the difference in training activities between treated and un-treated observations

- We multiplied the average length of training (**Length**) and the number of employees trained as a proportion of the total number of employees (**Trained_prop**), to generate an effective amount or volume of training provided for use as an outcome variable for the estimation of qualitative deadweight.

The comparison of this effective amount of training associated with apprenticeships could provide an estimate of qualitative additionality and deadweight loss.

Given the fact that there is no information on the number of individuals trained under *Train to Gain*, we believe that attempting to robustly estimate qualitative additionality or deadweight loss is not feasible for this programme. Given the absence of plausible alternatives, we explored this approach in relation to apprenticeships, although any results should be heavily caveated.

Figure 23: Intended analysis at firm level using the NESS – summary



Source: London Economics

Caveats

There are two main caveats to the analysis:

- **The first clearly relates to the identification of the counterfactual:** even after controlling for relevant variables available in the NESS, we cannot rule out the presence of unobservable differences between the treatment and control groups. Moreover, the more variables we control for in the matching process, the higher the probability of not finding any match for each treated observation. It might also be difficult to compare firms across different forms of training and funding: for

example we could observe cases where non-treated firms provide more training (at least quantitatively) than treated firms or treated firms providing “too much” private training (i.e. training more employees privately than the counterfactual).

- **The second caveat relates to the high degree of uncertainty surrounding the measure of total training and total apprenticeships undertaken.** Even if the cleaning strategy implemented should attenuate measurement error, the little information available on the different issues associated with the measures of training (whether apprenticeships are additional or already included in total training; whether the numbers reported for Apprenticeships only refer to formal Apprenticeships; the role of health and safety and induction training) imply that there is still a degree of uncertainty about the “true” value of total training and number of apprenticeships undertaken. However, it is important to note that although there is may be some measurement error in relation to a number of these dependent variables, this is less crucial than the existence of measurement error in the right hand side (independent) variables.

In Table 27 we present the variables we considered as outcome variables (quantitative/qualitative deadweight and additionality) following the Propensity Score Match.

Table 33: Data availability – NESS outcome variables	
Variable name	NESS
	Outcome variables
Quantitative deadweight and additionality	
Number employees engaged in training	<i>Total_trained</i>
Number of employees engaged in training as a proportion of total number of employees	<i>Trained_prop</i>
Number of employees engaged in training leading to a Nationally Recognised Qualification	<i>Trained_nrq</i>
Number of employees engaged in training leading to a Nationally Recognised Qualification as a proportion of total number of employees	<i>Trained_nrq_prop</i>
Qualitative deadweight and additionality	
Effective amount of training provided	<i>Eff_vol</i>
Level and type of qualification	<i>Lev1_prop, Lev2_prop, Lev3_prop, Lev4_prop</i>

Source: London Economics

In the next section, we detail the results following the detailed analysis of data.

4 Results

In the Propensity Score Matching process, we have considered a variety of matching estimators⁷⁰, and, given the minimal difference in the resulting outcome, we decided to use one-to-one matching (nearest neighbour) without replacement. While matching with replacement can be beneficial in terms of bias reduction, it also implies that the comparison group is likely to be smaller than the treatment group (observations in the comparison establishment may be matched on more than one occasion). Without replacement implies that each treatment establishment is matched to a different (nearest) comparison establishment⁷¹. As a further robustness check, we have also tried to vary slightly the set of matching variables, introducing variables such as skills gaps, hard to fill vacancies, and barriers to training etc. Again, results differed little when introducing new variables.

However, it is important to reiterate that a Propensity Score Matching approach on the available firm level characteristics may omit a number of potential unobserved characteristics that may influence firms' training habits. For example, the variables included may not necessarily cover all the dimensions of management quality and style, which may influence training policy within the firm. These unobservable characteristics (relating to the implicit likelihood of a firm undertaking employee training) may result in the estimated differences in training probabilities between the treatment and control groups occurring as a result of imperfect matching rather than the presence or absence of a particular policy intervention.

The information on the similarity of the observable characteristics between the treatment group and counterfactual are presented in section 3.4.3 and Annex 3 (for both the matching process associated with apprenticeships and *Train to Gain*). In summary, the findings suggest that across a wide range of variables, the matching process worked well with no obvious differences between the treatment and control groups of firms that would us to believe that the second stage results are biased.

4.1 Apprenticeships

The variables on apprenticeships report the number of employees being trained. Therefore, we are able to identify the difference in the proportion of employees being trained between the apprenticeship treatment and counterfactual groups⁷², which will provide an estimate of quantitative additionality. Any model specification will be unable to identify accreditation, displacement or substitution resulting in only an aggregate measure of deadweight loss.

⁷⁰ Such as one-to-one matching (nearest neighbour) with and without replacement, three nearest neighbours, calliper matching etc.

⁷¹ Dehejia, R & Wahba, S, (2002), *Propensity Score-Matching methods for non-experimental causal studies*, The Review of Economics and Statistics, Feb 2002, 84(1): 151-161

⁷² The NESS also contains information on the proportion of training attributable to health & safety induction, which might be removed from the overall amount of training provided (given the point in relation to training comparability).

4.1.1 Quantitative deadweight and additionality

The outcome variable of the first propensity score match is the proportion of employees undertaking training (**Total_trained**). The treatment group is formed of all firms with at least one employee undertaking an apprenticeship, while the control group is drawn from all other firms (also excluding those making use of other form of government funded training). Table 28 shows the results from this match. This gives us an estimate for the treated group of 45.6%, meaning that 45.6% of employees in the treated group receive some form of training (either publicly or privately funded). Under the assumption that the counterfactual is correctly identified, the estimate for the control group (33.1%) represents an estimate for the training that would have been undertaken in the absence of public intervention.

Table 34: Total training						
Variable	Sample	Treated (%)	Controls (%)	Difference	S.E	T-stat
<i>Trained_prop</i>	ATT	45.6%	33.1%	12.4 pp	0.01	13.83

Source: LE analysis of the NESS 2009. ATT – Average Treatment on the Treated.

Trained_prop - proportion of apprentices and trained employees to total number of employees

However, we cannot conclude that the difference between the control and the treatment group (12.4 percentage points) is the quantitative additionality from apprenticeships. This is because we do not know whether the difference between the treated and control groups is due to apprenticeships, other trained employees, or both.

In Table 29 we look at the proportion of privately funded training arranged in the treatment and counterfactual group. Clearly the estimate for the control group (33.1%) is unchanged compared to Table 28, given that firms in the comparison group have not undertaken any form of publicly funded training. The estimate for the treatment group stands at 28.3% and reflects the privately funded training provided by firms in the treatment group.

Table 35: Privately funded training						
Outcome Variable	Sample	Treated	Controls	Difference	S.E	T-stat
<i>Trained_priv_prop</i>	ATT	28.3%	33.1%	-4.8 pp	0.009	-5.51

Source: LE analysis of the NESS 2009 ATT – Average Treatment on the Treated.

Trained_priv_prop- proportion of employees receiving privately funded training to total number of employees

Using the estimates from Table 28 and Table 29 we can provide an estimate of quantitative deadweight and additionality for apprenticeships. Clearly, all the methodological and data issues presented should be taken into account when interpreting the results.

In the absence of publicly funded training in the form of apprenticeships, training incidence would have been 28.3%, which indicates a drop of 17 percentage points compared to the estimate of total training reported in Table 28. Given that the estimate for the control group is used as a benchmark for what would have happened in the absence of publicly funded training, we can disaggregate the difference into an estimate for deadweight loss (training that would have occurred anyway) and an estimate for quantitative additionality (training that would have not happened in the absence of public intervention). In fact, the difference between 28.3% and 33.1% (4.8pp) can be seen as an estimate of the **deadweight loss**

occurring and corresponds to around **28%** of the training undertaken through public funding.

Conversely, the difference between 33.1% and 45.6% (12.4pp) can be seen as an estimate of additionality, implying that approximately 72% of the training occurring through public funding is additional training.

Consequently, as a proportion of the total amount of apprenticeship training, deadweight is equal to approximately 28% and **additionality** is estimated to be approximately **72%** (Table 30). **Given the data limitations, care should be taken over these estimates.**

Table 36: Deadweight and additionality						
Outcome Variable	Treated (%) (ATT)	Control (%) (ATT)	DWL	Additionality	%DWL	%Add
<i>Trained_prop</i>	45.6%	33.1%		12.4 pp		72.1%
<i>Trained_priv_prop</i>	28.3%	33.1%	4.8 pp		27.9%	

Note: %DWL is calculated as $(0.048)/(0.048+0.124)$ and %ADD is calculated as $(0.124)/(0.048+0.124)$

Source: LE analysis of the NESS 2009. ATT – Average Treatment on the Treated.

Trained_prop - proportion of employees receiving privately funded training to total number of employees

Trained_priv_prop – proportion of employees receiving privately funded training to total number of employees

4.1.2 Disaggregated results – apprenticeship by age

Apprentices aged 16-24

In addition to the analysis presented previously considering all apprentices, we undertook the equivalent analysis focusing only on those firms training apprentices aged between 16 and 24, producing the following results (Table 31). The rationale for undertaking this disaggregated analysis was because apprentices over the age of 25 only receive public funding in a small number of specified cases (see section 2.1.3).

Table 37: Apprentices aged between 16 and 24						
Outcome Variable	Sample	Treated (%)	Controls (%)	Difference	S.E	T-stat
<i>Trained_prop</i>	ATT	44.7%	31.6%	13.1 pp	0.01	13.41
<i>Trained_priv_prop</i>	ATT	28.2%	31.6%	3.4 pp	0.01	-3.55

Source: LE analysis of the NESS 2009 ATT – Average Treatment on the Treated

Trained_prop - proportion of employees receiving privately funded training to total number of employees

Trained_priv_prop – proportion of employees receiving privately funded training to total number of employees

Given these results, deadweight loss is around **20.5%** when we focus on those apprentices aged between 16 and 24 compared to all apprentices (Table 32), which is lower than the estimates presented for the overall group of treated firms.

Outcome Variable	Treated (ATT)	Control (ATT)	DWL	Additionality	%DWL	%Add
<i>Trained_prop</i>	44.7%	31.6%		13.1 pp		79.5%
<i>Trained_priv_prop</i>	28.2%	31.6%	3.4 pp		20.5%	

Source: LE analysis of the NESS 2009 ATT – Average Treatment on the Treated.

Trained_prop - proportion of employees receiving privately funded training to total number of employees

Trained_priv_prop – proportion of employees receiving privately funded training to total number of employees

Using a similar approach, we also assessed the extent of deadweight loss and additionality within firms training apprentices aged between 16 and 18 and firms training apprentices aged between 19 and 24 separately. We estimated that the deadweight loss in the associated with apprenticeship training in firms with apprentices aged between 16 and 18 only was **15.6%**, increasing to approximately 27.3% for firm training apprentices aged between 19 and 24 only.

Apprentices aged 25 and over

In comparison, Table 33 demonstrates the equivalent results when looking only at those firms training only apprentices aged over 25. The results indicate that the estimate of deadweight loss stands at approximately **44%**, which implies that the extent of deadweight loss associated with the public funding of apprenticeships increases as the age of the apprentice increases. In other words, the greatest level of additionality associated with the public funding of apprenticeships is associated with the firms employing the youngest apprentices, with the least amount of additionality associated with the funding of apprentices over and above the age of 25. This result appears to support the rationale underpinning the funding allocation of apprenticeships depending on the age of the apprentice (i.e. 100% funding for apprentices aged between 16 and 18, 50% funding for apprentices aged between 19 and 24 with limited funding available for apprentices over the age of 25).

Outcome Variable	Sample	Treated	Controls	Difference	S.E	T-stat
<i>Trained_prop</i>	ATT	45.4%	36.0%	9.4 pp	0.031	3.040
<i>Trained_priv_prop</i>	ATT	28.7%	36.0%	-7.3 pp	0.031	-2.400

Source: LE analysis of the NESS 2009 ATT – Average Treatment on the Treated

Trained_prop - proportion of employees receiving privately funded training to total number of employees

Trained_priv_prop – proportion of employees receiving privately funded training to total number of employees

Table 40: Deadweight and additionality						
Outcome Variable	Treated (ATT)	Control (ATT)	DWL	Additionality	%DWL	%Add
<i>Trained_prop</i>	45.4%	36.0%		9.4 pp		56.3%
<i>Trained_priv_prop</i>	28.7%	36.0%	7.3 pp		43.7%	

Source: LE analysis of the NESS 2009 ATT – Average Treatment on the Treated

Trained_prop - proportion of employees receiving privately funded training to total number of employees

Trained_priv_prop – proportion of employees receiving privately funded training to total number of employees

4.1.3 Qualitative deadweight and additionality

We also exploit information from the NESS to help us try and generate an estimate of qualitative additionality/ deadweight loss. There are a number of possibilities in relation to apprenticeship training. Using the average length of training and the number of employees trained towards a Nationally Recognised Qualification, together with the qualification level, we originally proposed the generation of an effective amount of training provided (length (or qualification level) times number of employees receiving training)⁷³. The comparison of this effective amount of training associated with apprenticeships should provide an estimate of qualitative additionality and deadweight loss.

However, due to data limitations we are **unable to estimate qualitative deadweight**, as we are unable to allocate apprenticeships to a specific level of the Nationally Recognised Qualification (i.e. whether they are Intermediate, Advanced or Higher Apprenticeships). However we know that almost all apprenticeships are either at Level 2 or Level 3, with a tiny proportion at Level 4 so we would expect firms in the treatment group to have a higher proportion of employees trained at Level 2 and Level 3 of the National Qualification Framework.

In fact, looking at the results from Table 35, we can see that there is a difference in the proportion of employees receiving training between the treatment and control groups, with firms in the treatment group more likely to offer training at Levels 2 and 3. For example, 8.5% of employees are trained to Level 2 in the treatment group, compared to 3.6% in the control group. Similarly, treated firms trained 8.5% of employees to Level 3, compared to only 2.8% for the control group. However, we do not know how much of the percentage point difference is due to privately trained employees or apprentices. **This cannot be construed as an estimate of qualitative deadweight, but it does provide some interesting insights.**

⁷³ Although we don't observe the level of Apprenticeships being undertaken, we do observe is the final structure of training – the number of people being trained to a national recognised qualification, and to different qualification levels. Moreover we also know that the vast majority of *Train to Gain* and Apprenticeships funding relates to Level 2 or Level 3 qualifications and we will try to focus on that when assessing the difference in training activities between treated and un-treated observations

Table 41: Structure of training by qualification level						
Outcome Variable	Sample	Treated	Controls	Difference	S.E	T-stat
<i>LEV1_PROP</i>	ATT	4.3%	2.5%	1.8 pp	0.00	4.81
<i>LEV2_PROP</i>	ATT	8.5%	3.6%	5.0 pp	0.00	10.91
<i>LEV3_PROP</i>	ATT	8.5%	2.8%	5.6 pp	0.00	12.97
<i>LEV4_PROP</i>	ATT	2.7%	2.0%	0.7 pp	0.00	2.18

Source: LE analysis of the NESS 2009 ATT – Average Treatment on the Treated

The analysis presented in the previous table demonstrates the difference in the proportion of workers in receipt of training at different levels between the treatment and counterfactual groups. To at least partially address the possibility that there is a difference in the quality of the training received by those in receipt of publicly funded training compared to privately funded training only, we also compared the number of employees receiving training to different levels of the National Qualification Framework as a proportion of the total number of employees receiving training across treated and control firms. The analysis demonstrates that approximately 17.5% of workers receive training to Level 2 in the treatment group compared to 7.5% in the control group, while 17.5% of workers receive training to Level 3 compared to just 4.7% in the counterfactual group. This analysis (presented in Table 36) again suggests that the quality of training undertaken in the group of firms receiving public funding is indeed greater than what might have occurred in the absence of publicly funded training. Clearly an assessment of qualitative deadweight and additionality would require the availability of a matched employer-employee dataset.

Table 42: Structure of training by qualification level amongst those receiving training						
Outcome Variable	Sample	Treated	Controls	Difference	S.E	T-stat
<i>LEV1_PROP</i>	ATT	8.6%	5.5%	3.2 pp	0.006	4.890
<i>LEV2_PROP</i>	ATT	17.5%	7.5%	10.1 pp	0.008	12.600
<i>LEV3_PROP</i>	ATT	17.5%	6.3%	11.3 pp	0.008	14.560
<i>LEV4_PROP</i>	ATT	5.3%	4.7%	0.6 pp	0.005	1.150

Source: LE analysis of the NESS 2009 ATT – Average Treatment on the Treated

We also use the average length of training (in days) per employee (**Length**) as an outcome variable in our matching model (Table 37). Again, **we are unable to identify qualitative additionality from these estimates**. We interpret these estimates as an incorporation of both qualitative and quantitative deadweight. This is because the estimates illustrate the difference between the average length of training per employee between the treated and control groups, however, we do not know whether this difference is due to the extra people trained through apprenticeships (quantitative), or due to the same people being trained more intensively (qualitative).

Table 43: Average length of training per employee (days)						
Outcome Variable	Sample	Treated (days)	Controls (days)	Difference (days)	S.E	T-stat
<i>EFF_VOL</i>	ATT	6.03	3.94	2.09	0.44	4.73

Source: LE analysis of the NESS 2009 ATT – Average Treatment on the Treated

EFF_VOL – effective volume of training

Due to the fact that we do not know exactly where apprentices “fit in”, we are unable to separate the qualitative and quantitative elements of this estimate.

4.2 Train to Gain

For those firms in the *Train to Gain* treatment group, we can hypothesise that any additional training undertaken by the firm (relative to the control group) is through this programme, thereby allowing for a very rough upper bound of the extent to which quantitative additionality may exist. However, again, we are not able to estimate even an aggregate measure of deadweight loss, unless we assume that all training towards nationally recognised qualifications is undertaken through *Train to Gain*.

4.2.1 Quantitative deadweight and additionality

Table 38 illustrates that in the treatment group, 54% of employees are trained, whereas only 40% of employees are trained in the control group (so approximately 14 percentage points higher). However we don't know what proportion of this extra training is publicly funded and what proportion is privately funded, so we cannot draw any conclusions about additionality and deadweight loss associated to the *Train to Gain* programme; however, it does suggest a significant degree of additionality from the programme.

Outcome Variable	Sample	Treated	Controls	Difference	S.E	T-stat
<i>Trained_prop</i>	ATT	53.7%	40.0%	13.8 pp	0.01	24.32

Note: E4CDERPR2 is the number of employees trained as a proportion of the total number of employees

Source: LE analysis of the NESS 2009 ATT – Average Treatment on the Treated

Trained_prop - proportion of employees receiving privately funded training to total number of employees (scenario 1)

4.2.2 Qualitative deadweight and additionality

Given the fact that there is no information on the number of individuals trained under *Train to Gain*, we believe that attempting to robustly estimate qualitative additionality or deadweight loss is not feasible for this programme. We cannot estimate qualitative deadweight or additionality for the *Train to Gain* programme.

4.3 Where do these results sit within the wider evidence?

In Table 3 in Section 1.2.2 of this report, we provided a detailed review of the existing evidence relating to the extent and magnitudes of deadweight loss and additionality across a number of analyses at both firm-level and individual level. In Table 39 below, we replicate the results relating to firm level analyses.

Table 45: Summary firm-level evidence relating to deadweight loss

Author	Programme	Method	Quant. DWL	Qual. DWL	Estimate
LSC (2010)	Train to Gain (Broker-led)	Employer survey	Y	Y	24% (1)
LSC (2010)	Train to Gain (Broker/provider-led)	Employer survey	Y	Y	5-7% (2)
National Audit Office (2009)	Train to Gain	Secondary analysis*	Y	Y	50% (3)
LSC (2010)	Train to Gain (Provider-led)	Employer survey	N	Y	33% (4)
Abramovsky et al (2005)	Employer Training Pilots	Secondary analysis**	Y	N	85-90%
Hillage et al (2006),	Employer Training Pilots	Employer survey	Y	Y	83%
Anderson and Metcalf (2003)	Modern Apprenticeships	Secondary analysis***	Y	N	44%-53%
London Economics (2011)	Apprenticeships (quantitative only)	Secondary analysis [†]	Y	N	28%

Source: London Economics

Notes (1) Committed firms only; (2) Committed and participating firms only, (3) Committed and non-committed firms; (4) refers to the proportion of Level 2 qualifications that would have been provided to employees by employers (Committed and participating firms) in the absence of government funding. *The secondary analysis used the employer survey data collected as part of the LSC (2010) evaluation. ** Difference in difference analysis between Pilot areas and control areas. ***Secondary analysis using NIESR 2002 Survey of Modern Apprenticeship Employers. † Econometric analysis using propensity score matching model based on NESS data

It is important to remember that the analyses undertaken were based on different programmes, using different methodological approaches and definitions of deadweight, so may **not be directly comparable**. For example, our own estimates are based on Propensity Score Matching analysis of observed training behaviour in NESS, whereas those from the *Train to Gain* evaluation are based on asking employers what they would have done (hypothetically) in the absence of the programme.

Train to Gain

Looking at Employer Training Pilots (the precursor to *Train to Gain*) and *Train to Gain* specifically, the estimated measure of deadweight loss associated with Employer Training Pilots was in excess of 83%, while the estimates of deadweight loss for *Train to Gain* itself ranged between 5% and 50% depending on the assumption made in relation to the degree of engagement to the programme by firms (i.e. committed, not committed, committed and participating etc). Specifically, the analyses comparing firms 'engaged' with the *Train to Gain* programme in the broadest sense (i.e. aware but not necessarily 'committed' to *Train to Gain*) were associated with the highest estimates of deadweight - **50%** of employers who accessed training through *Train to Gain* would have arranged similar training in the absence of the programme. However, as the degree of engagement with *Train to Gain* increases, the estimates of deadweight loss decrease (qualitative deadweight was around 24% for firms 'committed' to *Train to Gain* and around 5-7% for firms 'committed and taking up the training offer'). As discussed throughout section 2 of the report, one of the key methodological issues when assessing deadweight loss relates to generating the appropriate counterfactual. It is questionable as to whether firms that are either not yet committed to *Train to Gain* or committed and not yet taking up the offer of training have the

same training needs or training circumstances compared to firms that are actually taking up the offer⁷⁴.

Therefore, considering the most appropriate counterfactual, which we believe consists of comparing those firms that are committed to *Train to Gain* and actually engaged in the *Train to Gain* offer, Furthermore, given that 'engaged' and 'committed' firms have not yet drawn any *Train to Gain* participation funding, it does not seem sensible to include them in an assessment considering the deadweight loss associated with such funding. For this reasons, our opinion is that the best estimates of deadweight loss associated with *Train to Gain* are at the lower end of this range. We thus believe it is reasonable to conclude that 93-95% employers did more or better training than they would have done in the absence of the *Train to Gain* programme.

However, given that *Train to Gain* funding is drawn at the level of an individual employee, this is the level at which we should arguably be assessing deadweight. The same LSC evaluation suggests that amongst provider-led employers, around 33% of employees who undertook a Level 2 qualification funded through *Train to Gain* would have undertaken this qualification in the absence of such funding. This implies that 67% of the qualifications gained through the programme were additional. However, some of the individuals gaining qualifications who would not have done so otherwise may still have received some training from their employer (even though it did not lead to a qualification), which means that quantitative deadweight, at an individual level, is likely to be higher than 33%. However, given the design of the evaluation survey, some caution should be exercised over these individual-level estimates.

Apprenticeships

Despite the many methodological and data difficulties associated with the analysis, our estimates indicate that the **quantitative deadweight loss** associated with Apprenticeships stands at approximately **28%**. This implies that in the absence of any publicly-funded apprenticeships, 28% of apprentices would have undertaken some training. The results also suggest that the estimate of deadweight loss stands at **16%** amongst firms offering training to 16-18 year olds only; approximately **27%** amongst firms offering apprenticeships to apprentices aged between 19 and 24 only; and approximately **44%** amongst firms offering training to apprentices aged over 25 only. However, these findings should be considered in light of the different funding arrangements for the different age groups e.g. in the absence of fully-funded 16-18 apprenticeships, 16% of learners would still have received some training; in the absence of co-funded 19-24 year-old apprenticeships, 27% of such learners would still have received some training; in the absence of the more limited funding for 25+ apprentices, 44% would have received some training.

These results are generally lower compared to those estimated in the only other study addressing apprenticeships (Anderson and Metcalf (2003), where the estimate of

⁷⁴ Similarly, the discrepancy between the incidence of training between broker-led and provider-led firms may indicate that the need for training does vary significantly across the sample of firms. Looking at provider-led employers, LSC (2010) estimate that 33% of employees who undertook a Level 2 course through Train-to-Gain were likely to have undertaken that qualification even in the absence of the programme. This compares with only 12% in broker-led employers, suggesting that provider-led employers are likely to have more urgent, pre-identified training needs.

deadweight loss ranged between 44% and 53% (depending on the level of apprenticeship). There are some very important caveats associated with the estimates. In particular, the analysis presented here only addresses the **quantitative deadweight** associated with apprenticeships. In other words, in addition to having a different methodological approach (i.e. a survey-based methodology rather than one based on an econometric analysis of treatment and control groups using secondary data), these analyses consider only those workers who would have received no training in the absence of publicly-funded apprenticeships (i.e. quantitative deadweight loss only). The previous assessments of *Train to Gain* also consider the extent to which workers received better training as a result of the programme (i.e. qualitative additionality). This explains why the figures presented in this analysis relating to Apprenticeships are not comparable with those results presented in Table 39 for *Train to Gain*.

From section 2 of this report outlining the conceptual framework for addressing deadweight loss and additionality, the lack of matched employer-employee data is likely to lead to any estimate of deadweight loss being an **over-estimate**. In addition, the estimate presented takes no account of the **qualitative additionality** (as mentioned above in relation to *Train to Gain*) that would potentially arise from apprenticeships that result from the fact that an apprenticeship consists of not just a standard National Vocational Qualification, but also a technical certificate and Key Skills qualification. As demonstrated, it is entirely probable that in the absence of government funding, employers would continue to undertake training of their employees to some extent, however, it is less likely that the training offered to employees would be as comprehensive as that currently provided.

To provide some evidence on this point, we identified those firms providing training to their workers (publicly or privately) and then assessed the proportion receiving training to different levels within the National Qualification Framework. Comparing the number of employees receiving training to different levels of the National Qualification Framework as a proportion of the total number of employees receiving training across treated and control firms, the analysis demonstrates that approximately 17.5% of workers receive training to Level 2 in the treatment group compared to 7.5% in the control group, while 17.5% of workers receive training to Level 3 compared to just 4.7% in the counterfactual group. This analysis suggests that the quality of training undertaken in the group of firms receiving public funding is greater than what might have occurred in the absence of publicly funded training.

Therefore, it is important to be aware that there is a qualitative additionality component associated with apprenticeships that may not be identified when comparing the levels of total training across firms (or training towards a nationally recognised qualification)⁷⁵.

The economic value associated with apprenticeships

A second important point relates to understanding the economic value associated with apprenticeship qualifications. As discussed in sections 1 and 2 of this report, although all

⁷⁵ In relation to what might happen to apprenticeship training in the absence of government funded training, some indication can be provided from the substantial reduction in the number of apprenticeships in the late 1980s and early 1990s following the withdrawal of government and levy funding (see section 1 using an analysis of the Labour Force Survey).

public interventions will have some degree of deadweight loss, the economic benefits generated by the individual and the Exchequer may be great enough to still warrant that intervention. As such, it may be optimal for the government to invest in a training programme associated with deadweight rather than an intervention that produces significantly lower economic benefits but with more limited deadweight loss associated with it. In other words, the existence of deadweight per se is an insufficient reason for government intervention not to take place.

From previous work undertaken by London Economics (2011)⁷⁶, using 15 years of Labour Force Survey data, this analysis demonstrated that there are significant employment returns associated with all forms of apprenticeship. Individuals in possession of Foundation apprenticeships are **10 percentage points** more likely to be employed (compared to individuals in possession of Level 1 academic or vocational qualifications), while individuals in possession of Advanced apprenticeships are almost **14 percentage points** more likely to be employed (compared to individuals in possession of Level 2 academic or vocational qualifications). In addition, there are sizeable earnings returns, with Advanced and Foundation apprenticeships generating 22% and 11% earnings returns compared to the relevant counterfactual⁷⁷.

Converting these labour market outcomes into monetary values, the analysis suggests that the present value of the lifetime benefits associated with the acquisition of apprenticeships at Foundation and Advanced level are very significant, standing at between **£48,000** and **£74,000** for Foundation apprenticeships and between **£77,000** and **£117,000** for Advanced apprenticeships. Through the modelling of enhanced income and National Insurance receipts, the analysis also demonstrates returns to the Exchequer of between **£33,000** and **£48,000** for Foundation apprenticeships (equivalent to a rate of return of between 11% and 14%), and between **£56,000** and **£81,000** for Advanced apprenticeships (equivalent to a rate of return of between 27% and 31%). These returns are between **2 and 3 times higher** than the economic and Exchequer returns associated with stand-alone National Vocational Qualifications at the equivalent level. This information is presented in Table 40.

⁷⁶ London Economics (2011), "The returns to intermediate and low level vocational qualifications", a report undertaken for the Department for Business Innovation and Skills, September 2011.

⁷⁷ These estimates replicate the analysis undertaken by McIntosh (2007), which demonstrated an 18% earnings return to Advanced apprenticeships and a 16% earnings return to Foundation Apprenticeships (both approaches use weekly earnings as the dependent variable). The London Economics (2011) analysis, upon which the individual and Exchequer benefits are assessed, use hourly earnings as the dependent variable and find an earnings premium of 13% and 8% for Advanced and Foundation apprenticeships respectively.

Table 46: Individual and Exchequer returns associated with vocational qualification attainment					
		Individual		Exchequer	
		Apprenticeship	NVQ	Apprenticeship	NVQ
Level 2	NPV Benefits	£48,324 - £74,387	£24,466 - £49,814	£31,484 - £47,540	£9,065 - £23,652
	Rate of return	50% - 69%	46% - 83%	14% - 18%	7% - 11%
Level 3	NPV Benefits	£76,990 - £117,337	£37,044 - £66,984	£55,632 - £80,661	£20,878 - £36,965
	Rate of return	67% - 86%	68% - 98%	27% - 33%	20% - 29%

Source: London Economics (2011)

In other words, the London Economics (2011) analysis demonstrates the significant economic value generated by the individual and the Exchequer through the provision of apprenticeships in absolute terms, but also the significantly higher returns compared to a number of other qualifications including stand-alone National Vocational Qualifications. This supports the idea that there may be substantial qualitative additionality associated with apprenticeships that simply cannot be estimated due to the lack of sufficient data (but are rewarded in the labour market), and that government intervention remains justified when significant economic value exists and can be exploited.

5 Conclusions and recommendations

5.1 General recommendations in relation to future work

Having developed a conceptual framework for the definition and measurement of deadweight loss and additionality, and undertaken a detailed assessment of the various data sources available for exploration, the results are somewhat disappointing from an empirical perspective. We do not wish to dwell on the various limitations in the data; however, they are entirely to be expected, given the fact that the various surveys were never conducted with the primary intention of assessing deadweight loss or additionality. The need for detailed information at both individual and employer level suggests that it was never wholly likely that entirely robust estimates would emerge.

There are two main problems associated with the estimation of deadweight loss and additionality: the quality and extensiveness of the required data and the identification of a suitable counterfactual. While the availability of a rich dataset is a necessary condition for the identification of the counterfactual, it may not be sufficient to accurately identify what would have happened in the absence of government intervention and the extent of deadweight loss and additionality.

The question that now needs to be addressed relates to how might deadweight loss and additionality be estimated consistently going forward? There are two fundamental approaches (and various options within each approach). Given the fact that existing secondary data is currently insufficient in providing robust estimates (as demonstrated throughout this report), the first approach relates to ensuring that whatever data is collected through existing processes addresses some of the relatively straightforward issues that have limited the effectiveness of the current analysis. The second approach involves the collection of new data specifically designed to address deadweight loss and additionality.

As suggested before, the manipulation of existing secondary data in their current form – either stand-alone or merged employee-employer data – is unable to withstand the intensity of the analysis required to produce robust estimates.

The straightforward approach – better use of existing data

It is clearly inefficient not to make the greatest use of existing information. Although the current version of the National Employers Skills Survey lacks certain key information, it would appear to be relatively straightforward to ensure that a small number of consistent and additional questions might be included in the survey of employers to increase the value of the data collected. For instance, we think it would be beneficial to ask employers about the following:

- the numbers of individuals that have received training on particular programmes (e.g. *Train to Gain* and apprenticeships);
- the number of employees reaching different levels of Nationally Recognised Qualifications that firm provided training leads to (e.g. *Train to Gain* and apprenticeships);
- the incorporation of a number of checks to ensure that the numbers receiving training (in general) and training to specific qualification levels are consistent;
- the amendment of the administration of survey modules relating to apprenticeship training and more general employer provided training to ensure that the treatment of the alternative types of training is consistent and double-counting/ omission is eliminated; and
- the incorporation of a number of checks to ensure that the responses relating to employees receiving apprenticeship training is compatible with the responses relating to the numbers of employees receiving on-the-job and off-the-job training.

Direct approach

We also think that it might be beneficial to ask a small number of questions specifically in relation to deadweight loss and additionality. In general, the approach that we have adopted for assessing deadweight loss and additionality has been based on the fact that there is no direct approach for addressing the topic. Asking employers about the training undertaken within the firm, and what might have happened in the absence of public intervention (using a small module of questions specifically designed for the purpose) is a reasonable approach to ascertain some of the measures of deadweight loss and additionality and might reduce the need for more elaborate strategies. This is currently being undertaken by the Department as part of a survey of apprenticeship employers. This option should be seriously considered, however is of little worth if the wider data contained in the NESS is questionable.

Addressing a number of the central conceptual issues and data limitations relating to deadweight loss and additionality, there are a series of questions in relation to the fees and subsidies received for apprenticeships; how changes in the costs of apprenticeship training (and removal of subsidies) might affect the provision of apprenticeship training; whether the employer has shifted the structure of apprenticeship training in light of the different funding arrangements associated with different age-groups; and the nature of the non-apprenticeship training undertaken by the firm and the degree of complementarity/ substitutability between the different types of training. In addition, to understand the key metric of qualitative additionality, the survey could also probe respondents on the different components of apprenticeship training and the extent to which employers may have undertaken the different components of the apprenticeship in the (partial or total) absence of public funding.

Adopting this type of approach more widely and consistently would result in the elimination of a number of the key evidence gaps that currently exist relating to estimation of deadweight loss and additionality, and result in significant benefits for policy makers going forward.

Qualitative analysis

Clearly, quantitative analysis is just one way of understanding deadweight loss and additionality. From the conceptual framework, we demonstrated the complexity of the definition of deadweight loss and additionality, but also the difficulty in empirically estimating the various aggregated and disaggregated measures. An alternative approach would involve undertaking qualitative research with employers (focus groups and case studies) to understand precisely what training activity might have occurred in the absence of public funding. This would consider the decision-making processes undertaken by firms with regards to training, and develop a better understanding of the role of publicly-funded training in such decisions. Although this approach would not provide robust empirical estimates, it would have the advantage of providing a deeper understanding of the specific behavioural responses of employers in the absence of publicly funded training.

Data consistency


Greater effort needs to be made to ensure the internal consistency of the data collected. For instance, we found that there were a significant number of cases (in the NESS) where the number of employees receiving training was greater than the number of employees; and mismatch occurred between a range of variables (e.g. the number receiving training was less than the number of employees receiving training at different qualification levels; or the number of employees receiving on and off the job training (sometimes zero) and the number of apprentices (positive)). There was also some degree of uncertainty in relation to the treatment of apprenticeships (whether included or excluded from the number of employees receiving training overall). All the organisations involved in both the survey design and its subsequent administration should undertake all reasonable steps to ensure that data collected is usable and such inconsistencies removed. In general, linking NESS information across editions and improved matching options with other existing datasets would also generate a considerable improvement. The latest NESS survey questionnaire is in the process of being designed, so there is the opportunity to achieve some methodological progress in the very short term.

This 'straightforward' option would ensure that the information collected from the NESS would provide some estimates of quantitative and qualitative additionality, though as detailed throughout the report, even a 'clean' version of the NESS will still be unable to provide any indication of certain aspects of deadweight loss - such as accreditation, displacement or substitution – because it does not contain matched employer-employee information.

More advanced approaches – again using existing data

In section 2 of this report, we identified the level of information necessary to undertake a detailed assessment of deadweight loss and additionality. This is presented in Figure 21.

Figure 24: Theoretical data requirements

Increasing comprehensiveness of information 					
Tier of information needed for estimation of DWL/additionality					
	Tier1: Firm Level characteristics and 'circumstances' (for PSM)	Tier2: Level 1 plus Basic aggregate training information (no. employees, hours)	Tier3: Level 1 plus detailed training information (no. employees, hours, level, type, attainment)	Tier4: Level 3 plus Matched firm-employee level data – individual training profiles	Tier5: Level 4 plus employee level prior attainment
Accreditation	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required
Displacement	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required	Not required
Substitution	Required but not sufficient	Required but not sufficient	Required but not sufficient	Required	Not required
Qualitative DWL	Required but not sufficient	Required – estimate improves with more comprehensive data			Not required
Qualitative additionality	Required but not sufficient	Required – estimate improves with more comprehensive data			Not required
Pure additionality	Required but not sufficient	Possible overestimate – estimate improves with more comprehensive data			

Required but not sufficient	Implies that this information is necessary for the estimation, although in isolation, may not be sufficient (i.e. information is too weak/ not detailed enough)
Not required	Implies that this information is unnecessary for the estimation – superfluous to requirements if more detailed information is available
Required	Implies that this information is necessary and sufficient for the estimation of the associated element of deadweight loss/ additionality

Source: London Economics

Fundamentally, the analysis undertaken suggests that matched data at the employer-employee level is required to assess the various components of deadweight loss (quantitative and qualitative). In addition to detailed information on firm level characteristics, the level, intensity, qualifications and funding source of the training provided by the firm (and to whom), information at an individual level on employee characteristics (including prior attainment and skills) for those employees receiving and not receiving training is also required. Data must be collected with the intention of estimating deadweight loss and additionality using questionnaires that have been structured appropriately.

The best source of information at both employer and employee level in the United Kingdom in the past has been the Workplace Employers Relations Survey, which has not been undertaken since 2004, but has produced some very informative analyses on more difficult to measure economic concepts (such as human capital spillovers (Battu et al (2003), Metcalfe and Sloane (2007))). The WERS (traditionally) is a national sample of interviews with managers in approximately 2,200 firms with more than 10 employees, alongside a survey of up to 25 (randomly selected) employees in those firms incorporating the collection of personal and socioeconomic information (and training). Clearly, given the sample structure, there may be some issues about the representativeness of the findings (especially the selection of employees within firms); however, this source of information is likely to offer significant opportunities for assessing deadweight loss and additionality.

The 6th Workplace Employment Relations Survey is being currently undertaken with the data available from the start of 2012, so any amendments to the existing questionnaires is impossible; however, there may be an opportunity at some stage in the future to undertake a follow up module of questions specifically in relation to education and training that could be used to estimate awareness and engagement with government funded training

programmes with the ultimate objective of assessing deadweight loss and additionality. Given the fact that fieldwork is still currently being undertaken, the time gap between the original fieldwork and potential follow up may be relatively insignificant. However, given the fact that employees are randomly selected within each firm it may not be possible to ensure that the same workers complete any subsequent modules. As such, the option of a WERS follow up may not be a particularly cost effective or meaningful for BIS in the short term, although some serious consideration should be given to using the WERS in the future. This is the one existing data set that could be used to potentially address all components of deadweight loss and additionality.

It is also worth exploring the possibility of gathering some employee level information from other existing employer-level data sets (such as the BIS Employer Apprenticeship survey or the National Employers Skills Survey), as these options might provide a better option in cost effectiveness terms.

Fully fledged randomised trial

A final option that warrants consideration involves undertaking a fully fledged randomised trial replicating the type of analysis undertaken by Wolter and Messer (2009) in Switzerland. This approach selected a random sample of respondents within the Swiss Labour Force Survey sample and provided them with vouchers to undertake additional training and compared their training decisions with a control group of individuals (also within the Swiss LFS). Neither the group of individuals in receipt of vouchers nor the control group were informed of their participation in the trial. This approach is potentially expensive (the value of the voucher); however, the rolling panel nature of the LFS in the United Kingdom would allow for detailed information on the personal and socioeconomic characteristics of individuals in the treatment and control group to be collected at a relatively low marginal cost. The fact that the relevant administration of the treatment and the subsequent collection of the training related outcomes would occur under the auspices of the ONS would potentially improve the quality of the data and subsequent analysis, although the fact that this approach consists of a voucher system may limit the wider applicability of the results. Also, the concrete funding features of different education and training courses already in place must be taken into account, given that some courses are already subsidised for individuals meeting certain eligibility criteria. Some consideration of the cost effectiveness of replicating this approach would need to be taken.

The randomised trial approach above focuses on individuals. While a similar approach could also be undertaken at firm level, some degree of care would be needed to structure the training voucher correctly. In fact, at firm level we need to match on the characteristics of both firm and employees: it is not enough to have similar characteristics in terms of employees' age and skills structure at firm level, but the matching exercise would need to be performed pairing similar individuals (in terms of age, previous education attainments, etc.) employed by similar firms (considering all relevant firm-level characteristics). If a fully randomised trial of employers were to take place, the optimal approach might be to piggy-back on the next Workplace Employers Relations Survey. However, the key limitation with the WERS is the fact that only training for a random selection of employees is involved and we would not have any guarantee of surveying individuals receiving the voucher. This is a much longer term option but does provide sufficient time to ensure the methodological approach is properly developed and tested.

Annex 1 Further details of propensity score matching

A1.1 Theory

In the absence of a randomised trial, matching can ensure that we can construct an appropriate counterfactual group for the treated, pairing members of the treated group with members of the counterfactual group, based on observable characteristics. The underlying matching assumptions ensure that, the difference in the outcome variable is explained by programme participation. The two key assumptions underlying a matching strategy are the Conditional Independence Assumption, which ensure that we have all the relevant information characterising the selection rule and the decision to participate or not in the programme, and the existence of a Common Support Region, which implies that we can find a match for each treated observation among the non-treated (the region defined by the set of observable characteristics \mathbf{X} represented among the treated is also represented among the non-treated).

However it is virtually impossible to find an exact match on observable characteristics for each treated observation, even if we restrict the attention to a few variables. To avoid the dimensionality problem associated with matching on the values of \mathbf{X} , it is possible to match using a function of the matching variables \mathbf{X} (rather than the actual variables). This is normally carried out estimating a probability of participation based on \mathbf{X} , called $P(\mathbf{X})$, or propensity score, and defined as

$P(\mathbf{X}) = P(D = 1/\mathbf{X})$, where $D=1$ identifies programme participation.

This probability can be estimated through probit, logit or linear probability model and will enable us to match on the propensity score, rather than on the set of matching variables \mathbf{X} , solving the dimensionality problem (but relying on the parametric assumptions implied by the chosen parametric specification).

In other words and applying it to our specific case, the PSM process involves creating a score which indicates the likelihood of any particular firm undertaking publicly funded training, and even firms not engaged in publicly funded training will have an estimated probability of doing so. This score or probability is derived from a first stage estimation of a probit equation model where the dependent variable takes the value of one if a firm is engaged in publicly funded training and zero otherwise. Firm level characteristics, as described above (and in a later section when discussing specific data sets), are then added to the model to try to predict the likelihood of firms being in the programme (such as *Train to Gain*).

From this model each firm gets a predicted probability score, which in essence indicates the likelihood of that firm engaging in publicly funded training with their given characteristics. This score is then used as the basis for choosing a control group. In other words, firms training employees with the assistance of public funds will be matched with firms that are not using publicly funded training but have similar propensity scores.

To undertake this process in practice, as a first step, the firms are split into separate data files, each one representing a different potential ‘treatment’ (for instance, publicly funded work-based learning, publicly funded College based learning, both) before the propensity score matching analysis is conducted on each. This step ensures that publicly funded work-based learning firms in the treated group (for instance, *Train to Gain*) are matched with a non-treated firm, and similarly for publicly funded College-based training firms are matched with non-treated firms.

The choice of the matching variables is crucial, given that if we have too little information included in X we risk leaving out relevant variables characterising the participation rule and the Conditional Independence Assumption will not hold. Conversely, if we include too many variables in X the Common Support region might be empty. When deciding which characteristics to include among the matching variables, it is crucial to make sure that these variables are determined when training decisions are made, or at least they are not directly affected by the treatment status.

A1.2 Application

There are a variety of approaches to establishing the propensity score match, but we have found in the past that one of the optimal approaches involves “**one-to-one ‘nearest neighbour’ matching allowing replacement of control observations after matching, subject to a common support condition**”. We describe this in more detail below

One-to-one ‘nearest neighbour’ propensity score matching selects, for each treatment group firm, the one control group firm with the most similar p-score. Based on the range of firm-level characteristics in the model, the technique picks the two most alike firms at the baseline period (possibly prior to the introduction of a particular policy) with the crucial difference between them being that one firm is engaged in publicly funded training whereas the other is not. The starting premise is that we would expect, *ceteris paribus*, the two chosen firms to evolve along the same path with regard to training. Alternatively, it is also possible to match each participant to multiple nearest neighbours (generally 10), a strategy that will reduce variance (we use more information to construct the counterfactual for each participant) at the cost of increased bias (we are using poorer matches on average).

In conducting propensity score matching, there is a choice of allowing the **replacement** of control observations following matching or not. On the one hand, if no replacement is allowed, once a control firm has been matched to a treated firm, it is removed from the sample from which matches are selected for subsequent treatment firms. Therefore, whilst the approach yields unique matches of a control firm to each treated firm, the quality of the match of the propensity scores diminishes for the later treated firms (with the dataset ordered randomly), as the size of the control observation pool is reduced.

On the other hand, if replacement is allowed, each ‘matched’ control firm is returned to the control pool for all subsequent matches, and so the full sample of control firms is available from which to select a match for each treated firm. Therefore, this approach involves a trade-off between the introduction of a possible bias in attainment (due to replication of control observations in the matched sample) and the increased ‘fit’ of all matches, particularly those in the latter part of the sample. From previous experience, we normally allow replacement. The primary rationale for this choice is motivated by the superior ‘fit’ of

the treated/control firm matches. Given the potentially large size of our sample, the trade-off between the increased efficiency of the estimator and the potential bias introduced by allowing repetition is normally acceptable.

Finally, the **common support condition** imposes the filter that the propensity score of all treatment observations must fall within the minimum and the maximum propensity score of the control observations, otherwise treated observations are dropped. This further imposes a quality filter on the matches.

Annex 2 Detailed information from the EPS

A1– Number of employees

Over one quarter (26%) of establishments in England have between 50 and 249 employees, while almost 12% employ over 250 people (Table 41).

Number of employees	Number of responses	Percentage
2-4	1,033	10.95%
5-9	1,035	10.97%
10-24	1,885	19.99%
25-49	1,864	19.76%
50-249	2,485	26.35%
Over 250	1,130	11.98%
Total	9,432	100.00%

Note: Question A1: How many staff work at this establishment? By that I mean both full-time and part-time employees on your payroll.

Source: EPS (2010)

A2/A3 – single site/multisite

Overall 41.8% of establishments are single-site organisations, while 58.2% are one of a number of establishments within a larger organisation. Of those 58.2% which are multi-site organisations, almost half (47.8%) are branches and 23% are head offices (Table 42).

	Number of responses	Percentage
Is this establishment...?		
The only establishment in the organisation	3,939	41.8%
One of a number of establishments within a larger organisation	5,493	58.2%
Total	9,432	100%
If the establishment is one of a number of establishments within a larger organisation, is this site...?		
A branch	2,627	47.82%
A division / subsidiary	763	13.89%
An area / regional office	479	8.72%
Head office	1,262	22.97%
A franchised organisation	202	3.68%
Other	113	2.06%
Don't know	47	0.86%
Total	5,493	100.00%

Note: Question A2 is this establishment...?; Question A3: Can i just check, is this site...?

Source: EPS (2010)

A7 – Organisation type

Over two thirds of the organisations in England surveyed (77%) are mainly seeking to make a profit, whereas 14% are public sector employers and 8% are third sector employers (Table 43).

	Number of respondents	Percentage
Mainly seeking to make a profit	7,257	76.94%
A charity or voluntary sector organisation or a social enterprise	754	7.99%
A local-government financed body	815	8.64%
A central government financed body	528	5.60%
Other	57	0.60%
Don't know	21	0.22%
Total	9,432	100.00%

Note: Question A7: Would you classify your organisation as one...?

Source: EPS (2010)

B7/B8 – qualification structure

SIZE	2-4	5-9	10-24	25-49	50-249	Over 250	Total
Roughly how many of your staff are qualified to degree level or above?							
0-4	1,013	899	1,201	805	436	21	4,375
5-9	0	100	333	328	306	22	1,089
10-24	0	0	261	431	550	82	1,324
25-49	0	0	0	167	413	107	687
50-249	0	0	0	0	451	356	807
Over 250	0	0	0	0	0	230	230
Total	1,013	999	1,795	1,731	2,156	818	8,512

Note: Question B7: Thinking about your current staff, roughly how many of them are qualified to degree level or above – this includes those with HNDs, HNCs and Foundation Degrees as well as any postgraduate degrees.

Source: EPS (2010)

SIZE	2-4	5-9	10-24	25-49	50-249	Over 250	Total
Roughly how many of your staff hold a Level 3 qualification?							
0-4	985	841	931	398	187	17	3,359
5-9	0	102	494	388	177	5	1,166
10-24	0	0	253	690	674	59	1,676
25-49	0	0	0	157	533	85	775
50-249	0	0	0	0	406	423	829
Over 250	0	0	0	0	0	144	144
Total	985	943	1,678	1,633	1,977	733	7,949

Note: Question B8: How many of your remaining staff hold a Level 3 qualification such as A/AS Levels, NVQ Level 3, City & Guilds Advanced craft, OND/ONC/BTEC national or equivalent level qualifications.

Source: EPS (2010)

Outcome variables

D2A, D2B and TRAIN

As Table 46 shows, two thirds of organisations (66.9%) have arranged or funded off-the-job training in the last 12 months, whilst for on-the-job training this increases to almost three quarters of businesses (74.7%). Over 80% of establishments engage in either on- or off-the-job training for their employees.

	Number of respondents	Percentage
Off-the-job training (D2A)		
Yes	6,311	66.91%
No	2,968	31.47%
Don't know	153	1.62%
Total	9,432	100.00%
On-the-job training (D2B)		
Yes	7,041	74.65%
No	2,277	24.14%
Don't know	114	1.21%
Total	9,432	100.00%
Either type of training (TRAIN)		
Train	7,757	82.24%
Do not train	1,675	17.76%
Total	9,432	100.00%

Note: Question D2A: Now thinking about the ways in which you may develop your workforce, over the past 12 months have you arranged or funded any off-the-job training or development for employees at this site? By off-the-job training we mean training away from the individual's immediate work position, whether on your premises or elsewhere? Question D2B: And have you arranged or funded any on-the-job training and development over the last 12 months?

Source: EPS(2010)

We now look at the TRAIN variable cross tabulated with some of the matching variables mentioned in the previous section (Table 47). It appears that training is more likely to occur in larger firms, with only 45.2% of firms with 2-4 employees engaging in training, while for establishments with more than 50 firms, approximately 94% are involved in some form of training for their employees.

The three sectors which have the greatest proportion of firms using training are Education (92.6%), Health and social work (92.6%) and Public admin, defence and compulsory social security (92.0%). The sector with the smallest proportion of firms engaging in training is Agriculture, hunting and forestry and fishing (60.7%).

There is little variation between the number of firms arranging or funding training for their workforce across regions. For many regions, approximately 80% of firms have been involved in training their employees in the past 12 months.

Table 53: Summary of training activity (EPS)				
	Train	Do not train	Total	Proportion Train
Size of employer (no. Of employees)				
2-4	467	566	1033	45.21%
5-9	748	287	1035	72.27%
10-24	1504	381	1885	79.79%
25-49	1651	213	1864	88.57%
50-249	2316	169	2485	93.20%
Over 250	1071	59	1130	94.78%
<i>Total</i>	<i>7757</i>	<i>1675</i>	<i>9432</i>	<i>82.24%</i>
Sector				
Agriculture, hunting and forestry, fishing	122	79	201	60.70%
Mining and quarrying	50	13	63	79.37%
Manufacturing	610	137	747	81.66%
Electricity, gas and water supply	156	45	201	77.61%
Construction	648	172	820	79.02%
Personal household goods	1070	319	1389	77.03%
Hotels and restaurants	619	172	791	78.26%
Transport, storage and communication	676	184	860	78.60%
Financial intermediation	340	60	400	85.00%
Real estate, renting and business activities	1152	246	1398	82.40%
Public admin, defence, compulsory social security	425	37	462	91.99%
Education	552	44	596	92.62%
Health and social work	775	62	837	92.59%
Other community, social and personal service activities	562	105	667	84.26%
<i>Total</i>	<i>7757</i>	<i>1675</i>	<i>9432</i>	<i>82.24%</i>
Region				
East Midlands	789	162	951	82.97%
East of England	1084	249	1333	81.32%
London	988	208	1196	82.61%
North East	320	51	371	86.25%
North West	892	192	1084	82.29%
South East	1259	264	1523	82.67%
South West	819	193	1012	80.93%
West Midlands	913	207	1120	81.52%
Yorkshire and The Humber	693	149	842	82.30%
<i>Total</i>	<i>7757</i>	<i>1675</i>	<i>9432</i>	<i>82.24%</i>

Note: Question D2A: Now thinking about the ways in which you may develop your workforce, over the past 12 months have you arranged or funded any off-the-job training or development for employees at this site? By off-the-job training we mean training away from the individual's immediate work position, whether on your premises or elsewhere? Question D2B: And have you arranged or funded any on-the-job training and development over the last 12 months?

Source: EPS (2010)

We now look at the **E12_4** (Have you used or been involved with *Train to Gain* in the past 12 months?) variable cross tabulated with some of the matching variables mentioned in the previous section (Table 48). It appears that a greater proportion of smaller firms use *Train to Gain* compared to than larger firms.

Table 54: Use or involvement in Train to Gain (EPS)					
	Used T2G	Have not used T2G	Don't know	Total	Proportion T2G
Size of employer (no. Of employees)					
2-4	982	46	5	1,033	95.06%
5-9	945	86	4	1,035	91.30%
10-24	1,647	214	24	1,885	87.37%
25-49	1,515	318	31	1,864	81.28%
50-249	1,810	607	68	2,485	72.84%
Over 250	771	296	63	1,130	68.23%
<i>Total</i>	7,670	1,567	195	9,432	81.32%
Sector					
Agriculture, hunting and forestry, fishing	188	12	1	201	93.53%
Mining and quarrying	58	5	0	63	92.06%
Manufacturing	583	142	22	747	78.05%
Electricity, gas and water supply	178	23	0	201	88.56%
Construction	654	150	16	820	79.76%
Personal household goods	1,259	109	21	1,389	90.64%
Hotels and restaurants	709	74	8	791	89.63%
Transport, storage and communication	736	113	11	860	85.58%
Financial intermediation	353	38	9	400	88.25%
Real estate, renting and business activities	1,131	243	24	1,398	80.90%
Public admin, defence, compulsory social security	345	98	19	462	74.68%
Education	408	167	21	596	68.46%
Health and social work	527	277	33	837	62.96%
Other community, social and personal service activities	541	116	10	667	81.11%
<i>Total</i>	7,670	1,567	195	9,432	81.32%
Region					
East Midlands	782	153	16	951	82.23%
East of England	1,081	226	26	1,333	81.10%
London	1,023	153	20	1,196	85.54%
North East	290	70	11	371	78.17%
North West	848	213	23	1,084	78.23%
South East	1,218	275	30	1,523	79.97%
South West	824	167	21	1,012	81.42%
West Midlands	929	169	22	1,120	82.95%
Yorkshire and The Humber	675	141	26	842	80.17%
<i>Total</i>	7,670	1,567	195	9,432	81.32%

Note: Question E12_4: Have you used or been involved with *Train to Gain* in the past 12 months?

Source: EPS (2010)

The three sectors which have the greatest proportion of firms using *Train to Gain* are Agriculture, hunting and forestry and fishing (93.5%), Mining and quarrying (92%) and personal household goods (90.6%). The sector with the smallest proportion of firms using *Train to Gain* is Health and social work (63%).

There is little variation between the number of firms using or being involved in the *Train to Gain* programme across regions. For many regions, approximately 80% of firms have

been involved in *Train to Gain* in the past 12 months. However, London has the highest use of *Train to Gain*, where approximately 85% of organisations have used the programme.

We now look at the **E17** (Do you currently have any staff undertaking Apprenticeships at this site?) variable cross tabulated with some of the matching variables mentioned in the previous section (Table 49). Unsurprisingly, it appears that a greater proportion of larger firms have staff undertaking Apprenticeships than smaller firms.

There appears to be a relatively low proportion of firms with staff undertaking Apprenticeships across most sectors of the economy, with not one sector above 50%. The three sectors which have the greatest proportion of firms with staff undertaking Apprenticeships are Construction (39.1%), Manufacturing (34.8%) and Public administration, defence, compulsory social security (29.2%). Comparatively, less than 10% of firms in the Agriculture, hunting and forestry, fishing sector have staff undertaking Apprenticeships at their site.

There is little variation between the number of firms who have an Apprentice at their site across regions. For many regions, approximately 20-30% of firms currently have an apprentice. This ranges from 16.7% of firms in London to 31.3% of firms in the North East.

Table 55: Staff undertaking Apprenticeships (EPS)					
	Used T2G	Have not used T2G	Don't know	Total	Proportion T2G
Size of employer (no. Of employees)					
2-4	23	486	0	509	4.52%
5-9	53	497	2	552	9.60%
10-24	157	898	4	1,059	14.83%
25-49	239	871	3	1,113	21.47%
50-249	475	1,151	13	1,639	28.98%
Over 250	407	424	27	858	47.44%
<i>Total</i>	1,354	4,327	49	5,730	23.63%
Sector					
Agriculture, hunting and forestry, fishing	9	87	0	96	9.38%
Mining and quarrying	6	28	1	35	17.14%
Manufacturing	172	321	2	495	34.75%
Electricity, gas and water supply	17	89	0	106	16.04%
Construction	198	308	0	506	39.13%
Personal household goods	196	586	3	785	24.97%
Hotels and restaurants	103	351	1	455	22.64%
Transport, storage and communication	66	376	1	443	14.90%
Financial intermediation	31	200	3	234	13.25%
Real estate, renting and business activities	168	666	9	843	19.93%
Public admin, defence, compulsory social security	92	219	4	315	29.21%
Education	102	307	13	422	24.17%
Health and social work	117	435	9	561	20.86%
Other community, social and personal service activities	77	354	3	434	17.74%
<i>Total</i>	1,354	4,327	49	5,730	23.63%
Region					
East Midlands	140	472	8	620	22.58%
East of England	163	611	5	779	20.92%
London	105	516	7	628	16.72%
North East	84	183	2	269	31.23%
North West	194	487	3	684	28.36%
South East	204	690	10	904	22.57%
South West	149	459	7	615	24.23%
West Midlands	166	515	6	687	24.16%
Yorkshire and The Humber	149	394	1	544	27.39%
<i>Total</i>	1,354	4,327	49	5,730	23.63%

Note: Question E17: Do you currently have any staff undertaking Apprenticeships at this site?

Source: EPS (2010)

Given the discussion presented in section 3 in relation to whether it is possible to estimate deadweight loss and additionality through the propensity score matching approach, an interesting variable that we have found in the EPS is the organisations perception of the importance of government support for training and development (**E19B**). Table 50 shows that of those firms that use some type of training, about 50% thought that government support was 'irrelevant'.

Table 56: Importance of government support for training and development (EPS)

	Train	Do not train	Total
Irrelevant	3,906	1,149	5,055
Neutral	1,037	163	1,200
A key resource	2,613	309	2,922
Don't know	201	54	255
Total	7,757	1,675	9,432

Note: Question E19B How important is government support for training and development to your establishment? 'Irrelevant' is a score of 1 to 4, 'Neutral' is a score of 5, 'A key resource' is a score between 6 and 10 on a scale from 1-10 where 1 = largely irrelevant and 10 = a key resource.

Source: EPS (2010)

Annex 3 Descriptive statistics of the treatment and counterfactual groups

A3.1 Apprentices

In this section we compare the distribution of each of the matching variables in the treated and counterfactual groups. Table 51 shows that the distribution for the number of employees in the untreated and treated groups is quite similar.

A1B6	Untreated (%)	Treated (%)	Total (%)
2-4	16.5	14.7	15.6
5-24	47.6	49.7	48.7
25-99	25.7	24.7	25.1
100-199	5.75	5.2	5.4
200-499	3.7	4.9	4.3
500+	0.9	0.9	0.9
Total	100	100	100

Source: LE analysis of the NESS 2009

For sector, there are some cases where the distribution is slightly different when comparing the untreated and treated groups (Table 52). For example, 7.1% of untreated firms are in the construction sector whereas 17.1% of treated firms are. In the hotels and restaurants sector, untreated and treated are 12.1% and 5.5% respectively.

Table 58: PSM Comparison of sector of operation (NESS)			
NEWSECTOR	Untreated (%)	Treated (%)	Total (%)
Agriculture, Hunting and forestry, fishing	2.8	1.1	1.9
Mining & Quarrying	0.1	0.1	0.1
Manufacturing	14.6	19.6	17.2
Electricity, gas and water supply	1.5	0.7	1.1
Construction	7.1	17.1	12.3
Personal household goods	24.2	20.5	22.3
Hotels and restaurants	12.1	5.5	8.7
Transport, storage and communication	11.2	9.1	10.1
Financial intermediation	2.7	1.4	2.1
Real estate, renting and business activities	15.4	12.7	14
Public admin, defence, compulsory social security	0.3	0	0.2
Education	1.3	2.0	1.7
Health and Social work	2.8	2.6	2.7
Other community, social and personal service activities	3.7	7.7	5.8
Total	100	100	100

Source: LE analysis of the NESS

In Table 53, we can see that in general the distribution between the treated and untreated groups is similar. However, there is a higher proportion of establishments in London and a lower proportion in the North West in the untreated group compared to the treated group.

Table 59: PSM Comparison of region of operation (NESS)			
REGION	Untreated (%)	Treated (%)	Total (%)
East of England	8.7	9.0	8.9
East Midlands	8.2	9.1	8.7
London	13.6	8.9	11.2
North East	6.0	7.1	6.6
North West	11.6	13.2	12.4
South East	16.9	16.5	16.7
South West	12.0	12.9	12.5
West Midlands	13.0	13.1	13
Yorkshire/Humber side	10.0	10.2	10.1
Total	100	100	100

Source: LE analysis of the NESS

The distribution for the rest of the matching variables are very similar between the untreated and treated groups (Table 54 through to Table 64).

Table 60: PSM Comparison of organisational components (NESS)			
A6	Untreated (%)	Treated (%)	Total (%)
Only establishment	60.0	59.6	59.8
One of a number of establishments within larger org.	39.9	40.4	40.2
Don't know	0	0	0
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 61: PSM Comparison of PLC status (NESS)			
PLC	Untreated (%)	Treated (%)	Total (%)
No/Don't know	74.7	74.9	74.8
Yes	25.3	25.1	25.2
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 62: PSM Comparison of ownership status (NESS)			
OWN	Untreated (%)	Treated (%)	Total (%)
None/not applicable	40.4	39.2	39.8
one owner	20.9	22.2	21.6
More than one owner	38.7	38.6	38.7
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 63: PSM Comparison of product market strategy (NESS)			
F1qual	Untreated (%)	Treated (%)	Total (%)
Very low	4.0	4.3	4.2
Low	10.2	11.6	10.9
Medium	36.0	35.3	35.7
High	29.3	27.6	28.4
Very High	20.5	21.1	20.8
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 64: PSM Comparison of product nature (NESS)			
F1_1/F1_2	Untreated (%)	Treated (%)	Total (%)
1. One-off / limited range	9.8	10.6	10.2
2	6.9	8.9	7.9
3	25.6	23.0	24.3
4	23.7	22.4	23
5. High Volume / wide range	31	30.8	30.9
6. Don't Know	3.1	4.3	3.7
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 65: PSM Comparison of dominant sales location (NESS)			
F1A	Untreated (%)	Treated (%)	Total (%)
Locally	40.0	39.6	39.8
Regionally	15.6	18.1	16.9
Nationally	29.0	26.0	27.5
Internationally	15.3	16.1	15.7
Don't know	0.1	0.3	0.2
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 66: PSM Comparison of firm training strategy (NESS)			
BUSST	Untreated (%)	Treated (%)	Total (%)
No	21.5	20.6	21
Yes	78.5	79.4	79
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 67: PSM Comparison of firm level vacancy status (NESS)			
VAC_STAT	Untreated (%)	Treated (%)	Total (%)
No vacancies	82.8	83.1	83
Vacancies	17.2	16.9	17
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 68: PSM Comparison of prevalence of 'Hard to fill' vacancies (NESS)			
SSV1	Untreated (%)	Treated (%)	Total (%)
No hard to fill vacancies	95.8	95.3	95.5
hard to fill vacancies	4.2	4.7	4.5
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 69: PSM Comparison of existence of skills gaps (NESS)			
SKGAP	Untreated (%)	Treated (%)	Total (%)
No	54.9	54.9	54.9
Yes	45.1	45.1	45.1
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 70: PSM Comparison of skill gap density (NESS)			
D2GD_TOTB	Untreated (%)	Treated (%)	Total (%)
0-0.10	66.5	66.2	66.4
0.10-0.20	14.7	12.0	13.3
0.20-0.30	8.8	10.8	9.8
0.30-0.40	4.2	4.8	4.5
0.40-0.50	3.1	4.3	3.7
0.50-0.60	0.5	0.6	0.6
0.60-0.70	1.0	0.5	0.8
0.70-0.80	0.5	0.2	0.3
0.80-0.90	0.1	0.2	0.2
0.90-1.0	0.6	0.4	0.5
Total	100	100	100

Source: LE analysis of the NESS 2009

We have not included the descriptive statistics for the variable E89PR, because it is a point estimate variable and there would be over 1,000 rows in the table. We can say that the distribution is broadly similar between the untreated and treated groups.

A3.1.1 Summary of evidence on robustness of propensity score match

Table 71: Summary results for the difference between the PSM score for the treated and control groups (apprenticeships)		
Percentile of gap	Gap	Smallest
1% (0.037582)	0	0
5% (0.036102)	0.00000004	0
10% (0.046801)	0.00000012	0
25% (0.020624)	0.00000045	0
50% (0.055197)	0.00000135	
		Largest
75% (0.092192)	0.00000467	0.0046123
90% (0.135836)	0.00001860	0.0095481
95% (0.162259)	0.00005060	0.0118191
99% (0.321504)	0.00043480	0.0171886
Observations	2,340	
Sum of Weight	2,340	
Mean	0.0000364	
Standard Deviation	0.0004974	
Variance	2.47e-07	
Skewness	26.75828	
Kurtosis	800.72	

Source: LE analysis of the NESS 2009

A3.2 Train to Gain

Compared to the descriptive statistics for apprentices, there appears to be more discrepancies between the untreated and treated groups for *Train to Gain*. For example, there is a higher proportion of establishments in the treated group with 25-99 employees but a lower proportion of those with 2-4 employees (Table 66).

Table 72: PSM Comparison of number of employees TTG (NESS)			
A1B6	Untreated (%)	Treated (%)	Total (%)
2-4	19.1	15.5	17.1
5-24	45.8	43.5	44.5
25-99	26.2	30.8	28.8
100-199	5.0	6.2	5.7
200-499	3.0	3.2	3.1
500+	0.9	0.8	0.8
Total	100	100	100

Source: LE analysis of the NESS 2009

For sector, there are some cases where the distribution is slightly different when comparing the untreated and treated groups (Table 52). For example, 20.6% of untreated firms are in the personal household goods sector whereas 14.4% of treated firms are. In the real estate, renting and business activities sector, untreated and treated are 23.1% and 17.8% respectively.

Table 73: PSM Comparison of sector of activity TTG (NESS)			
NEWSECTOR	Untreated	Treated	Total
	(%)	(%)	(%)
Agriculture, Hunting and forestry, fishing	1.2	0.9	1
Mining & Quarrying	0.1	0.2	0.2
Manufacturing	10	13.7	12.1
Electricity, gas and water supply	0.6	1.0	0.8
Construction	4.9	7.7	6.4
Personal household goods	20.6	14.4	17.2
Hotels and restaurants	8.2	7.3	7.7
Transport, storage and communication	11.4	10.2	10.8
Financial intermediation	3.7	1.8	2.6
Real estate, renting and business activities	23.1	17.8	20.2
Public admin, defence, compulsory social security	0.3	0.7	0.5
Education	3.1	6.6	5.1
Health and Social work	5.3	12.4	9.3
Other community, social and personal service activities, private households, organisations and bodies	7.4	5.2	6.2
Total	100	100	100

Source: LE analysis of the NESS

In Table 68, we can see that in general the distribution between the treated and untreated groups is similar. However, there is a higher proportion of establishments in London and a lower proportion in the East Midlands in the untreated group compared to the treated group.

Table 74: PSM Comparison of region of incorporation TTG (NESS)			
REGION	Untreated	Treated	Total
	(%)	(%)	(%)
East of England	10.6	11.5	11.1
East Midlands	8.9	10.3	9.7
London	14.0	12.6	13.2
North East	7.2	5.5	6.2
North West	12.2	12.6	12.4
South East	15.3	15.2	15.2
South West	11.1	11.2	11.2
West Midlands	10.7	10.7	10.7
Yorkshire/Humber side	10.1	10.4	10.3
Total	100	100	100

Source: LE analysis of the NESS

The distribution for the rest of the matching variables are very similar between the untreated and treated groups (Table 69 through to Table 72).

Table 75: PSM Comparison of organisational components TTG (NESS)			
A6	Untreated (%)	Treated (%)	Total (%)
Only establishment	55.8	54.5	55.1
One of a number of establishments within larger organisation	44.2	45.5	44.9
Don't know	0	0	0
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 76: PSM Comparison of PLC status TTG (NESS)			
PLC	Untreated (%)	Treated (%)	Total (%)
No/Don't know	77.3	77	77.1
Yes	22.7	23	22.9
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 77: PSM Comparison of ownership structure TTG (NESS)			
OWN	Untreated (%)	Treated (%)	Total (%)
None/not applicable	38.8	39.1	39
one owner	19.8	21.4	20.7
More than one owner	41.4	39.5	40.4
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 78: PSM Comparison of product market strategy TTG (NESS)			
F1qual	Untreated (%)	Treated (%)	Total (%)
Very low	3.4	3.4	3.4
Low	9.4	8.5	8.9
Medium	34.9	33.7	34.2
High	29.9	31.4	30.7
Very High	22.5	22.9	22.7
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 79: PSM Comparison of nature of products sold TTG (NESS)			
F1_1/F1_2	Untreated	Treated	Total
	(%)	(%)	(%)
1. One-off / limited range	10.1	8.2	9.1
2	8.2	8.2	8.2
3	22.6	24.2	23.5
4	23.9	25.4	24.7
5. High Volume / wide range	33.1	31.4	32.1
6. Don't Know	2.2	2.5	2.4
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 80: PSM Comparison of dominant sales location TTG (NESS)			
F1A	Untreated	Treated	Total
	(%)	(%)	(%)
Locally	33.2	31.0	32
Regionally	15.7	18.3	17.1
Nationally	31.5	32.8	32.2
Internationally	19.0	17.5	18.2
Don't know	0.5	0.4	0.4
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 81: PSM Comparison of strategic training plan TTG (NESS)			
BUSST	Untreated	Treated	Total
	(%)	(%)	(%)
No	14.5	13.0	13.7
Yes	85.5	87.0	86.3
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 82: PSM Comparison of vacancy status TTG (NESS)			
VAC_STAT	Untreated	Treated	Total
	(%)	(%)	(%)
No vacancies	80.6	78.9	79.7
Vacancies	19.4	21.1	20.3
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 83: PSM Comparison of 'hard to fill' vacancies TTG (NESS)			
SSV1	Untreated	Treated	Total
	(%)	(%)	(%)
No hard to fill vacancies	80.6	78.9	79.7
hard to fill vacancies	19.4	21.1	20.3
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 84: PSM Comparison of skills gaps TTG (NESS)			
SKGAP	Untreated	Treated	Total
	(%)	(%)	(%)
No	66.6	64.4	65.4
Yes	33.4	35.6	34.6
Total	100	100	100

Source: LE analysis of the NESS 2009

Table 85: PSM Comparison of skill gap density TTG (NESS)			
D2GD_TOTB	Untreated	Treated	Total
	(%)	(%)	(%)
0-0.10	74.7	72.9	73.7
0.10-0.20	9.7	10.7	10.2
0.20-0.30	6.6	7.0	6.8
0.30-0.40	3.3	3.2	3.2
0.40-0.50	3.0	3.1	3.0
0.50-0.60	0.5	0.6	0.6
0.60-0.70	0.8	1.0	0.9
0.70-0.80	0.5	0.6	0.5
0.80-0.90	0.2	0.3	0.3
0.90-1	0.8	0.7	0.7
Total	100	100	100

Source: LE analysis of the NESS 2009

We have not included the descriptive statistics for the variable E89PR, because it is a point estimate variable and there would be over 1,000 rows in the table. We can say that the distribution is broadly similar between the untreated and treated groups.

A3.2.1 Summary of evidence on robustness of propensity score match

Table 86: Summary results for the difference between the PSM score for the treated and control groups (TTG)

	Percentiles	Smallest
1% (0.187201)	0	0
5% (0.105343)	0.000000025	0
10% (0.142403)	0.000000433	0
25% (0.113687)	0.000001970	0
50% (0.090754)	0.000005640	
75% (0.149617)	0.000014700	0.00584830
90% (0.403611)	0.000045700	0.00725800
95% (0.393507)	0.000090900	0.00738830
99% (0.504512)	0.000432800	0.01118590
Observations	6,337	
Sum of Weight	6,337	
Mean	0.0000332	
Standard Deviation	0.0002501	
Variance	6.25e-0.8	
Skewness	27.40575	
Kurtosis	952.9229	

Source: LE analysis of the NESS 2009

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URN 12/767