The effectiveness and costs-benefits of apprenticeships: Results of the quantitative analysis

September 2013

Employment, Social Affairs and Inclusion

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Executive Summary

Apprenticeships are widely used in European Member States (MSs). According to recent research from the European Commission (European Commission, 2012a), 24 MSs have apprenticeship-type schemes which are mainly company-based (i.e. more than half of the training activities take place in a company). Apprenticeship schemes vary greatly across countries, both in terms of the number of young people involved and coverage rates (i.e. the number of young people involved in apprenticeship), quality (skill content) and institutional features (links with the education and training system, involvement of the social partners and employers, existence of a certification system, etc.). There are also large differences across sectors and occupations within countries, in terms of apprenticeship-related provision and funding by employers.

In assessing the effectiveness of apprenticeship, it is thus important to bear in mind this heterogeneity in the coverage and features of apprenticeship schemes across EU countries. At the same time, the results of the available studies have to be considered in relation to the specific features of the schemes evaluated. There are, however, some common results emerging from the evaluation literature that can be considered relatively sound and generalized.

To assess the effectiveness of traineeship and apprenticeship schemes three methodological approaches have been adopted:

1. A review of the findings of existing evaluation studies;
2. The econometric analysis of cross-country data on apprenticeship and traineeship schemes available at EU level;
3. The evaluation of the effects of apprenticeship schemes in two countries: Italy and the UK. These two countries are particularly interesting in this respect because since the 1990s they have both expanded apprenticeship-type training for young people, even if their approach “is still closer to an ALMP programme” (Piopiunik and Ryan, 2012).

The following sections present the aims, methodology and results of the research, while this section summarises the main findings.

A. Main findings emerging from existing evaluation studies

There are a very limited number of impact evaluation studies on apprenticeships and no evaluation studies on traineeships. Most of the studies relate to countries with strong apprenticeship-based vocational education and training (VET) systems (e.g. Austria, Germany, Switzerland, Denmark, the Netherlands), where reliable micro-data are available for evaluations. The reviewed studies evaluate the effects of apprenticeship on participants in terms of both the transitions to work and the economic returns with respect to non-apprentices with low education or individuals with school-based vocational education.

Some studies consider the impact of apprenticeship on training firms, analysing the effects on firms’ profits and productivity, as well as the determinants of firms’ decisions to supply apprenticeship positions. Detailed cost-benefit analyses of apprenticeship training exist only for Germany and Switzerland.

Effects of apprenticeship on participants

- In the empirical literature there is a **general consensus on the positive effects of apprenticeships in easing the school-to-work transition.** Cross-country evidence shows that in those European countries where the apprenticeship system is most developed young people have better labour market outcomes than in other countries (Van der Velden et al., 2001; Quintini and Martin, 2006; Quintini and Manfredi, 2009). Furthermore, national studies, based on individual data, provide evidence of the superiority of apprenticeships in smoothing the transition from school-to-work compared to vocational school-based education or to entering the labour market immediately after compulsory education. Apprentices achieve better job matches (Ryan, 2001); higher wages; shorter periods of unemployment before finding a first job (Ryan,1998; Bonnal et al., 2002; Parey, 2009); or a longer duration of first job (Bellmann et al., 2000) compared to individuals with low educational attainment or school-based vocational education.
- The empirical evidence seems to be consistent about a **positive effect of apprenticeship on wages only when compared to workers with low education and no apprenticeship training**, but not when compared to workers having completed full-time vocational education (Ryan, 1998; Clark and Fahr, 2002; Hofer & Lietz, 2004, McIntosh, 2007; Fersterer et al., 2008).
- **Compared to school-based vocational pathways, the advantages of apprenticeships** tend to be higher at the beginning of the working life and then **decline or even disappear** over the longer term (Plug and Groot, 1998; Ryan, 1998 and 2001).
- There are **gender differences in the effectiveness of apprenticeships**: the beneficial effects on transitions and pay seem not to hold true for women in all countries, mainly because of occupational and sectoral segregation (Ryan, 1998 and 2001).
- The **size of the training firm appears to affect the labour market** prospects of former apprentices in Germany (Euwals and Winkelmann, 2004; Bougheas and Georgellis, 2004).
- The positive effects of apprenticeships on labour market outcomes are also related to the **quality of the apprenticeship** (e.g. training intensity, duration and type - general as opposed to firm specific training) (Büchel, 2002; Bertschy et al., 2009).
- **The educational level and quality apprenticeship applicants is found to influence the selection process into high or low quality apprenticeships in Germany and Switzerland**. Furthermore, in Germany previous low educational achievement is found to continue to exert a negative effect on labour market prospects, even for those individuals with poor educational results who complete a high quality apprenticeship (Büchel, 2002). On the contrary, in Switzerland once the transition to apprenticeship is taken out of the equation (controlling for ability), apprentices with poor educational results are not further penalized once they complete apprenticeship training (Bertschy et al., 2009).
- **Apprenticeship training seems to be transferable across firms**, especially when the training firm is large and investing more in general training. In Germany, moving to another firm after apprenticeship does not always result in a wage penalty (Belmann et al., 2000; Clark and Fahr, 2002; Werwartz, 2002, Bougheas and Georgellis, 2004, Euwals and Winkelmann, 2004).

Provision of apprenticeships and costs and benefits for training firms

- Studies which investigate the effects of apprenticeships on firms concentrate on dual-apprenticeship system countries (namely, Germany and Switzerland).
- Empirical findings for Germany show that **costs and benefits vary according to both apprenticeship-related occupational categories and the size and sector of the training firm** (Mohrenweiser are Zwick, 2009). Thus, the provision of apprenticeships varies across sectors, occupations and firm sizes: positive effects on gross profits in the short-term are found for trade, commercial, craft and construction occupations; while firms with apprentices in manufacturing occupations face net training costs during the apprenticeship period itself but gain by the long-term employment of former apprentices.
- **Training firms seems also to vary according to their motivation** for supplying apprenticeship positions: for some firms apprenticeships represent a long-term investment, while for others they may represent a substitute for regular employment (Mohrenweiser et al., 2010; Cappellari et al., 2012).
- **Comparative cost-benefit analysis in Germany and Switzerland show that during the apprenticeship period German firms incur, on average, net costs while Swiss firms experience net benefits.** The difference in apprenticeship returns for firms in the two countries appears to be mainly related to benefits rather than to costs (Wolter et al., 2006; Dionisius et al., 2009) and can be explained by a higher share of productive tasks allocated to apprentices in Switzerland and by the differences in relative wages with respect to regular employment (with higher wage differentials in Switzerland). The large supply of apprenticeship positions by German firms, which on average incur a net cost during training can thus be explained by the higher productivity of trained apprentices later on.
- **Public subsidies for apprenticeships may play a role in increasing the provision of apprenticeships, although the empirical evidence on the effectiveness of these subsidies is still limited and controversial** (Westergaard et al., 1999; Wacker, 2007; Mühlemann et al. 2007). In order to avoid the possible negative effects in terms of deadweight loss and substitution effects, governments are advised to target apprenticeship subsidies to specific industries and firms (Brunello, 2009; Wolter and Ryan, 2011). Furthermore, direct subsidies appear to be effective in encouraging firms to start training, but not to increase the demand for apprentices in firms that already train (Mühlemann et al., 2007).

Cost–benefit analyses

- Studies on the overall costs and benefits of apprenticeships or traineeships are not widespread across EU countries because of the **difficulties in calculating social costs, externalities, or foregone wages from regular jobs**. Some cost-benefit analysis estimates which also consider the social costs and benefits have been conducted in the UK (McIntosh, 2007) and the US (Reed et al., 2012) and show that in these two countries the social benefits of apprenticeships exceed costs, although these schemes initially require investment by employers, individual apprentices and society/public budgets.

B. Results of cross-country estimates

Using information available from Eurostat LFS micro-data and the LMP databases, a cross- country exploratory regression analysis was carried out with panel data for EU countries to estimate the relationship between youth labour market outcomes and indicators relative to apprenticeship and/or

traineeship schemes. Estimates are based on country level data covering the 1998-2010 period. The analysis considers three main dependent variables: (i) the employment rate; (ii) the unemployment rate; and (iii) the NEET rate. Furthermore, two alternative definitions of apprenticeships are adopted: (i) Coverage rate of apprenticeship (Apprentices/Total population, 15-24 years old); and (ii) Public expenditure on apprenticeship per participant.

The main results of the cross-country econometric analysis are consistent with results emerging from the evaluation literature:

- **A higher incidence of apprenticeships is associated with higher youth (15-24) employment rates**. The estimates are statistically significant, especially when using the coverage rate as the apprenticeship variable. For this variable, results are also very robust considering all different model specifications.
- **Apprenticeships are associated with lower youth unemployment** and again estimates are statistically significant and more robust when using the coverage rate as the apprenticeship variable.
- Estimates based on the research team's full specification, including time and country-fixed effects, structural controls, indicators of regulation and labour market policies expenditure, show that a **one percentage point increase in the apprenticeship coverage rate is associated with an increase in the youth employment rate of 0.95 percentage points and a reduction in the youth unemployment rate of 0.8 percentage points.**

C. Results of estimates for Italy

In Italy an apprenticeship has always been considered to be an employment contract with a training purpose; as such, it is not part of the education system. It was introduced in the late fifties and since its introduction, the number of apprentices increased up to around 800,000 in the early sixties, and then gradually halved down to 400,000 in 1997. The Treu Law in 1997 increased the age limit for the eligibility for this contract from 22 to 24, which was further extended to 29 by the Biagi law in 2003. These two laws boosted the number of apprentices up to 650,000 in 2007, but as a result of the economic downturn this was then reduced to 550,000.

In order to incentivise employers to hire young workers through apprenticeship contracts, in 2003 the "Biagi Law" abolished the certification of qualifications and introduced the option of undertaking part of the training at the workplace as a substitute for external training courses, in an effort to reduce the apprenticeship-related cost for firms.

In 2012, the "Fornero Reform" revised the regulation of labour market entry contracts with the aim of reducing the incidence of temporary work and other precarious employment contracts and, at the same time, widening the scope for hiring on apprenticeship contracts, which should become "the main port of entry into the labour market". In fact, among all the other temporary contracts available to the Italian youth population, apprenticeships have always demonstrated a better performance in terms of the amount of training undertaken during the contract as well as in terms of a lower probability of experiencing a subsequent period of unemployment and a greater probability of transition into stable employment.

A cost-benefit analysis was not possible due to data limitations, while the effectiveness of apprenticeships in supporting the school-to-work transition in Italy was assessed by examining the following aspects:

- The effects of the apprenticeship contract on the probability of unemployment and on having a permanent contract, compared to other types of temporary contracts. The former can be

considered an indirect test for the so called “stepping stone” role played by temporary contracts, while the latter can measure the extent to which different types of temporary contracts enhance the probability of securing a stable/permanent job and not lead young people into a dead end.

- The effect of the 2003 Biagi reform on the probability of being an apprentice and receiving training during an apprenticeship.
- The overall effect of the Biagi 2003 reform on youth unemployment.

Estimates are based on two different data-sets: (i) the LFS cross-sectional data-set; and (ii) the longitudinal data-set of the ISFOL – PLUS survey, consisting of four waves conducted in 2005, 2006, 2008 and 2010 on about 55,000 individuals of which the analysis uses both the cross-sectional and the retrospective dimension.

Effects of the apprenticeship contract on the probability of unemployment and on having a permanent contract relative to other temporary contracts

Based on the ISFOL-PLUS longitudinal data-set, five different types of temporary contracts were compared in terms of the probability of experiencing a period of unemployment after the contract expiration: (i) apprenticeships (19% in the sample used); (ii) fixed-term (46%); (iii) collaboration workers (24%); (iv) other training contracts (6%); and (v) temporary agency jobs (5%). The main results are as follows:

- **Young individuals who were on an apprenticeship scheme have on average a significantly 5% lower probability of being unemployed in the subsequent wave when compared with fixed-term contracts;** a reduction which is the greatest among the different contracts.
- The effect of apprenticeships in reducing the probability of being unemployed in the next period is **stronger (6.3%) for individuals with less than a tertiary education degree.**
- Having been an apprenticeship **increases the probability of having a permanent contract in the future: apprentices have a 16% higher probability of a stable job** than young fixed-term workers. There are no significant gender differences.

The causal effect of the 2003 Reform on the probability of being an apprentice and receiving training

The 2003 apprenticeship reform increased the probability of being an apprentice relative to other type of contracts for young people. This greater probability increased the incidence of training among those on apprenticeship contracts when compared to other type contracts (temporary as well as permanent). This was probably due to the financial support of the regions, which increased the amount of training funds for apprenticeships when adopting the new law.

The effect of the 2003 Reform on the youth unemployment rate

The 2003 Reform seeking to expand the use of apprenticeships reduced significantly the probability of youth unemployment. These results complement those of a previous study on the positive effects of the 2003 Reform on apprenticeship-related employment (that substituted external staff) and on the productivity of training firms: added value per worker (+1.5%); sales per worker (+0.9); and total factor productivity (+1.6%).

D. Results of estimates for the UK

Since the mid 1990s, both the Central Government and the devolved administrations of Wales, Scotland and Northern Ireland have invested heavily in the apprenticeship system. In England, for

example, there are at present 162 apprenticeship frameworks leading to 258 specific intermediate vocational qualifications at Level 2 and Level 3, and 11 at Level 4 or above. These frameworks guide the industry-specific competencies, technical skills, theoretical concepts and relevant knowledge required to obtain a vocational qualification. Participation in Apprenticeships has increased steadily in England over the last eight years, while it has grown moderately in Scotland and Northern Ireland and decreased in Wales. In 2011/2012, there were over half a million people starting an apprenticeship in the UK.

Review of the existing evidence on the effectiveness of apprenticeships

Previous research on the returns to Apprenticeships in the UK found highly positive effects in terms of earnings and on the probability of being employed. Using pooled data from the Labour Force Surveys (LFS) of 2004 and 2005, McIntosh (2007) found that completing an Intermediate Apprenticeship is associated with a 16% wage increase, compared to those who have not completed one and whose highest qualification was at Level 1 or 2. Completion of an Advanced Apprenticeship was found to lead to an 18% increase, relative to having a Level 2 qualification and not completing an Apprenticeship. With regard to employment outcomes, completion of Advanced Apprenticeships was associated with a probability of being employed which is 15.7 percentage points higher, relative to not completing it and having Level 2 attainment. Completion of Intermediate Apprenticeships would lead to a 7.4 percentage points increase in this probability, relative to having Level 1 or 2 qualifications and no Apprenticeship qualification. More recent work developed by London Economics on the basis of LFS data and administrative surveys have confirmed the high returns to Apprenticeships in the UK. Their results based on LFS data point to a divergent trend in recent years, whereby the returns of Intermediate Apprenticeships have gone down slightly and the returns to Advanced Apprenticeships have increased. Based on administrative data, the estimated effects on employment were substantial but considerably lower than those obtained in McIntosh (2007).

An estimation of returns to Apprenticeships in the UK based on 2011 Annual Population Survey (APS) Data

In the UK paper accompanying this analysis, new, updated estimates of the returns to Apprenticeships in the UK are provided, based on data from the Annual Population Survey (APS) (April 2011-March 2012). The large sample size of this dataset means that no data pooling is required. The econometric method used to estimate the causal effects of Apprenticeships on wages and employment probability draws on the Mincer model and takes advantage of relevant control variables available in the APS, such as a set of 31 dummy variables which provide detailed information about all types of qualifications held (i.e. not only the highest qualifications). Since there are quite substantial numbers of non-achievers, and more generally large numbers of people with lower qualifications, who could, but did not participate in apprenticeships, the relevant comparison group is people with Level 1 qualifications and no completed Apprenticeship.

Two regression analyses are run separately in order to estimate the effect of completing Level 2 and Level 3 Apprenticeships (Intermediate and Advanced). In terms of wage returns, the findings indicate that completion of a Level 2 Apprenticeship leads to a 14.7% increase in wages, relative to staying at Level 1 without completing an Apprenticeship. Completion of a Level 3 Apprenticeship is associated with a wage return of 23.6%, relative to people staying at Level 1 with no Apprenticeship. A logistic model is then used to estimate the effects of Apprenticeship completion on the probability of being employed, again using two models for each level of Apprenticeship. In the case of Level 2 Apprenticeships, the probability of being employed increases by 7.8 percentage points when this type of programme is completed, relative to having Level 1 qualifications and no Apprenticeship.

Completion of a Level 3 Apprenticeship is associated with a 10.7 percentage point increase in this probability.

Cost-benefit analysis of Apprenticeships in the UK

The estimated impacts are then used to carry out a Cost-Benefit Analysis (CBA)_of Apprenticeship programmes. The CBA framework takes into account cost and benefits to (i) employers (remuneration, supervision and administration costs, productive contribution of the apprentice, etc.); (ii) apprentices (opportunity costs of undertaking an apprenticeship, remuneration); and (iii) public budgets (costs of the programme, tax revenues and benefit expenditures) as well as society at large, using available estimates, the research team's own impact estimates and a detailed collection of information regarding tax and benefits. The results of the CBA differ markedly for different stakeholders and also depend on whether short-term or long-term outcomes are considered. For example, by taking on apprentices, employers incur a cost in the short-run, but in the longer term there is a net benefit. A similar outcome is observed for apprentices, public budgets and society at large; in the latter cases, the calculations presented show a large net benefit, reflecting that Apprenticeships are an investment. They can be costly at present, but in the longer term they appear to yield substantial benefits for all stakeholders involved.

1. A review of existing evaluation studies on apprenticeship and traineeship schemes

The review of existing evaluation studies on apprenticeship and traineeship schemes has involved three separate steps: (1) the investigation and selection process; (2) the collection of selected studies according to an assessment grid; (3) the qualitative analysis of results from selected studies and previous reviews.

1.1 The investigation and selection process

The investigation of existing evaluation studies on apprenticeship and traineeship schemes has been based on a wide range of sources and search tools[1]. In order to select only relevant studies, the following criteria were used:

- Only studies assessing the effectiveness of apprenticeships or traineeships (both on participants and on training firms) were considered;
- Only the most recent studies (end of 1990's onward) were collected[2];
- Only studies using an impact evaluation approach or econometric techniques to assess the effectiveness of apprenticeships and traineeships were collected[3];
- Only published works were selected, either journal articles or working papers of well-known institutions[4].

In total, 25 studies were selected and reviewed according the above mentioned criteria. The main features and results of these studies are presented in the following discussion according to an assessment grid (see Tables 1 and 2) which includes: (i) the characteristics of the analysed sample (country of analysis, data level and source, observation period, existence of a comparison group); (ii) the main topic of the study and the outcome variables; (iii) the methodological approach used, highlighting, where applicable, the identification strategy and the impact evaluation approach; and (iv) the principal results and quantitative findings of the study.

In addition, other relevant research reports and reviews on apprenticeships and traineeships[5] were examined and their main findings informing the conclusions on the effectiveness of such programmes (presented in in Chapter 3).

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[1] Existing reviews on apprenticeships (Wolter and Ryan, 2011; Ryan 1998 and 2001); articles, cross-references; existing reviews on evaluation of labour market policies aimed at young people and school-to-work transitions (Piopiunik and Ryan, 2012; Kluve, 2006; Quintini et al., 2007; Hujer, Caliendo, 2000, Card, Kluve, 2009); European Commission reports on apprenticeships and traineeships (European Commission, 2012a and 2012b); working papers and publication of primary research institutes such as OECD, IZA, NBER, CEP, etc; economic search engines: Econlit, Ideas; Google search.

[2] Although there is a substantial body of theoretical and empirical literature on apprenticeships dating back to the nineties, impact evaluation studies are restricted to most recent years. In addition, Ryan (1998 and 2001) already provides a comprehensive review of past empirical work on the effectiveness of apprenticeships.

[3] Given the scarcity of impact evaluation studies, we decided to collect also the studies assessing the effectiveness of apprenticeship on participants and analysing costs and benefits for training firms. On the contrary, we did not consider reports or studies analysing transitions based on descriptive statistics, since they report gross results (not controlling for firms/individuals/institutions/environmental characteristics, or for selection biases). An exhaustive survey of national studies reporting descriptive statistics and transitions to work of apprenticeship and traineeship participants are provided by two recent studies by the European Commission (2012a, 2012b)

[4] Only one study (Parey, 2009) does not respect this criterion.

[5] See note 1 and references.

1.2 Main features of selected studies

Overall, the investigation process has identified a limited number of impact evaluation studies on apprenticeships and for this reason it was not possible to conduct a quantitative meta-analysis.

Furthermore:

- No impact evaluation studies or microeconometric analysis for traineeship schemes were found[6].
- No evaluation or assessment studies considering ESF co-funded schemes of apprenticeships (or traineeships) were found[7].
- The majority of studies on the effects of apprenticeships are microeconometric studies cover countries with a structured and widespread apprenticeship system (e.g. Austria, Germany and Switzerland).
- There are a limited number of studies which employ an impact evaluation approach (based on counterfactual analysis, or other techniques). This is due to several reasons: (i) impact evaluation analysis is quite a recent approach, and started to be more widespread in the 2000s; (ii) data-related issues : panel data or surveys with retrospective questions are required to collect information on apprenticeship participation; (iii) difficulties in identifying the counterfactual situation: apprenticeships is an entitlement programme, which means large scale participation and a corresponding shortage of a valid comparison group (Piopiunik & Ryan, 2012); (iv) selection problems: positive or negative selection into apprentices programmes may arise and should be controlled for ("...educational selection is notoriously intensive by ability, motivation and social class.", Ryan, 2001, p. 73).
- There are many studies assessing the effects of apprenticeships on participants with respect to other educational categories, in terms of wage returns, wage growth, employment and unemployment probabilities and duration.
- There are also many studies concerned with the impact of apprenticeship on training firms, analysing the effects on firms' profits and productivity, as well as, the determinants of firms' decision to supply apprenticeship positions. However, studies analysing costs and benefits of apprenticeships for firms are less common and can be mainly found in Germany and Switzerland.

The selected studies present the following main features:

- Most use data from countries with strong and well-established apprenticeship-based VET systems (e.g. Austria, Germany, Switzerland, Denmark, the Netherlands); the German apprenticeship system is by far the most investigated.
- As regards data, administrative records are the most frequently used, because of their longitudinal feature and population coverage. In some cases, ad hoc firms' surveys on apprenticeships or surveys with retrospective questions are used.
- The vast majority of studies based on data on apprenticeship participants are restricted to males employed in the private sector. The exclusion of females from the sample of analysis is explained

[6] The recent study on traineeship of the European Commission (2012b) contains a specific chapter on the "effectiveness of traineeships". However, the evidence of the effectiveness of traineeships schemes in EU countries seems to rely only on descriptive statistics of transition to work or retention rates by the training firm.

[7] We only found and reviewed a study on a German active labour market policy directed to youth -"Preparatory practical training"- which may have been co-financed by the ESF. The program consists in a subsidized internship within a firm where predominantly basic practical skills and literacy are conveyed. Some employers might also use this as a probation period before offering a full apprenticeship position within the firm.

by the specific patterns of female labour market participation (e.g. part-time work, family care, horizontal segregation).

- Only a few studies use an impact evaluation approach: two exploit reforms involving the apprenticeship system (natural experiment design) and three use matching models or instrumental variables (quasi-experimental design).
- A wide variety of econometric techniques are used, which respond to different datasets at hand and to different research questions.
- All the studies are very elaborate and use advanced econometric techniques to obtain robust results (controlling for selection, endogeneity, biases, etc.). Moreover, many studies seek to assess effectiveness for numerous output variables using different models and techniques and performing several estimates aimed at checking for robustness.

1.3 Main results emerging from the selected studies

Apprenticeships are widely used in European Member States (MSs). According to recent research from the European Commission (EC, 2012a), 24 MSs have VET schemes which are mainly company-based (i.e. more than half of the training activities take place in a company). However, as observed by Wolter and Ryan (2011, p.522) "apprenticeship varies greatly across countries, in terms of both quantity (numbers trained) and quality (skill content); and across sectors and occupations within countries, in terms of its provision and finance by employers."

In assessing the results of the selected studies it is important to bear in mind this heterogeneity in the features of apprenticeship schemes across EU countries.

In the following section, the effectiveness of apprenticeships has been qualitatively assessed from findings of existing studies across European countries, firstly considering those studies which assess the effects on participants and then the studies which examine the effects on firms.

Results on participants are presented distinguishing by the evaluation questions and the outcomes variables adopted in the studies. Furthermore, results regarding a number of transversal issues (e.g. gender perspective, duration of effects, apprenticeship quality) are discussed separately.

The section on the effects on firms considers the empirical findings of studies investigating costs and benefits of apprenticeships for training firms and the determinants of apprenticeship provision.

1.3.1 Effects on participants

The studies analysing the effectiveness of apprenticeships on participants are mainly concerned with economic returns (wages, wage growth) and with the school-to-work transition (employment probability, unemployment duration, duration of the first job).

The effectiveness of apprenticeships on individuals is generally measured in relation to a comparison group, which alternatively is identified as either non-apprentices with low education and/or individuals with school-based vocational education. Former apprentices leaving the training firm are used as a comparison group by studies analysing differential effects amongst former apprentices remaining or leaving the training firm.

i. Apprenticeship and the school-to-work transition

In the empirical literature there is a general consensus on the positive effects that apprenticeships have on the youth school-to-work transition. **The effectiveness of apprenticeships in easing the**

school-to-work transition has been demonstrated by many cross-country comparative studies and national studies.

Several **cross-country studies** have shown that countries with strongly developed apprenticeship systems have proven quite successful in giving young people a good start in the labour market.

Van der Velden et al. (2001) show that European countries with apprenticeship systems enjoy better youth employment patterns, particularly in terms of larger employment share in skilled occupations and in high-wage sectors, than those with little or no apprenticeship participation (cited in Quintini and Martin, 2006).

Quintini and Martin (2006) show that in European countries where the apprenticeship system is most developed young people have better labour market outcomes than in other countries. As a matter of fact, Denmark, and Switzerland were among the OECD countries with the lowest youth unemployment rates, and Austria was well below the OECD average. Austria, Denmark and Germany were found to be among the countries with the lowest share of youth experiencing repeated periods of unemployment. Moreover, in Germany and Austria more than half of those leaving school found a job without experiencing any period of unemployment.

Quintini and Manfredi (2009) find that the most successful European countries in terms of school-to-work transitions are those where apprenticeships are widespread. Indeed, Austria, Denmark and Germany have a larger share of youth on career trajectories characterised by employment and stability compared to other EU countries characterised by a high incidence of temporary work (e.g. Belgium, France, Italy, Portugal and Spain).

The effectiveness of apprenticeships in the school-to-work transition is also acknowledged in **national studies**, which use individual data on apprenticeship participants, taking into account individual characteristics and selection bias.

A number of studies highlight the superiority of apprenticeships compared to vocational school-based education in promoting a smooth transition from school-to-work. Bertschy et al. (2009) find that, with respect to full-time vocational schooling, apprenticeships enhance the probability of a good job and skills match in Switzerland. Apprenticeships are also associated with higher employment rates in the UK (Ryan, 2001). Many studies present evidence of shorter periods of unemployment in finding a first job for apprentices compared to full-time VET students. For example, Parey (2009) and previous studies reviewed by Ryan (1998) prove that apprenticeships have a positive effect in reducing the period of unemployment in Germany and France. Bonnal et al.(2002) show that former apprentices in France experience less long-term unemployment as young adults than those who go through full-time vocational schooling.

For some young people the alternative to an apprenticeship is not school-based vocational education but entering the labour market directly after compulsory education. A number of studies reviewed by Ryan (1998, 2001) show that, compared to entering the labour market with compulsory education only, having completed an apprenticeship in France has positive effects in terms of both employment and wage returns. It seems that this apprenticeship-related positive impact on employment depends partly on improved occupational matching between qualifications and jobs, including lower rates of occupational downgrading in early working life (Ryan, 1998). Positive effects of apprenticeships on unemployment duration are also found in Germany in comparison to highly educated young people (Ryan, 2001). Bellmann et al.(2000) analysing the effects of apprenticeships on job duration in West Germany, find that lower secondary school leavers having completed an apprenticeship enjoy a longer duration of their first job (one/two times longer) compared to individuals with lower secondary school and not having completed an apprenticeship.

ii. Economic returns to apprenticeships

Empirical evidence on the economic returns on apprenticeship participants is not homogeneous: the sign and magnitude of the wage returns of apprenticeships vary across countries and studies. According to Wolter and Ryan (2011) "this heterogeneity in the empirical results arises less from differences in research methods and data than from differences in the scale and content of apprenticeship itself. Consequently, results for specific countries or programmes can rarely be generalized to apprenticeship training *per se*."

Moreover, there are differences in empirical findings according to the comparison group used in measuring the wage premium of having completed an apprenticeship. Empirical findings seem to converge on the **beneficial effect of apprenticeships on wages when compared to workers with low education and no apprenticeship completion, but not when compared to workers having completed full-time vocational education**.

With respect to low educational attainment, apprenticeships show wage gains in almost all studies and countries analysed. In his review Ryan (1998) finds that apprenticeships are positively and strongly associated with higher earnings for males in the UK and Germany relative to a "no post-school training" alternative. Clark and Fahr (2002) estimate an annualised average return of German apprenticeships at around 8% (5.9% in small firms). McIntosh (2007) estimates a wage return of apprenticeships in the UK of about +16-18% with respect to individuals with low educational attainment. Similar positive findings for the UK were also detected by other studies on apprenticeships and training in the UK (London Economics, 2011a, 2011b; National Audit Office, 2012). Positive effects on wages are also found in Austria by Hofer and Lietz (2004) and by Fersterer et al. (2008). Hofer and Lietz find that unskilled workers earn 10-12% less than former apprentices. While Fersterer et al., who analyse the individual return on apprenticeships using different duration of apprenticeships due to firms' failure, estimate that a year of apprenticeship training generates an increase in pay of about 5%. Finally, a study by Malamud and Pop-Eleches (2010), which uses information from an educational reform in Romania, finds that wages of former apprentices (and more generally those who had vocational education) do not differ significantly from those who participated in mainstream schooling in the long-term. In particular, the results demonstrate that increased mainstream education did not improve labour market outcomes relative to apprenticeships or school-based vocational education.

In contrast, when compared to full-time vocational education, evidence of wage gains through apprenticeships is not homogeneous. In a few studies apprenticeships are associated with higher pay. Adda et al. (2010) find positive returns for West Germany but only immediately after the completion of an apprenticeship; wages for non-apprentices grow at a lower rate but for longer. Payne (1995) finds higher pay in the UK, but only for males. Instead, a number of other studies point to no significant differences in wages and wage growth with respect to individuals with school-based vocational education in Germany (Parey, 2009 and previous studies reviewed by Ryan,1998) and in the Netherlands (Plug and Groot, 1998). Euwals and Winkelmann (2004) even find negative returns for German apprentices in the long run.

iii. Transversal issues

Short versus long-term benefits

Empirical findings from reviewed studies seem to point to the fact that, compared with school-based vocational pathways, the apprenticeship-related advantages **tend to be higher at the beginning of working life and then decline or even disappear over the longer term.** Evidence for France and

the UK shows that, relative to full-time vocational programmes, apprenticeships are associated with selective improvements in early labour market experience. In France, former apprentices spend more of their early working lives in employment, but attain lower pay levels at the end of five years (Ryan, 2001). In the long run, beneficial effects of apprenticeships, when compared to those of full-time vocational schooling, tend to decline also in terms of employment probabilities. Plug and Groot (1998), analysing apprenticeships in the Netherlands, find that in the long run there are hardly any differences in earnings, earnings growth and employment opportunities between workers who have gone through the vocational schools and those who have taken the apprenticeship route.

Gender perspective

The beneficial effects of apprenticeships on labour market transitions and pay seem not to hold true for women in all countries, mainly because of occupational and sectoral segregation. When empirical studies analyse apprenticeship effects distinguishing by gender, it is found that apprenticeships benefit women less than men in terms of entry rates, occupational access and subsequent labour market outcomes. In his reviews Ryan (1998, 2001) finds that in the UK, apprenticeships even appear to reduce female pay significantly. The only exception is Germany, where entry rates and pay benefits appear similar for both men and women, even if occupational segregation remains marked.

Firm size

The size of the training firm seems to play a role in the labour market prospects of apprentices in Germany. In fact, even though "apprenticeship training in most countries is certified so as to ensure that apprentices acquire at least some transferable skills, there is always a certain degree of firm specificity to the employer" (Wolter and Ryan, 2011). Former apprentices receiving more general training (as compared to firm specific training) would find it easier to change firm or job, since external firms will not pay for skills that they cannot use. Empirical evidence shows that large firms tend to invest more in general training when compared to smaller firms, which invest more in firm-specific training. In fact, according to Euwals and Winkelmann (2004) larger firms tend to have a higher training intensity. Considering a sample of former apprentices in Germany they find that retention rates, first job duration, and post-apprenticeship wages are all positively related to the training intensity during the apprenticeship. Similarly, Bougheas and Georgellis (2004), who investigate how apprenticeship training affects the early career mobility and earnings profiles of young apprentices, find significant gains for those who received their apprenticeship training in large firms compared to smaller firms both for graduate apprentices continuing to work for the same training firm and for those who leave the training firm.

Quality of apprenticeship and previous educational achievement

The effects on employment prospects according to the quality of apprenticeship (using the apprenticeship occupation/vocational fields as proxies) are also analysed by some studies of German and Swiss apprenticeships. In general, they find that the positive effects of apprenticeships on employment prospects are related to the **quality (length) and type (occupation) of apprenticeship.**[8]

However, **poor educational achievement before undertaking an apprenticeship may exert a negative effect even after completing the apprenticeship.** Büchel (2002) analyses apprenticeship-to-work transition in West Germany accounting for selection in the apprenticeship occupation (which

[8] In Germany, apprenticeships form part of the formal educational system and usually start after the completion of compulsory general education. Young people receive vocational education and training in a "dual" system where theory is taught in educational institutions and practical skills are acquired at the workplace in a company (Piopiunik and Ryan, 2012).

presents different transition-to-work rates). He finds that access to a "good occupation apprenticeship" is largely determined by the quality of the general school-leaving certificate; moreover, he finds that the subsequent apprenticeship-to-work transition remains negatively influenced by poor educational achievement, independently of the quality of the apprenticeship undertaken. On the contrary, Bertschy et al. (2009), who investigate apprenticeship-to-work transitions in Switzerland, find that once the transition into the apprenticeship is taken out of the equation (controlling for ability), apprentices with poor educational results are not further penalized once they complete their apprenticeship training.

Transferability of apprenticeship training: Stayers versus movers

A number of studies, analysing the German apprenticeship system, compare the labour market prospects, in terms of both transition to work and wage returns, of former apprentices who stay in the training firm as opposed to those who move to another firm.

What emerges is that **moving to another firm after completing an apprenticeship does not always result in a wage penalty. Moreover, apprenticeship training seems to be transferable across firms**, especially when the training firm is large and investing more in general training. Indeed Clark and Fahr (2002) find only very small wage penalties associated with leaving the firm where training occurred. Similarly, Werwatz (2002) points out that only a minority of movers incurs a loss in earnings, while the majority of movers secure a skilled job with increased earnings. Euwals and Winkelman (2004) find little difference in the earnings of stayers and movers, once controlling for firm size and training quality. The results from Bougheas and Georgellis (2004) predict that although movers initially experience a productivity loss, their earnings grow at a faster rate than those of stayers.

As regards labour market transitions, positive effects for stayers are found in terms of the duration of the first job in Germany. Euwals and Winkelmann (2004) using German register data find that apprentices staying with their training firm after graduation enjoy a longer duration of their first job. They find that after five years the survivor probability of stayers is still 11% above the survivor rate of movers. They argue that the long duration of first job for stayers is due to the training firm's need to recoup the costs of apprenticeship training.

1.3.2 Provision of apprenticeships: Costs and benefits for training firms

In the previous paragraphs the benefits of apprenticeships for young people in the school-to-work transition have been discussed. However, there should also be net benefits for the firms that explain their willingness to provide training. The incentives for employers to provide apprenticeship places depend on the benefits and costs they expect from training (OECD, 2009).

Specific analysis of costs and benefits of apprenticeships for firms has been undertaken in Germany and Switzerland where, over the past decades, a number of employer surveys have been conducted on the costs and benefits to firms of apprenticeship training. They demonstrate that during the apprenticeship period, German firms incur on average net costs, while Swiss firms report on average net benefits (Mühlemann et al., 2007; Dionisius et al., 2009). Using matching methods, Dionisius et al. (2009) analyse the reasons for these differences. They find that most of the difference in the net costs of training between the two countries can be explained by a higher share of productive tasks allocated to apprentices in Switzerland and by the differences in relative wages with respect to regular employment (with higher differential in Switzerland).[9] Moreover, they find that the difference in apprenticeship returns for firms in the two countries appears to be mainly related to benefits rather than to costs: although the two countries have similar costs, Switzerland enjoys significantly higher

[9] In Switzerland wage differentials between apprentices and regular employees are larger than in Germany.

apprenticeship-related benefits. Lack of sufficient benefits is also found to be the reason for not providing training by a proportion of Swiss firms. Wolter et al. (2006) simulate the net cost of training for non training firms and show that **differences between training and non training firms related principally to the benefits which employers associate with apprenticeships**.

The large supply of apprenticeship places from German firms, which on average incur a net cost during training, can thus be explained by the higher productivity of trained apprentices at a later stage. Wolter and Ryan (2011) review several theories based on market imperfections which allow firms to pay their former apprentices less than the market rate for skilled workers in order to recoup net costs incurred during the apprenticeship period: (i) information asymmetries on the amount and quality of training the apprentice receives; (ii) asymmetries regarding the ability and productivity of the apprentice; (iii) positive selection of students into apprenticeships; (iv) monopsony power of training firms; (v) role of market institutions (trade unions, minimum wages); etc.

Net costs (benefits) of apprenticeships for firms may also vary across sectors and firm sizes. Recent empirical work shows that **not all the firms bear net costs for apprentices, since costs and benefits vary according to apprenticeship-related occupational categories and the size and sector of the training firm.** Mohrenweiser and Zwick (2009) analyse the impact of the proportion of different occupational groups of apprentices on firm performance. They find positive effects on gross profits in the short-term for trade, commercial, craft and construction occupations; while firms with apprentices in manufacturing occupations face net training costs during the apprenticeship period but gain by the long-term employment of their former apprentices.

Thus, **in some industries apprenticeships represent a long-term investment, while in others they may represent a substitute for regular employment.** Mohrenweiser et al. (2010) using the within firm retention rate as an indicator of firms' training strategies in Germany find that less than 20% of training firms adopt a substitution strategy. Moreover, small firms and firms in the service sector are significantly more likely to adopt such a substitution strategy than large or manufacturing firms. Cappellari et al. (2012) in evaluating the effects of a recent reform of apprenticeship contracts, aimed at increasing the use of apprenticeships in Italy (by relaxing apprenticeship-related regulations and extending age limits), find an increase in apprenticeship-related employment and a substitution effect for external staff (*collaboratori a progetto*).[10] They also find a positive net effect on the productivity of training firms mobilised by the reform: added value per worker (+1.5%), sales per worker (+0.9), total factor productivity (+1.6%). On the basis of these results, they argue that the rise in productivity estimated could reflect a compositional shift in labour quality to the extent that external collaborators have a lower attachment to the firm and exert lower effort than apprentices.

In many European countries, the cost of apprentices is reduced by government-sponsored employer incentives in the form of either direct subsidies for apprenticeships (e.g. in Austria, Finland and Hungary) and/or tax deductions (e.g. in Austria, France, the Netherlands and Italy) (OECD, 2009). These policies are often justified with the argument that, in the absence of public intervention, the market produces less than the optimal proportion of apprentices (Brunello, 2009). However, **public funding may cause deadweight losses and result in substitution effects** (Wolter and Ryan, 2011; Brunello, 2009). In particular, Brunello (2009) warns that substitution effects may be particularly relevant in an economic downturn, because additional subsidies paid out to firms in order to hire apprentices may reduce employment opportunities for unskilled and semi-skilled labour not targeted

[10] Often collaborators are young people in the same age group (15–30) covered by apprenticeship contracts, and it may well be that firms consider workers on these contracts as substitutes for apprentices. In Italy, the number of collaboratori a progetto has been increasing in the past decade. This has, in turn, given rise to several concerns among trade unions, since this type of contract falls between dependent employment and self-employment. Collaboratori a progetto have a fixed-term contract usually renewed for several years and work on the firm premises during normal working hours.

by the policy. Finally, Wolter and Ryan (2011) argue that, **if subsidies are uniformly distributed across sectors, distortions are to be expected** in the labour market: sectors with low training costs expand training, even if the skills involved are not the ones most needed in the present or the future.

However, empirical evidence on the effectiveness of government subsidies for apprenticeships is still limited and has yielded mixed results which do not allow clear conclusions to be drawn. Westergaard et al. (1999) estimate the effect of apprenticeship-related subsidies on Danish firms on the basis of the variation in the amount of subsidies during the period 1980-1991. According to their results, public subsidies increased, on average, the demand for apprentices by about 7%, although significant positive effects of public funding were found only in some industries (manufacturing, office and trade). This, in turn, suggests the presence of possible deadweight losses. On the contrary, Wacker (2007, cited in OECD, 2009) detects very little impact of subsidies in Austria. Mühlemann et al. (2007) find that apprenticeship-related costs have a significant impact on the firm's training decision in Switzerland but no influence on the number of apprentices, once the firm has decided to train. This, in turn, indicates that subsidies for firms which already train apprentices would not further boost the number of available training places. They conclude that **direct subsidies appear to be effective in encouraging firms to start training but not to increase the demand for apprentices in firms which already train**.

The discussion on apprenticeship-related subsidies in the existing empirical evidence and literature seems to converge on the fact that these should be targeted at specific industries and firms which would not otherwise offer apprenticeship positions. All the same, there is agreement that governments face considerable difficulties in implementing such targeting: "It is unlikely that governments possess the information necessary to circumvent this problem by targeting subsidies on particular sectors" (Wolter and Ryan, 2011).

BOX 1 – Cost-benefit analysis of apprenticeships

A comprehensive cost-benefit analysis (CBA) of apprenticeships entails measuring cost and benefits for apprentices, firms and society as a whole (e.g. subsidies, reduced costs for unemployment benefits).

A quite recent work by Hoeckel (2008), drawing on OECD evidence of different approaches to CBA of VET, provides a comprehensive list of costs and benefits for apprentices, employers and society (see Table A.1).

Table A.1 – Apprenticeship costs (direct and indirect) and benefits (short and long-term) to different stakeholders

	COSTS	SHORT TERM BENEFITS	LONG TERM BENEFITS
Individual	Accept lower wages. Opportunity costs (forgone earnings as unskilled worker).	Employment chances. Earning levels. Work satisfaction. Drop out less likely from vocational than general courses.	Flexibility and mobility. Lifelong learning (more likely to receive training and upgrade skills later in life).
Employer	Pay wages (and labour costs) higher than productivity. Mistakes by inexperienced trainees, wasted resources and time of experienced workers. In-house training courses (material, special clothing, teacher salary, administration).	Higher productivity from well trained workforce. Saved costs from recruiting external skilled workers (incl. time for integration and risk of hiring a person not known to the company).	Supply benefits (e.g. image improvement). Less turnover (no need for retraining of new workers).
State	Subsidies to training firms.Financial concessions to employers (tax allowances).	Saved expenses for social benefits (unemployment as consequence of failed transition from education to work)	Externalities from productivity gain due to better education. Increase in tax income from higher earnings.

Source: adapted from Hoeckel, K. (2008) "Costs and Benefits in Vocational Education and Training, OECD (pp. 3-4).

Studies on CBA of apprenticeships or traineeships are not common across EU countries because of the difficulties in calculating for example social costs, externalities, or foregone wages from regular job. Some CBA estimates considering also the social costs and benefits have been conducted in the UK (McIntosh, 2007) and the US (Reed et al.2012) and show that in these two countries in the long run apprenticeships social benefits exceed costs.

Cross-country comparisons of results from CBA studies are however hardly feasible due to the diversity of apprenticeship systems, labour market regulation and welfare systems, and not least, different methodological approaches to the analysis. This heterogeneity makes the results of existing studies difficult to generalise.

1.4 Conclusions

The investigation has identified a very limited number of impact evaluation studies on apprenticeships and no evaluation studies on traineeships. Therefore, it was not possible to conduct a quantitative meta-analysis of evaluation studies on these training schemes.

In total, 24 studies assessing the effectiveness of apprenticeships, using an impact evaluation approach or other econometric techniques which account for selection bias, were selected from published works. The main features and results of these studies have been presented according to an assessment grid and qualitatively reviewed.

Most of the studies use data from countries with strong apprenticeship-based VET systems (e.g. Austria, Germany, Switzerland, Denmark, the Netherlands). They analyse the effects of apprenticeships on participants in terms of both the transitions to work and the economic returns in relation to non-apprentices with either low education levels or school-based vocational education. Furthermore, a number of studies are concerned with the impact of apprenticeship on training firms in terms of costs and benefits.

Apprenticeship schemes are widely used in European MSs (European Commission, 2012a). However, apprenticeship schemes vary greatly across countries both in terms of the number of young people involved and coverage rates (i.e. the number of young people involved in apprenticeship), quality (skill content) and institutional features (links with the education and training system, involvement of the

social partners and employers, existence of a certification system, etc.). There are also large differences across sectors and occupations within countries, in terms of apprenticeship-related provision and funding by employers (Wolter and Ryan, 2011).

In assessing the effectiveness of apprenticeships it is thus important to bear in mind this heterogeneity in the coverage and features of apprenticeship schemes across EU countries. At the same time, the results of the available studies have to be considered in relation to the specific features of the schemes evaluated. There are, however, some common results emerging from the evaluation literature that can be considered relatively sound and generalized.

In the empirical literature there is a general consensus on the positive effects of apprenticeships in easing the school-to-work transition. Cross-country evidence shows that in those European countries where the apprenticeship system is most developed young people have better labour market outcomes than in other countries (Van der Velden et al., 2001; Quintini and Martin, 2006; Quintini & Manfredi, 2009). Furthermore, national studies, based on individual data, provide evidence of the superiority of apprenticeships in smoothing the transition from school-to-work compared to vocational school-based education or to entering the labour market immediately after compulsory education. Apprentices achieve better job matches (Ryan, 2001); higher wages; shorter periods of unemployment before finding a first job (Ryan,1998; Bonnal et al.,2002; Parey, 2009); or a longer duration of first job (Bellmann et al., 2000) compared to individuals with low educational attainment or school-based vocational education.

The empirical evidence seems to be consistent about a positive effect of apprenticeship on wages only when compared to workers with low education and no apprenticeship training, but not when compared to workers having completed full-time vocational education (Ryan, 1998; Clark and Fahr, 2002; Hofer and Lietz, 2004, McIntosh, 2007; Fersterer et al., 2008). However, it should also be noted that empirical findings of national studies are not homogeneous and can rarely be generalised to apprenticeship training *per se* (Wolter and Ryan, 2011).

Compared to school-based vocational pathways, the advantages of apprenticeships tend to be higher at the beginning of the working life and then decline or even disappear over the longer term (Plug and Groot, 1998; Ryan, 1998 and 2001). Likewise, there are clear gender differences in the effectiveness of apprenticeships: the beneficial effects on transitions and pay seem not to hold true for women in all countries, mainly because of occupational and sectoral segregation (Ryan, 1998 and 2001).

According to some evaluation studies on the German apprenticeship system, the size of the training firm appears to affect the labour market prospects of former apprentices in Germany (Euwals and Winkelmann, 2004; Bougheas and Georgellis, 2004). The positive effects of apprenticeships on labour market outcomes are also related to the quality of the apprenticeship (e.g. training intensity, duration and type - general as opposed to firm specific training) (Büchel, 2002; Bertschy et al., 2009). Apprenticeship training seems to be transferable across firms, especially when the training firm is large and investing more in general training. In Germany, moving to another firm after completing an apprenticeship does not always result in a wage penalty (Belmann et al., 2000; Clark and Fahr, 2002; Werwartz, 2002; Bougheas and Georgellis, 2004; Euwals and Winkelmann, 2004).

Studies which investigate the effects of apprenticeships on firms concentrate on dual-apprenticeship system countries (namely, Gemany and Switzerland). Empirical findings for Germany show that **costs and benefits vary according to both apprenticeship-related occupational categories and the size and sector of the training firm** (Mohrenweiser are Zwick, 2009). Thus, the provision of apprenticeships varies across sectors, occupations and firm sizes. Training firms seems also to vary according to their motivation for supplying apprenticeship positions: for some firms apprenticeships

represent a long-term investment, while for others they may represent a substitute for regular employment (Mohrenweiser et al., 2010; Cappellari et al., 2012).

Comparative cost-benefit analysis in Germany and Switzerland show that during the apprenticeship period German firms incur, on average, net costs while Swiss firms experience net benefits. The difference in apprenticeship returns for firms in the two countries appears to be mainly related to benefits rather than to costs (Wolter et al., 2006; Dionisius et al., 2009) and can be explained by a higher share of productive tasks allocated to apprentices in Switzerland and by the differences in relative wages with respect to regular employment (with higher wage differentials in Switzerland).

Public subsidies for apprenticeships may play a role in increasing the provision of apprenticeships, although the empirical evidence on the effectiveness of these subsidies is still limited and controversial (Westergaard et al., 1999; Wacker, 2007; Mühlemann et al., 2007). In order to avoid the possible negative effects in terms of deadweight loss and substitution effects, governments are advised to target apprenticeship subsidies to specific industries and firms (Brunello, 2009; Wolter and Ryan, 2011).

Table 1.0 Evaluation studies on the effects of apprenticeships on individuals: Transition to work and economic returns

Study	Country	Data source	Obs period	Theme	Main topic	Methodology Identification strategy	Impact evaluation	Comparison group	Outcome(s)	Results
Fersterer; Pischke; Winter-Ebmer (2008)	Austria	administrative data	1975-1998	Returns to apprenticeship	Analyses returns (log wages) to apprenticeship exploiting different duration of apprenticeship due to firms failure. Duration of apprenticeship depends on firm failure, not on apprenticeship type, which could be correlated with ability.	Wage regression, with IV Controls for selection bias (ability) instrumenting with the length of apprenticeship due to failure of training firm.	Quasi-experimental		Wages	Returns using IV (although statistically significant) are similar or larger than using OLS, indicating relatively little selection. Returns (OLS) are significant: between 5% and 2.7% per year (according to model specification).
Plug; Groot (1998)	Netherlands	surveys	1985-1994	Returns to apprenticeship	Analyses the long term effects on earnings, earnings growth and probability of being employed of apprentices compared to those who chose vocational education, controlling for selection into the two type of education.	Switching regression model; controls for selection in educational choice (apprenticeship vs school based VE).		Individuals with school based vocational education	Long-term effects on: Earnings Earnings growth Employment	No significant differences between apprentices and individuals with school based vocational education.
McIntosh (2007)	UK	surveys (LFS)	2004-2005	Returns to apprenticeship	Analyses f the wage benefits for individuals of completing an apprenticeship.	OLS No controls for selection (ability).		No apprentices, whose highest qualification is at Level 2	Wages	Positive effect (+16/18%) Probably upward biased results.
Clark, Fahr (2002)	Germany	administrative data	1984-1995	Returns to apprenticeship	Estimates the returns to apprenticeship within the training occupation and estimates the transferability of apprenticeship training to other occupations.	Wage regression on common support.		No apprentices with low educational attainment (in the same occupation)	Wages	Annualised average return of apprenticeship around 8% and 5.9% in small firms (2-9 employees). Very small wage penalties associated with leaving the training occupation, suggest that training is transferable.
Werwatz (2002)	Germany	survey	1996	Returns to apprenticeship	Estimates wage effects of occupational mobility of ex-apprentices, distinguishing by moving to skilled or unskilled jobs.	Switching regression model; multinomial logit and four wage regressions.		Stayers vs movers	Wage	Only a minority of movers incurs a loss in earnings. The majority of movers holds a skilled job with increased earnings. This result does not seem to be caused by self-selection effects.
Acemoglu; Pischke (1998)	Germany	surveys	1979, 1985/6	Returns to apprenticeship	Tests a theory of training whereby workers do not pay for general training they receive. The hypothesis is that the training firm has superior information about the worker's ability relative to other firms. Thus, this ex post monopsony power encourages the firm to provide training.	Wage regression		Stayers vs movers	Wages	Stayers earn higher wages than those who left their apprenticeship firm for other reasons, although the coefficients are not estimated very precisely

Study	Country	Data source	Obs period	Theme	Main topic	Methodology Identification strategy	Impact evaluation	Comparison group	Outcome(s)	Results
Adda; Dustmann; Meghir; Robin (2010)	West Germany	administrative data	1975-1996	Returns to apprenticeship	Evaluates the German apprenticeship system by modelling individual careers from the choice to join such a scheme and followed by their employment, job to job transitions and wages over the lifecycle	Dynamic discrete choice model of the decision to enrol in apprenticeship training, of employment decisions, of job to job mobility and of wages.		Individuals that at age of 10 chose a vocational path but at the age of 16 did not choose apprenticeship	Wage growth	Apprenticeships increase wages, and change wage profiles with more growth upfront, while wages for non-apprentices grow at a lower rate but for longer. The life-cycle returns to an apprenticeship (which lasts usually 3 yrs) are 14.1%.
Bougheas; Georgellis (2004)	West Germany	Surveys (longitudinal)	1984-2000	Returns to apprenticeship	Investigates how apprenticeship training affects early career mobility and earnings profiles of young apprentices.	Earnings equations for stayers and movers, controlling for selection (being a full-time employee and a mover) using a bivariate probit model.		Stayers vs movers	Wages Wage growth	Movers experience an earnings loss, but their earnings grow at a faster rate. Workers trained in large firms earn more than those trained in small firms.
Euwals; Winkelmann (2004)	Germany	administrative data	1975-1995	Transition to work Returns to apprenticeship	Investigates the impact of quality of training (i.e. training intensity) on retention rates, as well as, the differences between movers and stayers in the duration and wages of first jobs (after apprenticeship).	Proportional hazard model and linear regressions, controlling for training intensity (duration of apprentice and apprentice wage).		Stayers vs movers	Retention rates Duration of first job Wage of first job	Retention rate (RR): 10% increase in apprentice wage increases the RR by 2p.p. ; 16 p.p difference in the RR between short and long apprenticeships. Duration of first job: stayers have a longer first-job durations. Wage differential: not statistically significant.
Parey (2009)	Germany	administrative data	1975-2001	Transition to work Returns to apprenticeship	Assesses the labour market effect of apprenticeship compared to school based VE, exploiting regional variation in the supply of apprenticeship contracts.	Regressions with IV. Selection in educational choice is instrumented by the variation in supply of apprenticeship vacancies.	Quasi-experimental	Full-time school-based vocational education	Unemployment Wage Job mobility (between sectors and occupation) Response to negative shocks	Unemployment duration: positive effect (-0.1 yrs). Wages: no significant differences. Mobility: positive but not statistically significant. Responsiveness to firm closure: adverse effect is stronger for former apprentices, although not always statistically significant.
Bellmann; Bender; Hornsteiner (2000)	West Germany	administrative data	1975-1990	Transition to work	Analyses the effects of apprenticeship on job duration in West Germany, using information from two cohorts of new entrants to the labour force.	Survival analysis. Accelerated failure time model allowing for unobserved heterogeneity.		Individuals with lower secondary school with no apprenticeship (cohorts entering labour market in 1979 and 1985)	Job duration (first job)	Lower secondary school leavers with a completed apprenticeship stay longer on their first jobs. (+1.3 times longer for 1979 and 2.2 for 1985 cohort). Positive and significant effect if switch into the job directly from apprenticeship (1.8 times longer for 1979 and 2.5 for 1985 cohort)
Büchel (2002)	West Germany	survey	1991-1992	Transition to work	Analyses school to apprentice transition and apprenticeship-to-work transition across years. It accounts for selection in the type/quality of apprenticeship and then assess the transition to work quality (post apprentice occupation coherent with training).	Bivariate probit model Controls for selection into different types of apprenticeship (high and low quality) by using previous educational attainments ("poor education" vs. "good education").		Poor vs good education (before apprenticeship) High vs low quality apprenticeship	School to apprentice transition Apprenticeship-to-work transition (employed in jobs coherent with apprenticeship)	Access to a "good" apprenticeship is largely determined by the quality of the general school-leaving certificate (positive selection). Poor schooling continues to have a negative effect on work transition independently of the quality of apprenticeship taken.

Study	Country	Data source	Obs period	Theme	Main topic	Methodology Identification strategy	Impact evaluation	Comparison group	Outcome(s)	Results
Caliendo; Künn; Schmidl (2011)	Germany	administrative data	2001-2008	Transition to apprenticeship (ALMP)	Analyses the effects of specific ALMP aimed at enhancing the chances of youths at entering the vocational training system: "Preparatory practical training (PT)". The program consists in a subsidized internship within a firm where predominantly basic practical skills and literacy are conveyed. Some employers might also use this as a probation period before offering a full apprenticeship position within the firm.	Matching Propensity score (selection); stratification and inverse probability weighting.	Quasi-experimental	Youth not participating in any ALMP within the first 12 months of unemployment but who are potentially treated later	Employment Education	Negative for employment at 30 and 60 months (although decreasing) Positive effects for participation in further education (+10%)
Bertschy; Cattaneo; Wolter (2009)	Switzerland	surveys	2000-2005	Transition to work	Investigates whether compulsory school achievements (PISA tests) influence transition and good matching into first job, or whether a successful transition depends more on the type of vocational education (quality of apprenticeship).	Multivariate probit model controlling for endogeneity and self section.			Employment (in jobs coherent with apprenticeship)	A higher intellectual level of the vocational training occupation has a positive impact on the school-to-work transition (good match). Full-time vocational school trainees are less likely to get an adequate job compared with those having completed apprenticeship training. Compulsory school achievements indirectly influence transition to work (choice of a higher level of VET and higher probability of success in completing VET).
Bonnal; Mendes; Sofer (2002)	France	survey	1989-1990	Transition to work	Analyses the effects on school-to-work transition and unemployment duration of apprenticeship, as compared to school based vocational education that lead to the same diplomas.	Simultaneous maximum likelihood model, controlling for apprenticeship selection bias.		School based vocational education, leading to same qualification of apprenticeship.	Employment Unemployment duration	Apprentices have better chances of finding a job immediately than vocational school leavers, especially for men. For those that do not find immediately a job, apprenticeship has a significant positive effect on unemployment duration.
Hofer; Lietz, (2004)	Austria	Administrative data	1993-1998		Examines earnings and the stability of occupational career of former apprentices with respect to individuals of the same birth cohort (1970) taking different educational paths.	Estimates an earnings equation function, controlling for personal characteristics and previous working experience, working sector, etc.		Workers with a full time secondary school education Workers with compulsory education only	Wages Career (long term unemployment; unemployment spell)	Former apprentices are better off than workers who have completed only their compulsory education in terms of earnings and unemployment spell. Whereas, high school graduates perform better than former apprentices as regards unemployment spell and wages (especially after a few a few years of work experience).
Malamud; Pop-Elechesn (2010)	Romania	census; surveys	1995-2000	Transition to work	Examines the relative benefits of general education and vocational training in Romania exploiting a 1973 educational reform that shifted a large proportion of students from vocational training to general education.	Regression discontinuity design. Exploits an educational reform that increased the number of years of compulsory general education, while reducing that of vocational education (including apprenticeship).	Natural experiment	Individuals unaffected by the policy (previous cohorts)	Unemployment Non-employment	The effect of the policy on the probability of being unemployed or non-employed is small and insignificant in all years examined. No differences for 1 more year of general education, as compared to vocational training.

Table 2.0 Evaluation studies on the effects of apprenticeship on firms: costs, benefits and provision of apprenticeship

Study	Country	Data source	Obs period	Theme	Main topic	Methodology Identification strategy	Impact evaluation	Comparison group	Outcome(s)	Results
Mohrenweiser; Zwick (2009)	Germany	administrative data	1997-2002	Cost-benefit	Analyses the impact of increasing the share of apprentices at the cost of the share of unskilled or semiskilled employees on establishment performance.	Estimation of a Cobb Douglas gross profit function: share of apprentices occupational categories. System GMM to account for estimation biases.		Unskilled/semiskilled workers	Firm gross profit	1% increase in the share of apprentices in commercial/trade occupations increases gross profit of about +1% , in craft and construction occupations (+1.4%); reduce gross profits for manufacturing occupations (-1.2%).
Zwick (2007)	Germany	administrative data	1997-2004	Cost-benefit	Investigates whether the impact of an increase in the share of apprentices on contemporary profits is negative.	Panel system GMM methods, in order to account for possible endogeneity of training intensity and unobserved heterogeneity in the profit estimation.			Firm profit	Both, the lagged share of apprentices and the contemporary share of apprentices have a positive, albeit insignificant, impact on profits.
Cappellari; Dell'Aringa; Leonardi (2012)	Italy	surveys	2004-2007	Cost-benefit Supply of apprenticeship	Investigates the effects of an apprenticeship reform using panel data on Italian firms. The reform aimed at increasing the use of apprenticeships by weakening the need for training certifications and extending the scope of their applicability to individuals up to 30 years of age.	Impact of Apprenticeship reform. Difference in difference approach; exploits variation in the timing of implementation of new regulation across regions and sectors.	Natural-experiment	Not exposed firms	Job turnover Employment levels Employment growth Production inputs Productivity	The reform increased job turnover and induced the substitution of external staff (*collaboratori)* with apprentices, with an overall productivity-enhancing effect. Job turnover of apprentices.: +3% Employment growth appr: +1.6% Employment level appr: +5% Effects on capital, investment and skill ratio: not statistically significant. Positive effects on productivity: - Value added per worker: +1.5% - Sales per worker: +0.9% - TFP: + 1.6%
Wolter; Mühlemann; Schweri (2006)	Switzerland	surveys	2000	Cost-benefit	Investigates why some Swiss firms do not provide training given that most apprentices offset the cost of their training during their apprenticeship on the basis of the productive contribution of the work they perform.	ML selection model to estimate the net cost of training for firms without an apprenticeship programme. To control for selection: firms recruiting difficulties.		Training vs non training firms	Net cost of apprenticeship	Non-training firms would incur in significantly higher net cost during the apprenticeship period if they would switch to a training policy. Average net cost (CHF) for TF=-6,174; NTF=42,395. The differential is due to low benefits and to a lesser extent to higher costs.
Dionisius; Muehlemann; Pfeifer; Walden; Wenzelmann; Wolter (2009)	Germany, Switzerland	surveys	2000	Cost-benefit	Analyses and identifies source of different net cost of apprenticeship programs in Germany (loss) and Switzerland (profit).	Matching model		Germany vs. Switzerland net costs	Determinants of apprenticeship net cost in Germany (with respect to Switzerland)	The difference in the net costs of training apprentices between Germany and Switzerland amounts to 25,000 € for a three year training program. Determinants of the differential are: Relative wages (lower wage differential between apprentices and regular employment in DE) Regulations (impose more investment-oriented training in DE) Tasks allocation (more use of non productive activities in DE).

Westergaard-Nielsen; Rasmussen (2000)	Denmark	administrative data	1980-1991	Supply of apprenticeship	Estimates the effect of subsidies to apprenticeship on firm supply of apprenticeship contracts, using the changes in the subsidy amount in Denmark during the period 1980-1991.	Poisson regression model, using variation in the amount of public subsidies to apprenticeship			Supply of apprentices places	Public subsidy increased, on average, total demand for apprentices (+7%). However, significantly positive effect of subsidies in manufacturing, office and trade, while insignificant effects in the other industries.
Mohrenweiser; Backes-Gellner (2010)	Germany	surveys	1996-2005	Supply of apprenticeship	Tests firms motivations for apprenticeship: substitution (cheap labour) versus investment strategy; and determinants of substitution strategy.	Analysis of within firm retention rate of apprentices in order to define investment and substitution strategies of firms; Analysis of determinants for substitution strategy			Firms motivation in supplying apprenticeship	18.5 % of firms follow a substitution strategy (within firm retention rate over 3 year is <20%) and 43.75% an investment strategy (>80%); the rest is mixed or undetermined. The probability of following a substitution strategy increases with: lower capital equipment, absence of works council, a higher share of white collar workers, in smaller firms and in the service sector.
Mühlemann; Schweri; Winkelmann; Wolter (2007)	Switzerland	surveys	2000	Supply of apprenticeship	Aims to estimate the effect of net costs on the number of apprentices hired by a firm, given that there is large variation in net costs across firms and, negative net costs for 60% of all firms investigated.	Count data models (hurdle)			Cost elasticity of apprenticeship at the extensive margin (i.e. probability whether to train or not to train) Cost elasticity of apprenticeship at the intensive margin (i.e. for the number of apprentices among training firms)	Costs have a significant impact on the training decision but no significant influence on the number of apprentices, once the firm has decided to train. Cost elasticity at the extensive margin: -0.45; Cost elasticity at the intensive margin is zero.

References

Acemoglu, D., Pischke, J.S., (1998) "Why do firms train? Theory and evidence", *The Quarterly Journal of Economics*, 113, 1, 79-119.

Adda, J., Dustmann, C., Meghir, C., Robin, J.-M., (2010) "Career Progression and Formal versus On-the-Job Training", *Institute for Fiscal Studies Working Papers*, n.W10/13.

Bellmann, L., Bender, S., Hornsteiner, U., (2000) "Job tenure of two cohorts of young German men 1979-1990: An analysis of the (West-)German employment statistic register sample concerning multivariate failure times and unobserved heterogeneity", *IZA Discussion Paper*, n. 106.

Bertschy, K., Cattaneo, M.A., Wolter, S.C., (2009), "PISA and the transition into the labour market", *Labour: Review of Labour Economics and Industrial Relations,* 23, 111–137.

Bonnal, L., Mendes, S., Sofer, C., (2002) "School-to-work transition: Apprenticeship versus vocational school in France", *International Journal of Manpower*, 23 (5), 426–442.

Bougheas, S. and Georgellis, Y. (2004) 'Early Career Mobility and Earnings Profiles of German Apprentices: Theory and Empirical Evidence.' *Labour*, Vol. 18, 233- 263.

Büchel, F., (2002) "Successful apprenticeship-to-work transitions: On the long-term change in significante of the German school-leaving certificate", *International Journal of Manpower*, 23 (5), 394–410.

Caliendo, M., Künn, S., Schmidl, R.,(2011) "Fighting Youth Unemployment: The Effects of Active Labor Market Policies", *IZA Discussion Paper, n.*6222.

Cappellari, L., Dell'Aringa, C., Leonardi, M., (2012) "Temporary employment, job flows and productivity: a tale of two reforms", *The Economic Journal*, 122 (August), 188-215.

Damon, C., Fahr, R., (2002) "The Promise of Workplace Training for Non-College Bound Youth: Theory and Evidence from German Apprenticeship", *Centre for Economic Performance Discussion Papers*, n. 0518.

Dionisius, R., Mühlemann, S., Pfeifer, H., Walden, G., Wenzelmann, F., Wolter, S.C., (2009) "Costs and benefits of apprenticeship training. A comparison of Germany and Switzerland", *Applied Economics Quarterly,* 55 (1), 5–38.

Euwals, R., Winkelmann, R., (2004) "Training intensity and first labour market outcomes of apprenticeship graduates", *International Journal of Manpower*, 25, 447–462.

Fersterer, J., Pischke, J.S., Winter-Ebmer, R., (2008) "Returns to apprenticeship training in Austria: Evidence from failed firms", *Scandinavian Journal of Economics*, 110 (4), 733–753.

Hofer, H, Lietz, C. (2004) "Labour Market Effects of Apprenticeship Training in Austria", *International Journal of Manpower*, Vol.25, 104-122.

Malamud, O., Pop-Eleches, C., (2010) "General education versus vocational education: Evidence from an economy in transition", *The Review of Economics and Statistics*,92 (1), 43–60.

McIntosh, S., (2007) "A Cost-Benefit Analysis of Apprenticeships and Other Vocational Qualifications", Department of Economics, University of Sheffield- Sheffield University Management School, Research Report 834

Mohrenweiser, J., Zwick, T., (2009) "Why do firms train apprentices? The net cost puzzle reconsidered", *Labor Economics*, 16 (5), 631–637.

Mohrenweiser, J.; Backes-Gellner, U., (2010) “Apprenticeship Training, what for: Investment or Substitution?”, *International Journal of Manpower*, 31(5), 545-562.

Mühlemann, S., Schweri, J., Winkelmann, R., Wolter, S.C., (2007) “An empirical analysis of the decision to train apprentices”, *Labour: Review of Labour Economics and Industrial Relations*, 21 (3), 419–441.

Parey, M. (2009), “Vocational Schooling versus Apprenticeship Training. Evidence from Vacancy Data”, mimeo.

Plug, E., Groot, W.J.N., (1998) “Apprenticeship versus vocational education: Exemplified by the Dutch situation”, *TSER/STT Working Paper*, 10–98.

Werwatz, A., (2002) “Occupational mobility after apprenticeship—How effective is the German apprenticeship system?” *Applied Econonomics Quarterly,* 48 (3–4), 279–303.

Westergaard-Nielsen, N., Rasmussen, A.R., (2000) “The impact of subsidies on the number of new apprentices” *Research in Labor Economics,* 18, 359–375.

Wolter, S.C., Mühlemann, S., Schweri, J., (2006) “Why some firms train apprentices and many others not”, *German Economic Review*, 7 (3), 249–264.

Zwick, T., (2007) “Apprenticeship Training in Germany –Investment or Productivity Driven?”, *ZEW Discussion Papers*, n. 07-023

Other references

Brunello, G. (2009), “The Effect of Economic Downturns on Apprenticeships and Initial Workplace Training: a Review of the Evidence”, *IZA Discussion Papers*, n.4326

Card, D., Kluve, J., (2009) “Active Labor Market Policy Evaluations: A Meta-Analysis”, *IZA Discussion Papers*, n.4002.

European Commission (2012a), “Apprenticeship supply in the Member States of the European Union”, Directorate-General for Employment, Social Affairs and Inclusion.

European Commission (2012b), “Study on a comprehensive overview on traineeship arrangements in Member States”, Directorate-General for Employment, Social Affairs and Inclusion.

Hoeckel, K. (2008) “Costs and Benefits in Vocational Education and Training, *OECD*

Hujer, R., Caliendo, M., (2000) “Evaluation of Active Labour Market Policy: Methodological Concepts and Empirical Estimates”, *IZA Discussion Papers*, n.236.

Kluve, J., (2006) “The Effectiveness of European Active Labor Market Policy”, *IZA Discussion Papers*, n.2018.

London Economics (2011a) “The Long-Term Effect of Vocational Qualifications on Labour Market Outcomes”, *BIS* Research Paper 47.

London Economics (2011b) “Returns to Intermediate and Low Level Vocational Qualifications”, *BIS* Research Paper 53.

National Audit Office (2012), “Adult Apprenticeships. Estimating economic benefits from apprenticeships – Technical Paper”, *Department for Innovation, Business and Skills, Skills Funding Agency and National Apprenticeship Service*.

OECD (2009), “Taking advantage of workplace training” in *Learning for Jobs: OECD policy review of vocational education and training. Initial report*, Paris.

OECD (2011), “OECD reviews of vocational education and training. Learning for Jobs”, *OECD reviews of vocational education and training Learning for Jobs*, Paris.

Piopiunik, M., Ryan, P., (2012) “Improving the transition between education/training and the labour market: What can we learn from various national approaches?”, Report for the European Commission, *EENEE*, Analytical Report n. 13.

Quintini G. and T. Manfredi (2009), “Going Separate Ways? School-To-Work Transition in The United States and Europe”, *OECD Social, Employment and Migration Working Papers*, n. 90, OECD, Paris.

Quintini, G., Martin, J.P., Martin, S., (2007) “The Changing Nature of the School-to-Work. Transition Process in OECD Countries”, *IZA Discussion Paper, n.*2582.

Quintini, G., Martin, S., (2006) “Starting Well or Losing their Way? The Position of Youth in the Labour Market in OECD Countries”, *OECD Social, Employment and Migration Working Papers*, n. 39, OECD, Paris.

Reed, D., Yung-Hsu Liu, A., Kleinman, R., Mastri, A. Reed, D., Sattar, S. Ziegler, J. (2012) “An Effectiveness Assessment and Cost-Benefit Analysis of Registered Apprenticeship in 10 States”, *Mathematica Policy Research* for the U.S. Department of Labor Employment Final Report and Training Administration

Ryan, P., (1998) “Is apprenticeship better? a review of the economic evidence”, *Journal of Vocational Education & Training*, 50(2), 289-329.

Ryan, P., (2001), “The school-to-work transition: A cross-national perspective” *Journal of Economic Literature*, 39 (1), 34–92.

Ryan, P., (2011), “Apprenticeship : between theory and practice, school and workplace”, Swiss Leading House on Economics of Education, University of Zurich, Working Paper n. 64.

Van der Velden, R., Welter, R., Wolbers, M. (2001), “The Integration of Young People into the Labour Market within the European Union: the Role of Insitutional Settings”, *Research Centre for Education and the Labour Market* Working Paper n.7E

Wolter, S., Ryan, P., (2011) “Apprenticeship”, pp. 521-76 in R. Hanushek, S. Machin and L. Wössman (eds), *Handbook of the Economics of Education*, Vol. 3. Amsterdam: ElsevierNorth-Holland.

2. Apprenticeships, traineeships and labour market outcomes: A cross-country regression analysis

This part focuses on an exploratory econometric analysis, based on country level panel data covering the 1998-2010 period in order to estimate the relationship between the main youth labour market outcomes and indicators relative to apprenticeship and traineeship schemes.

Starting with a brief review of the empirical literature on cross-country studies available (section 1); section 2 includes the description of the data and empirical analysis strategy; while sections 3 and 4 present the results of the descriptive and econometric analysis.

2.1 Review of empirical literature

The majority of studies on the effects of apprenticeships on youth labour market performance are microeconometric national studies on countries with a structured and widespread apprenticeship system (such as Austria, Germany and Switzerland).[11]

Given the features of the empirical analysis presented below, this section focusses on the few cross-country studies available. On the whole, they show that countries with more developed apprenticeship systems are more successful in giving young people a good start in the labour market.

Van der Velden et al. (2001) point out that European countries with apprenticeship systems enjoy better youth employment outcomes, particularly in terms of larger employment share in skilled occupations and in high-wage sectors, than do those with little or no apprenticeship coverage.

Similarly, Quintini and Martin (2006) show that in European countries where the apprenticeship system is more developed young people have better labour market outcomes than in other countries. As a matter of fact, Denmark, and Switzerland are among the OECD countries with the lowest youth unemployment rates, and Austria is well below the OECD average. Austria, Denmark and Germany are among the countries with the lowest proportion of young people experiencing repeated periods of unemployment. Moreover, in Germany and Austria more than half of those leaving school found a job without experiencing any period of unemployment.

Looking at different types of school/work-based qualifications (including apprenticeships) in 12 European countries, Gangl (2003) finds that apprenticeships perform rather favourably both compared to school-based education at the same level of training and across different qualification levels. Apprenticeships produce a significant reduction in early career unemployment rates also after controlling for institutional and structural factors (see also Ryan, 2001).

Ryan (2000) analysed school-to-work patterns and related issues for seven economies (France, Germany, Japan, the Netherlands, Sweden, UK and USA) and showed that apprenticeships appear to increase the employment content of early working life. Compared to full-time vocational education, their effects on pay and promotion prospects are less clear, while compared to labour market alternatives, these are positive.

Quintini and Manfredi (2009) find that the most successful European countries in terms of school-to-work transitions are those where apprenticeships are widespread. Indeed, Austria, Denmark and

[11] For details see the analysis of existing evaluation studies on apprenticeship and traineeship schemes.

Germany have a larger share of young people on career trajectories characterised by employment and stability compared to other EU countries characterised by a high incidence of temporary work (Belgium, France, Italy, Portugal and Spain).

Ryan (2001) and Steedman (2005) point out that this result may be due to better matching of training to labour market demand achieved in apprenticeship programmes, where training is contingent on a job offer from the employer. However, while most regulated apprenticeship systems offer young people much improved employment prospects, they are not always able to guarantee higher pay or career prospects in the medium run (Quintini et al., 2007). In general, empirical evidence shows that the effects of apprenticeship training on long-term employment outcomes, including wages, are rather mixed (Ryan, 2001).

2.2 Data and empirical analysis strategy

Estimates are based on country level panel data covering the 1998-2010 period. An original data-set was created by merging information from different sources: (i) Eurostat Labour Market Policies (LMP) database; (ii) Eurostat Labour Force Survey (EU LFS); (iii) OECD indicators of employment and product markets regulation; (iv) ICTWSS Visser database. All the variables vary by country and year and given the presence of missing data for some years/countries, the data-set is an unbalanced panel, e.g. the periods of observation are not the same.

The analysis focuses on young people aged 15-24 and considers three main dependent variables: (i) the employment rate; (ii) the NEET rate; and (iii) the unemployment rate.

In order to capture the conditional relationship between apprenticeship and youth labour market performance, the following linear model is estimated:

$$Y_{it} = \beta_1 + \beta_2 A_{it} + \beta_3 X_{it} + \gamma_i + \tau_t + e_{it} \qquad [1]$$

where the suffix “it” denotes the i-th country at time t; Y is one of the three measures of labour market performance for the young; A is an indicator of the policy of interest (apprenticeship); X is a vector of control variables; γ is a vector of country-fixed effects, in order to take into account structural cross-country differences which may influence the youth labour market performance; and τs are time-fixed effects.

Furthermore, two alternative definitions of apprenticeship are adopted: (i) Public Expenditure on apprenticeship per participant; and (ii) the Coverage Rate (Apprentices/Total population, 15-24 years old). The first indicator is based on Eurostat LMP Database, while the second one is based on micro-data from EU LFS.[12]

The vector X of time-variant control variables include a set of:

Structural controls (Cohort dimension, defined as the share of people aged 15-24 on total population; share of part-time workers; share of workers with flexible working time; share of employment in services; Government expenditure as a share of GDP);

Indicators of regulation (Product Market Regulation; Employment Protection Legislation; Minimum wage as a share of median monthly wage of full-time workers);

[12] To identify apprentices, we use the variable TEMPREAS in the EU LFS micro data, which collects information about the reason for having a temporary job/work contact. Following the indications which emerged during the 3rd European User Conference for EU-LFS and EU-SILC (Mannheim, 21- 22 March 2013), we consider as apprentice a person who has a “ temporary contract covering a period of training (Apprentices, trainees, research assistants, etc.) (TEMPREAS=1). According to the indications at the Conference, the majority of individuals in this category are apprentices.

Active and Passive Labour Market Policies expenditure as share of GDP. Since the latter may, in turn, be influenced by labour market performance (specifically, higher unemployment means a larger pool of unemployment benefits recipients and hence a higher expenditure on (passive) labour market policies), their lagged values were used as regressors.

Table 2.1 reports the detailed description of the variables and relative sources.

Table 2.1: Description of Variables

Variable	Description	Source
Labour Market Indicators		
Employment rate	% of employed people on the total population (15-24)	Eurostat, LFS
Unemployment rate	% of unemployed people on the active population (15-24)	Eurostat, LFS
NEET rate	% of population not in employment, education or training on the total population (15-24)	Eurostat database
Apprenticeship Indicators		
Public Expenditure on apprenticeship per participant	It has been estimated as the ratio of the Total Public Expenditure on Apprenticeship and the number of beneficiaries	Eurostat, LM Policy Database
Apprenticeship coverage rate	Apprentices have been estimated using the Reason for having a temporary contract of limited duration in the EU LFS microdata (TEMPREAS variable=1) The coverage rate is the percentage of apprentices on the total population	Eurostat, LFS microdata
Structural Controls		
Cohort dimension Part-time rate	% of people aged 15-24 on the total population % of employed population working part-time on the total employed	Eurostat database Eurostat, LFS
Flexible hours rate	% of employed population with flexible working hours	Eurostat, LFS microdata
% of employment in services	% of employed in services on the total employed	Eurostat database
Government expenditure	General government revenue, expenditure and main aggregates in % of GDP	Eurostat database
Markets regulation		
Product Market Regulation	Integrated indicator which measures the degree to which policies promote or hinder competition in areas of the product market where competition is viable. Higher values of PMR are assigned to those countries with a more pervasive state regulation.	OECD database
Employment Protection Legislation	It is a measure of all types of employment protection measures, whether grounded primarily in legislation, court rulings, collectively bargained conditions of employment or customary practice. The indicator ranges from 0 to 6, with higher scores representing stricter regulation.	OECD database
Minimum wage	Proportion of minimum relative to median monthly wages of full-time workers.	Visser, J. (2011), ICTWSS database, Version 3.0
Active Labour Market Policy Expenditure		
LMP expenditure as % of GDP	% of expenditure in Active LMP (category 2-7) and total supports LMP (category 8-9).	Eurostat, LMP Database

2.3 Descriptive evidence

Figure 2.1 shows the correlation between the incidence of apprenticeships, the expenditure per capita and the youth labour market indicators.

The figure suggests a positive relationship between the incidence of apprenticeships (coverage rate) and the youth employment rate. The countries with the highest coverage rates, namely Germany, Austria and Denmark, are characterized by youth employment rates substantially higher than the EU-27 average (36.5% for the considered period). On the contrary, countries with low coverage rates, namely the Southern and Eastern European countries, also have lower youth employment rates.

Figure 1 also shows that the coverage rates are negatively associated with youth unemployment and NEET rates. In Germany, Austria and Denmark high coverage rates are associated with youth unemployment rates and the NEET rates below the EU27 average during the considered period (18% and 12% respectively), while countries with youth unemployment rates and NEET rates above the EU-27 average are characterized by low coverage rates.

Similar findings are highlighted by the graphs on the relationship between public expenditure on apprenticeship per participant and youth unemployment and NEET rates.

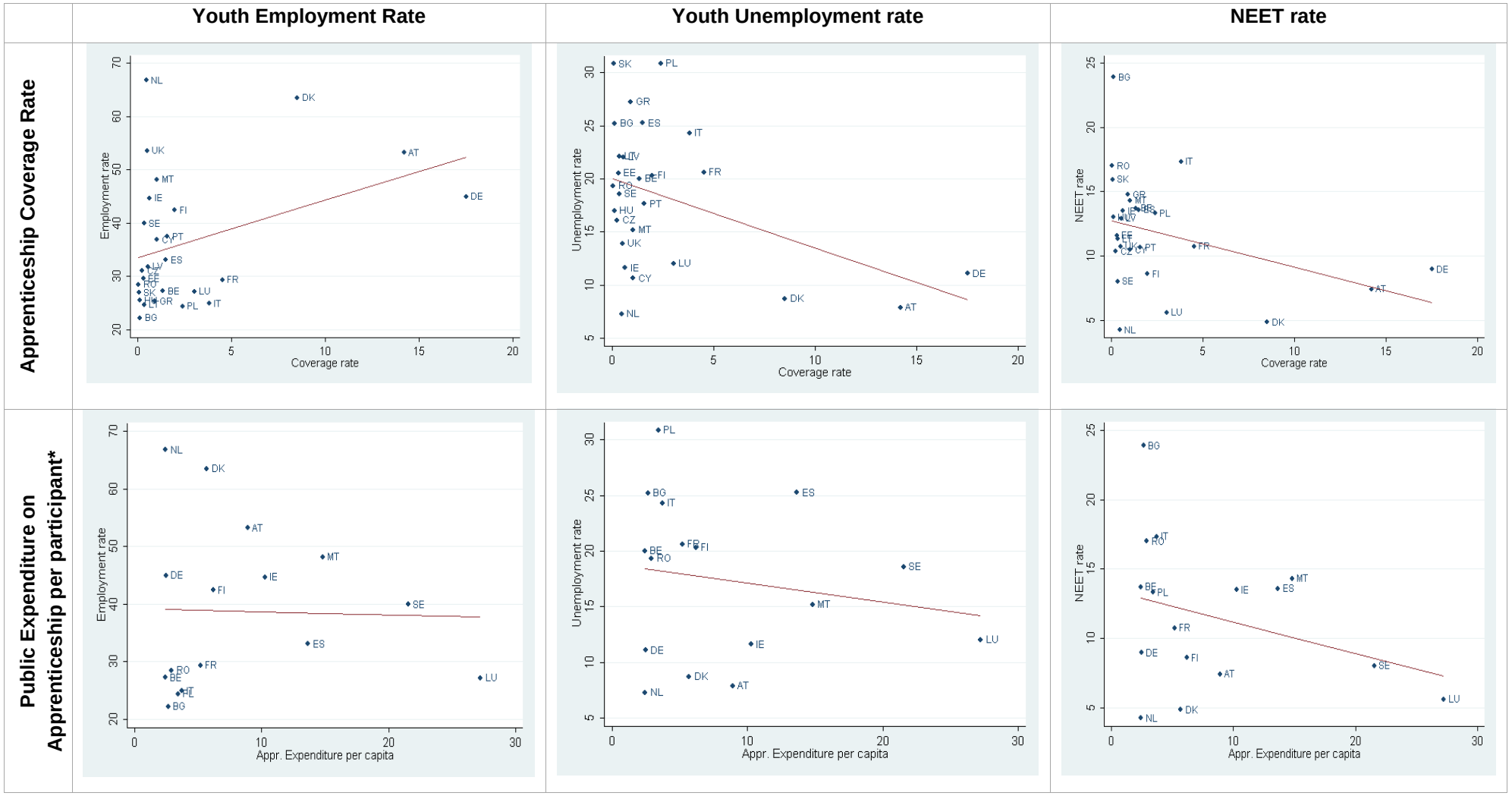
Figure 2.2 highlights the correlations between changes in the labour market indicators and changes in apprenticeship indicators during the economic crisis. Specifically, Figure 2 uses the variations in percentage points between the level estimated during the economic crisis (2009/10) and the pre-crisis levels (2006/07). A greater use of apprenticeships during the economic crisis is positively correlated to better performance of youth labour markets.

The figure suggests that the increase in the youth employment rate is generally larger in countries that increase the apprenticeship coverage rate compared to the EU27 average (countries in the upper-right quadrant), while the decrease in the coverage rate is often associated with a negative variation in the youth employment rate (countries in the lower left quadrant).

Figure 2 also confirms the negative relationship between the apprenticeship coverage rate, youth unemployment and NEET rates. Where the variation in the coverage rate is positive, changes in the youth unemployment and NEET rates are generally negative (with the exception of Denmark and France). In contrast, Spain shows both the highest reduction in the apprenticeship coverage rate and a substantial increase in both the youth unemployment and NEET rates.

Similar relationships are shown using the public expenditure on apprenticeship per participant as apprenticeship indicators.

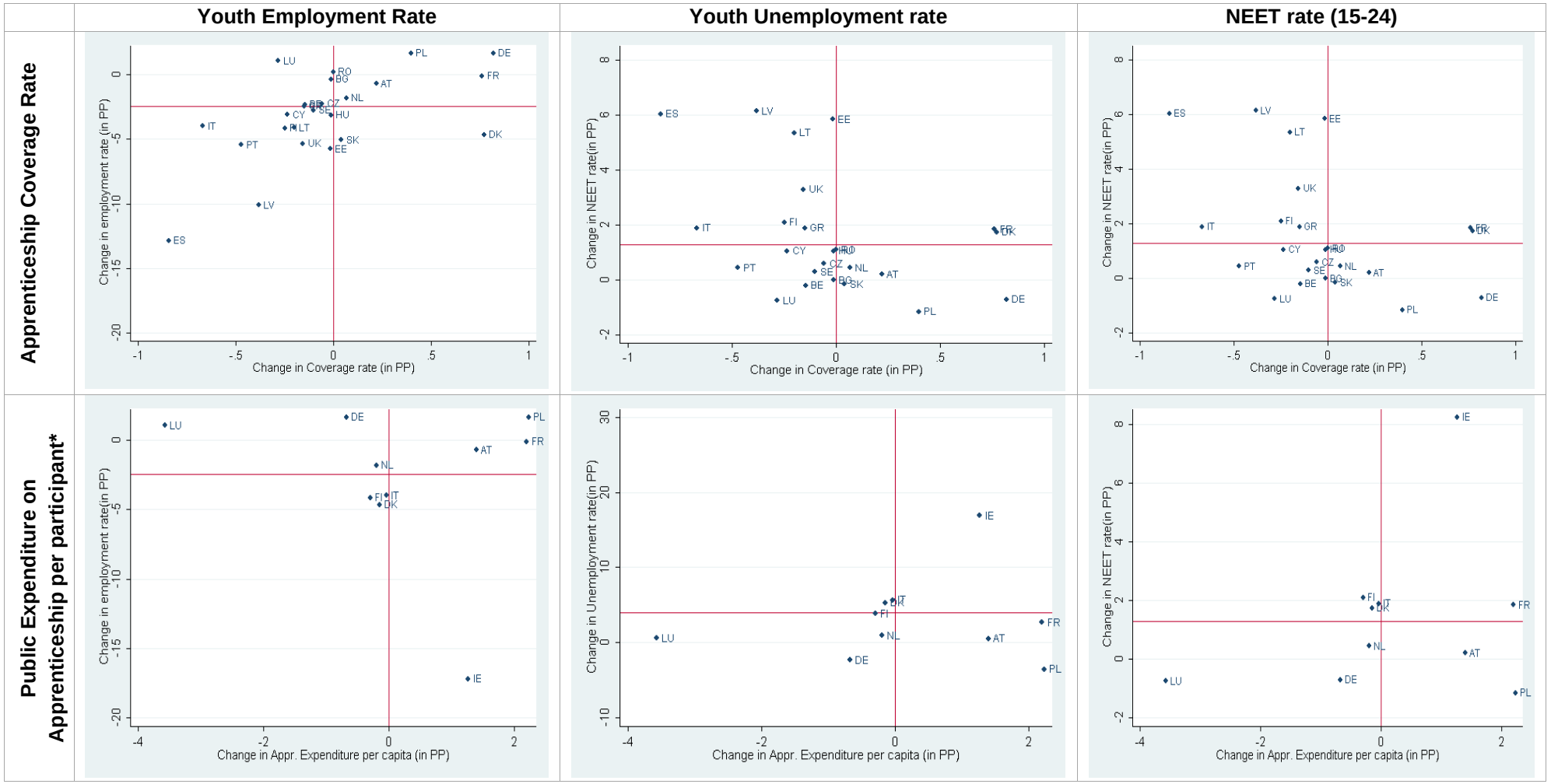
Figure 2.1 Pairwise correlations: Apprenticeship Indicators and Youth Labour Market Outcomes (1998/2010 average)



*Missing data for: CY, CZ, EE, GR, HU, LT, LV, PT, SI, SK

Source: own calculations on Eurostat data (EU LFS and Labour Market Policy Database)

Figure 2.2 Change in Apprenticeship Indicators and Youth Labour Market Outcomes (2009/10 vs 2006/07)



*Missing data for: CY, CZ, EE, GR, HU, LT, LV, PT, SI, SK

Source: own calculations on Eurostat data (EU LFS and Labour Market Policy Database)

2.4 Main econometric findings

Tables 2.2, 2.3 and 2.4 present the main estimates of the effects of apprenticeships on (i) the youth employment rate (Table 2); (ii) the youth unemployment rate (Table 3); and (iii) the NEET rate (Table 4). In each table, the two panels present each of the two measures of apprenticeships used: the coverage rate is shown in the upper panel, while public expenditure on apprenticeship per participant in the lower one.[13]

Columns present the different model specification used. More specifically, one starts with a very parsimonious specification, where only one of the apprenticeship indicators above (Column 1) is used as regressor. To control for composition effects and time-invariant differences across countries, other controls are progressively added that should influence the youth labour market performance indicators. First, in order to control for the business cycle, in Column 2 year fixed effects are added. Second, and more importantly, in Column 3 country-fixed effects are added to take into account time-invariant differences across countries. In this regard, estimates in Column 3 may be interpreted as the effect of a change in the apprenticeship indicator on labour market performance within a certain country, while estimates in Columns 1 and 2 capture rather differences between countries. To control for composition effects (i.e. the fact that the observed differences in the distribution of the labour market outcomes can be explained by differences in the distribution of a number of time-varying variables other than apprenticeships) in the following columns further time-varying controls are added at the country level, namely: (i) structural controls (Column 4); (ii) indicators of both labour and product market regulation (Column 5); and (iii) expenditure on passive and other active labour market policies (different from, where applicable, apprenticeships) as share of GDP (Column 6). Finally, to assess the importance of composition effects relative to cross-country differences (as captured by country-fixed effects), in the last column estimates of the full specification without country-fixed effects are reported.

According to the main estimates in Table 2, a higher incidence of apprenticeship is associated with a higher youth (15-24) employment rate; these estimates are statistically significant mainly when the coverage rate is used as the apprenticeship variable. For this variable, the results of the analysis are also very robust to model specification. Estimates based on expenditure per participant confirm this positive relationship when country-fixed effects are introduced in the models (Columns 3 to 6), even if they are less robust than estimates based on coverage rate.

Apprenticeships also reduce youth unemployment and our estimates are statistically significant and more robust to model specification when we use the coverage rate.

In particular, estimates based on the research team's full specification with country-fixed effects (Column 6 in the Tables) show that a one percentage point increase in the coverage rate is associated with an increase in the employment rate of almost 0.95 percentage points and a reduction in the unemployment rate of around 0.8 percentage points.

On the contrary, estimates are less robust considering total NEET rate and dependent variables.

[13] We also ran estimates also using Public Expenditure on apprenticeships as a share of GDP as our main regressor, but results were much less robust than those obtained with the other two apprenticeship-related indicators.

Table 2.2: Effect of apprenticeships on the employment rate (15-24)

	1	2	3	4	5	6	7
Coverage rate	1.162 ***	1.175 ***	0.743 ***	0.695 **	0.688 **	0.942 ***	0.581 ***
	(0.167)	(0.168)	(0.306)	(0.295)	(0.297)	(0.292)	(0.133)
Time Fixed Effects (year dummies)	No	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	No	Yes	Yes	Yes	Yes	No
Structural Controls (a)	No	No	No	Yes	Yes	Yes	Yes
Regulation Indicators (b)	No	No	No	No	Yes	Yes	Yes
Expenditure on LMPs (c)	No	No	No	No	No	Yes	yes
N. Obs.	299	299	299	298	240	240	240
Adj. R2	0.137	0.124	0.945	0.951	0.958	0.961	0.76

	1	2	3	4	5	6	7
Appr. Exenditure per capita	-0.111	-0.12	0.079 ***	0.052 **	0.041 *	0.03	0.128 **
	(0.097)	(0.103)	(0.240)	(0.022)	(0.023)	(0.023)	(0.054)
Time Fixed Effects (year dummies)	No	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	No	Yes	Yes	Yes	Yes	No
Structural Controls (a)	No	No	No	Yes	Yes	Yes	Yes
Regulation Indicators (b)	No	No	No	No	Yes	Yes	Yes
Expenditure on LMPs (c)	No	No	No	No	No	Yes	yes
N. Obs.	140	140	140	138	131	131	131
Adj. R2	0.002	-0.068	0.962	0.976	0.976	0.977	0.817

(a) These include: (i) young cohort dimension (people aged 15-24/population); (ii) % part-time employment; (iii) % workers with flexible working time; (iv) % employment in service sector; (v) Government expenditure as a share of GDP

(b): These include: (i) OECD Employment Protection Legislation indicator; (ii) OECD Product Market Regulation indicator; and (iii) the minimum wage (as a proportion of median monthly wage of full-time workers)

(c): Expenditure on active and passive labour market policies (% GDP) from Eurostat LMP data-base, lagged values

Source: own estimates

Table 2.3: Effect of Apprenticeships on the Unemployment rate (15-24)

	1	2	3	4	5	6	7
Coverage rate	-0.6 ***	-0.6 ***	-0.473	-0.511	-0.475	-0.801 **	-0.705 ***
	(0.104)	(0.102)	(0.453)	(0.411)	(0.387)	(0.351)	(0.101)
Time Fixed Effects (year dummies)	No	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	No	Yes	Yes	Yes	Yes	No
Structural Controls (a)	No	No	No	Yes	Yes	Yes	Yes
Regulation Indicators (b)	No	No	No	No	Yes	Yes	Yes
Expenditure on LMPs (c)	No	No	No	No	No	Yes	yes
N. Obs.	299	299	299	298	240	240	240
Adj. R2	0.097	0.136	0.682	0.741	0.787	0.833	0.590

	1	2	3	4	5	6	7
Appr. Exenditure per capita	-0.0858 *	-0.0901 *	-0.0823 ***	-0.0543 **	-0.0381 *	-0.0277	-0.0858 **
	(0.047)	(0.048)	(0.026)	(0.024)	(0.022)	(0.021)	(0.043)
Time Fixed Effects (year dummies)	No	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	No	Yes	Yes	Yes	Yes	No
Structural Controls (a)	No	No	No	Yes	Yes	Yes	Yes
Regulation Indicators (b)	No	No	No	No	Yes	Yes	Yes
Expenditure on LMPs (c)	No	No	No	No	No	Yes	yes
N. Obs.	140	140	140	138	131	131	131
Adj. R2	0.017	-0.012	0.814	0.881	0.909	0.919	0.523

(a) These include: (i) young cohort dimension (people aged 15-24/population); (ii) % part-time employment; (iii) % workers with flexible working time; (iv) % employment in service sector; (v) Government expenditure as a share of GDP

(b): These include: (i) OECD Employment Protection Legislation indicator; (ii) OECD Product Market Regulation indicator; and (iii) the minimum wage (as a proportion of median monthly wage of full-time workers)

(c): Expenditure on active and passive labour market policies (% GDP) from Eurostat LMP data-base, lagged values

Source: own estimates

Table 2.4: Effect of Apprenticeships on the NEET rate (15-24)

	1	2	3	4	5	6	7
Coverage rate	-0.319 ***	-0.314 ***	0.117	0.17	-0.014	0.036	-0.23 ***
	(0.065)	(0.066)	(0.25)	(0.225)	(0.186)	(0.167)	(0.058)
Time Fixed Effects (year dummies)	No	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	No	Yes	Yes	Yes	Yes	No
Structural Controls (a)	No	No	No	Yes	Yes	Yes	Yes
Regulation Indicators (b)	No	No	No	No	Yes	Yes	Yes
Expenditure on LMPs (c)	No	No	No	No	No	Yes	yes
N. Obs.	255	255	255	255	201	201	201
Adj. R2	0.082	0.077	0.811	0.851	0.856	0.885	0.503

	1	2	3	4	5	6	7
Appr. Exenditure per capita	-0.033	-0.032	-0.001	-0.001	0.001	0.006	-0.014
	(0.032)	(0.033)	(0.011)	(0.010)	(0.010)	(0.010)	(0.025)
Time Fixed Effects (year dummies)	No	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	No	Yes	Yes	Yes	Yes	No
Structural Controls (a)	No	No	No	Yes	Yes	Yes	Yes
Regulation Indicators (b)	No	No	No	No	Yes	Yes	Yes
Expenditure on LMPs (c)	No	No	No	No	No	Yes	yes
N. Obs.	118	118	118	116	109	109	109
Adj. R2	0.001	-0.045	0.921	0.949	0.95	0.956	0.586

(a) These include: (i) young cohort dimension (people aged 15-24/population); (ii) % part-time employment; (iii) % workers with flexible working time; (iv) % employment in service sector; (v) Government expenditure as a share of GDP

(b): These include: (i) OECD Employment Protection Legislation indicator; (ii) OECD Product Market Regulation indicator; and (iii) the minimum wage (as a proportion of median monthly wage of full-time workers)

(c): Expenditure on active and passive labour market policies (% GDP) from Eurostat LMP data-base, lagged values

Source: own estimates

References

Gangl M (2003) 'Returns to Education in Context: Individual Education and Transition Outcomes in European Labour Markets' Pp. 156-185 in Walter Müller and Markus Gangl (eds.), *Transitions From Education to Work in Europe - the Integration of Youth into EU Labour Markets* Oxford: Oxford University Press.

ILO, 2012, Overview of apprenticeship systems and issues, ILO contribution to the G20 Task Force on Employment, November 2012.

Quintini G. and T. Manfredi (2009), "Going Separate Ways? School-To-Work Transition in The United States and Europe", *OECD Social, Employment and Migration Working Papers*, n. 90, OECD, Paris.

Quintini, G., Martin, J.P., Martin, S., (2007) "The Changing Nature of the School-to-Work. Transition Process in OECD Countries", *IZA Discussion Paper, n.*2582.

Quintini, G., Martin, S., (2006) "Starting Well or Losing their Way? The Position of Youth in the Labour Market in OECD Countries", *OECD Social, Employment and Migration Working Papers*, n. 39, OECD, Paris.

Ryan P., 2000. „The Attributes and Institutional Requirements of Apprenticeship: Evidence from Smaller EU Countries" *International Journal of Training and Development*, January 2000, 4(1), pp 42-65.

Ryan, P., (2001), "The school-to-work transition: A cross-national perspective" *Journal of Economic Literature*, 39 (1), 34–92.

Ryan P., K. Wagner, S. Teuber, U. Backes-Gellner, 2010. *Trainee Pay in Britain, Germany and Switzerland: Markets and Institutions* SKOPE Research Paper No. 96 July.

Steedman H. (2005), “Apprenticeship in Europe: Fading or Flourishing?”, Centre for Economic Performance discussion paper No. 710.

Van der Velden, R., Welter, R., Wolbers, M. (2001), “The Integration of Young People into the Labour Market within the European Union: the Role of Institutional Settings”, *Research Centre for Education and the Labour Market* Working Paper n.7E

3. The role of apprenticeships in the youth labour market: Evidence from a decade of reforms in Italy[14]

3.1 Background on apprenticeships and other training and temporary contracts in Italy

Apprenticeships and other training contracts in Italy

In Italy an apprenticeship is and has always been considered an employment contract with a training purpose; as such, it is not part of the education system. The employment purpose prevails, if not in the law, certainly in terms of implementation. It combines work with training and apprentices are considered to be employees. Firms benefit from tax relief, consisting in the complete reduction in employer welfare and social security contributions for the entire length of the contract. It lasts from 3 to 5 years and, being a temporary contract, expires naturally at the end of the apprenticeship period.[15] It was introduced in the mid-fifties and has been modified in a number of ways over the years. It was substantially reformed in 2003 by the so-called Biagi Law (see Box 2).[16]

BOX 2 – Main features of the Biagi reform on apprenticeships

In 2003, the "Biagi Law" introduced a number of changes in the apprenticeship-related legislation with the aim of updating it, making the contract more suitable for both young people and firms and expanding its implementation.

The first change concerned the introduction of the apprenticeship for young people aged 15-18 (*apprendistato per l'espletamento del diritto-dovere all'istruzione e formazione*, literally "apprenticeship for the right/duty of education and training"). The contract can last up to a maximum of three years and the training programme for this type of apprenticeship should be established by the regions in collaboration with the Ministry of Labour and the Ministry of Education.

The second type of apprenticeship was defined as *apprendistato alto* (high-level apprenticeship) and was a new feature with respect to past legislation. The young apprentice could obtain an educational qualification of secondary education or a degree. The parties involved in this contract were not only the employer and the apprentice but also, and this was the key novel feature, the university or another accredited educational or training institution. The specific length and regulations governing the apprenticeship were determined by the regions, in agreement with regional employer associations, universities, technical and professional institutes and other training and research institutes.

The most interesting and documented form of apprenticeship introduced by the Biagi Law was the so-called *apprendistato professionalizzante* (apprenticeship leading to an occupation). The new legislation extended the age limit of the apprentices up to 30 years, abolished the certification of qualifications and introduced the option of undertaking part of the training at the workplace as a

[14] by Simona Comi, IRS and University of Milano

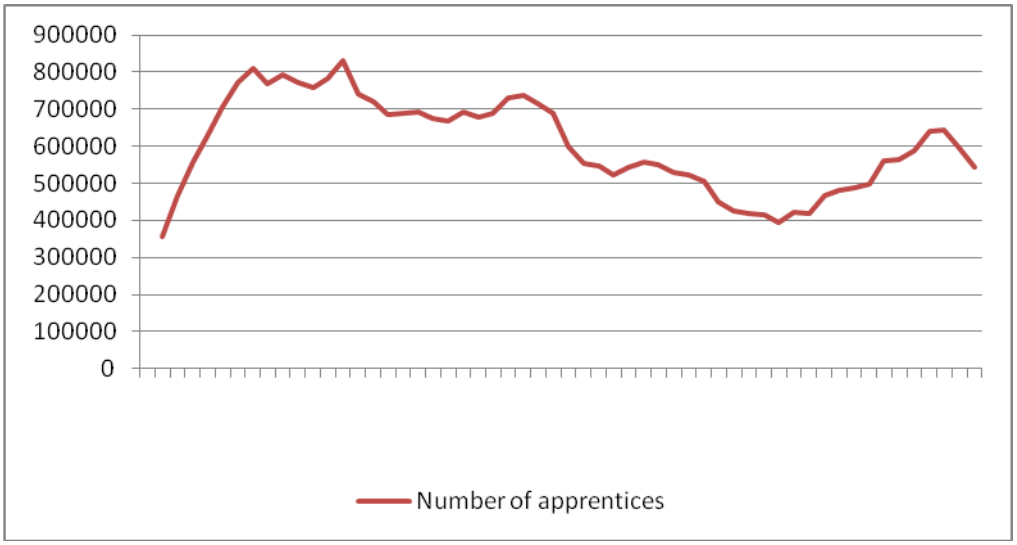
[15] This changed in 2012 as a result of the Fornero Reform

[16] Law N. 25/1955, N. 6/1987, Treu Law /1997 are the main statutes

substitute for external training courses, in an effort to reduce the apprenticeship-related cost for firms. Since vocational education, apprenticeships and other training are administered in Italy at the regional level, regional governments had to issue regional regulations before the new law could be implemented. Given the substantial heterogeneity in the ability to spend public funds and pass legislation of Italian regions, some regions introduced the new apprenticeship earlier than others, while the proportion of company-based training allowed varies substantially across regions.

As can be seen in Figure 3.1, since the introduction of the contract, the number of apprentices increased up to around 800,000 in the early sixties, and then gradually halved down to 400,000 in 1997. The Treu Law in 1997 increased the age limit for the eligibility for this contract from 22 to 24, which was further extended to 29 by the Biagi Law in 2003. These two laws boosted the number of apprentices up to 650,000 in 2007 but, as a result of the economic downturn, this was then reduced to 550,000.

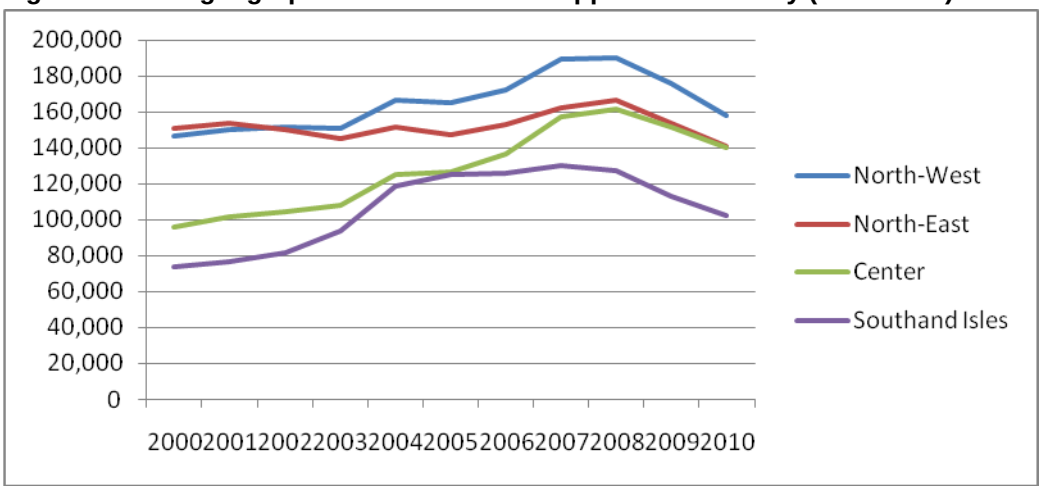
Figure 3.1: The evolution of the number of apprentices over time (1956-2010)



Source: Osservatorio Mercato del lavoro, www.nuovoapprendistato.it

Figure 3.2 focuses on the evolution of apprenticeships in the last decade and shows substantial differences among the main geographical areas: traditionally apprenticeships have been concentrated in Northern Italy, the most developed and industrialized area with the highest employment rates in Italy, while the Southern Regions have the lowest number of apprentices. As shown in Figure 3.2, the economic crisis hit the four areas in a similar way.

Figure 3.2: The geographical distribution of apprentices in Italy (2000-2010)



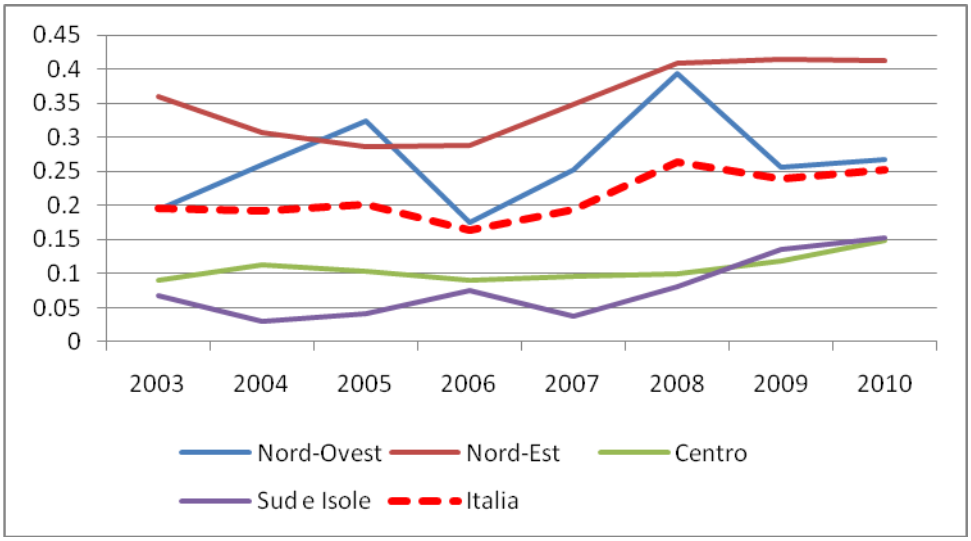
Source: Osservatorio Mercato del lavoro, www.nuovoapprendistato.it

Besides apprenticeships, in Italy there are other so-called training contracts (*Contratti formativi*), the main ones being: (i) the training and work contract (*Contratto di Formazione Lavoro - CFL*)[17]; and (ii) the more recent work-entry contract (*Contratto di inserimento/CdI*), introduced in 2003 for the private sector. In 2004, there were 553,000 apprentices, 117,576 young people employed on CFL contracts and more than 30,000 young workers employed on work-entry contracts.[18] Workers with these contracts have to undergo a compulsory amount of formal training each year (120 hours for apprenticeship, 20 hours for the CFL Type B, 130 for CFL Type A, 16 for CdI). Although a number of legal provisions establish compulsory training during apprenticeship, the real amount of training received by apprentices is difficult to measure. On average, it is estimated that in Italy only one fourth of apprentices receives training (Figure 3.3), while there are also large regional variations. Specifically, the percentage of training ranges between 30% and 40% in Northern Italy and falls down to 10% in Central and Southern Italy. Finally, no data are available about the quality of the training. As Tiraboschi (2012) states, "reality is often very distant from the ideal apprenticeship model, and this tool becomes a mere instrument of exploitation of a flexible and cheaper labour force".

[17] Since 2003 this type of contract is available only in the public sector. Two types of CFL are available: (i) Type A, for the acquisition of intermediate skills (namely *contratto finalizzato all'acquisizione di professionalità intermedie*); and (ii) Type B, for entry in an occupation/profession (*contratto finalizzato all'inserimento professionale*). Type B was largely used as opposed to type A which was rarely used..

[18] Source: Inps rendiconto 2004

Figure 3.3: Share of apprentices receiving formal training funded by the region (2003-2010)



Source: Osservatorio Mercato del lavoro, www.nuovoapprendistato.it

Other temporary contracts

Since the late 1990s, Italy has experienced a series of labour market reforms at the margin aimed at reducing the overall rate of unemployment which went from around 12% in the mid-1990s to 6% in 2007. These reforms introduced and liberalized the so-called atypical employment contracts. Of these the focus here is on various temporary contracts which are defined as contractual arrangements that do not provide a permanent working relationship.

The Treu Law was introduced in 1997 with the explicit aim of promoting labour market flexibility. The main novelty of the reform was the introduction of fixed-term contracts and the creation of Temporary Employment Agencies.

The most important reform was the so-called Biagi Law, enacted in 2003 in order to match the objectives set by the European Employment Strategy which tried to implement a coordinated strategy aimed at addressing the structural weaknesses of the Italian economy: (i) high youth unemployment; (ii) long-term unemployment; (iii) the regional divide (nortth vs. south) in terms of unemployment; (iv) the low labour market participation rate of females and older people; etc. In particular, new forms of employment were introduced (staff leasing, on call working, job sharing, part-time, work experience programmes). At the same time, some existing employment contracts were reformed (part-time work, apprenticeships, coordinated and continuous collaboration) and others eliminated (CFL in the private sector). This growth of "flexible" employment has raised concerns that these temporary jobs may crowd out more stable employment.

The share of temporary contracts in total employment has risen from 6% in 1993 to 13.4% in 2007, which nevertheless remains lower than the EU average of 14.7% (Isfol, 2006). Fixed-term contracts were most widespread among the young. In the 15-24 age-group, one out of three is a non standard temporary employee.

3.2 Evidence from previous studies

As some other European countries like Spain and France have learned, reforms introducing and liberalizing the so-called atypical employment contracts while maintaining a high employment

protection for permanent workers, have created a dual labour market which has penalised, in particular, the young and low skilled workers (OECD, 2012).

Obviously, from the employer's perspective, it may be optimal for a firm seeking to maximize its profits to hire both temporary and permanent workers and face lower firing costs whenever temporary workers are dismissed, in particular when a high employment protection exists for standard jobs (Bertola, 1990).

From the individual's perspective, temporary contracts can be attractive because they may be a port of entry to permanent employment. This is more likely to occur if during a temporary contract the worker receives some training, because this would increase his/her productivity and thus his/her employability compared to that of the unemployed. Even if no training is provided, temporary jobs may allow the worker to build a network of professional contacts which may lead to more stable job opportunities in the future. In any case, a temporary contract allows for a reduction in unemployment duration (Blanchard and Landier, 2002). For these reasons such contracts can act as stepping stones into the more regular labour market (Boot and al., 2002).

On the contrary, in many countries concerns have been expressed that workers may end up trapped in a sequence of temporary working arrangements without enhancing their human capital, social network and future employability. Indeed, a number of drawbacks of temporary jobs have been documented, including reduced access to welfare provisions, lower wages, less training (and higher risk of on-the-job injuries), greater instability of employment, etc. (OECD, 2004; Guadalupe, 2003). This evidence points to an increasing risk of social exclusion and has, in many instances, led to temporary contracts being seen as "dead ends".

The "stepping stone" theory has been tested in the empirical literature in many countries and, as de Graaf-Zijl et al (2004) shows, it holds for some countries (Germany, the Netherlands and the UK) but not for others (Spain and the US). In Italy, Ichino et al. (2005) find that temporary work is a port of entry to more regular employment in Tuscany but not in Sicily. Contini et al. (1999) show that short periods of employment are not detrimental to young workers, while Caroleo et al (2011) find that temporary contracts seem to act slightly more as dead end jobs rather than as stepping stones.

Among all the other temporary contracts available to the Italian youth population, apprenticeships have always demonstrated a better performance in terms of the amount of training undertaken during the contract, as well as in terms of a lower probability of experiencing a subsequent period of unemployment and a greater probability of transition into stable employment (Berton et al, 2011; Bosio, 2011). For this reason its use has been enhanced by a number of reforms such as the Treu Law in 1997 and the above mentioned Biagi Law in 2003. More recently, in 2011, a new law was passed that foresees apprenticeship as a permanent employment contract in an effort to further enhance the role of apprenticeships as a crucial link between VET and the labour market.[19] Finally, in 2012, the Italian government approved a new comprehensive reform aimed at the reduction of the labour market segmentation, first by reducing the incidence of temporary work and other precarious contractual arrangements, and second by widening the scope for hiring on apprenticeship contracts which, according the former Ministry of Labour Elsa Fornero, should become "the main port of entry into the labour market".[20]

[19] Legislative Decree of 28 July 2011 (Ministry of Labour)

[20] We are not able to cover the effects of this reform due to the lack of suitable data for such a recent period.

3.3 Evaluation of the effectiveness of apprenticeships in Italy

The effectiveness of apprenticeships in Italy was evaluated by examining the following aspects:

- The effects of the apprenticeship contract on the probability of unemployment and of having a permanent contract, compared to other types of temporary contracts. The former can be considered an indirect test for the so-called "stepping stone" role played by temporary contracts, while the latter can measure the extent to which different types of temporary contracts enhance the probability of securing a standard as opposed to a dead-end job.
- The effect of the 2003 Biagi reform on the probability of being an apprentice and receiving training during an apprenticeship
- The overall effect of the Biagi 2003 Reform on youth unemployment.

Estimates are based on two different data-sets: (i) the LFS cross-sectional data-set and (ii) the longitudinal data-set of the ISFOL – PLUS survey, consisting of four waves conducted in 2005, 2006, 2008 and 2010 on about 55,000 individuals of which the analysis uses both the cross-sectional and the retrospective dimension.

Effects of apprenticeships on the probability of unemployment and on having a permanent contract relative to other temporary contracts

Based on the ISFOL-PLUS longitudinal data, the five different type of temporary contracts were compared in terms of the probability of experiencing a period of unemployment after the contract expiration: (i) apprenticeships (*Apprendistato*); (ii) fixed-term contracts (*Tempo Determinato*); (iii) collaborators (*Collaborazioni Coordinate e Continuative e collaborazioni a progetto*, the so-called co.co.co and co.co.pro); (iv) other training contracts (*Contratto di formazione o di inserimento*); and (v) temporary employment agency jobs (*Interinali*).

The ISFOL-PLUS survey consists of four waves conducted in 2005, 2006, 2008 and 2010 on about 55,000 individuals. The sample for the empirical analysis was selected as follows: keeping individuals aged 18 to 30, who held a temporary contract in the previous wave that had expired between two waves and were employed or unemployed in the subsequent wave. [21]

The first column of Table 3.1 shows the descriptive statistics of the entire sample.

Table 3.1: Descriptive statistics. ISFOL PLUS longitudinal file

	Sample means	
Type of contract in the previous wave:	***Full sample***	***Employed***
Fixed-term contract (*tempo determinato*)	45.4%	49.6%
Other training contract (*contratto di formazione/inserimento*)	6.1%	6.9%
Apprenticeship	19.2%	13.7%
Temporary agency job (*contratto con agenzia interinale*)	5.1%	5.1%
Collaboration worker (*Co.Co.co e co.co.pro*)	24.24%	24.7%
Individual characteristics:		
University degree	30.1%	32%
Secondary education degree	61.9%	61%
Male	45.5%	44%
Age	25.3	25.5
% of unemployed people	12.6%	-

[21] Thus in each wave they are unemployed or have a job tenure which is less than 12 months.

Regional GDP per capita	23.70	23.9
Regional unemployment rate for 15-29 (%)	22.1%	21.5
Number of observations	**2,517**	**1,939**

Source: ISFOL PLUS

On average, individuals in the above sample are 25 years old, around 60% have a secondary education degree, 30% hold a university degree, 45% are males and 15% are unemployed. In this sample, around 19% had undertaken an apprenticeship in the previous wave, 46% had a fixed-term contract, 24% were collaboration workers, 6% had other training contracts and 5% were temporary agency workers. Excluding those who are currently unemployed results in a sample which is slightly more educated, with around 49% of individuals holding a fixed-term contract in the previous wave, and around 13% being former apprentices.

Two different outcomes variables were examined: (i) probability of unemployment and (ii) probability of having a permanent contract. For each dependent variable, a probit model was estimated where the observations within individuals were clustered[22]. Individual characteristics were controlled for though: (i) a gender dummy; (ii) age and age squared; (iii) two educational dummies (secondary and tertiary education degree); (iv) the vector of previous temporary contracts; etc. Time-fixed effects, regional fixed effects, macroeconomics variables (e.g. unemployment rate of the 15-29 age group at a regional level and regional GDP per head) were also taken into account. The model is as follows:

$$Yit = \hat{a}_1 + \hat{a}_2 C_{it} + \hat{a}_3 X_{it} + \gamma_i + \tau_t + e_{it} \qquad (1)$$

where the suffix "it" denotes the i-th individual at time t; Y is alternatively the dummy unemployed and the dummy permanent employment (Column V); C is the vector of ex-temporary contracts; X is a vector of individual control variables; γ is a vector of regional fixed effects; and τ_t are time-fixed effects.

Table 3.2 (Column 1) shows that those young people who were on an apprenticeship scheme have on average a significantly 5% lower probability of being unemployed in the subsequent wave when compared with fixed-term contracts.[23] Crucially, this reduction is the greatest among all types of contracts.

Table 3.2: Probability of unemployment of individuals who held a temporary contract in the previous wave (2006-2008-2010), ISFOL-PLUS

	Dependent variable: Probability of unemployment			
	All	**Male**	**Female**	**Less than tertiary education**
Type of contract in the previous wave:				
Fixed-term contract (*tempo determinato*)	-	-	-	-
Other training contract (*contratto di formazione/inserimento*)	-.172 (.15)	-.327 (.225)	-.007 (.210)	-.270 (.189)
Apprenticeship	-.303*** (.10)	-.259* (.144)	-.335** (.145)	-.339** (.112)
Temporary agency job (*contratto con agenzia interinale*)	.155 (.14)	.508*** (.189)	-.474* (.276)	.097 (.159)
Collaboration worker (*Co.Co.co e co.co.pro*)	.034 (.08)	.129 (.128)	.007 (.114)	.078 (.104)
Male	-.007 (.004)	-	-	-.001 (.079)

[22] Each wave of ISFOL–PLUS was used as a repeated cross-section but, given that an individual may be observed in more than one wave, the covariance matrix was corrected accordingly.

[23] Marginal effects computed at the sample means.

Tertiary education degree	-.45*** (.13)	-.465** (.184)	-.402* (.208)	-
Secondary education degree	-.36*** (.11)	-415*** (.137)	-.295 (.191)	-.365*** (.110)
Age	-.03 (.24)	.396 (.360)	-.437 (.346)	.025 (.289)
Age squared	-.000 (.004)	-.009 (.007)	.008 (.007)	-.001 (.006)
Year fixed effect	Yes	Yes	Yes	Yes
Regional fixed effect	Yes	Yes	Yes	Yes
Regional macro-economic variables (b)	Yes	Yes	Yes	Yes
Constant	-1.56 (4.24)	-8.816 (6.138)	5.89 (6.01)	-1.74 (4.95)
R2	0.064	.087	.073	.064
Number of observations	**2,517**	**1,144**	**1,373**	**1,759**

Source: ISFOL PLUS

Notes: (b) they include: regional GDP per capita and regional rate of youth unemployment. The standard error are clustered within individuals. Marginal effects available upon request.

As expected, the probability of being unemployed is lower for those with a tertiary education degree, while gender and/or age do not affect this probability in a statistically significant way. Running the estimates separately for men and women shows that apprenticeships reduce the unemployment risk slightly more for females (5%) than for males (4.5%). Furthermore, depending on gender the contribution of apprenticeships in reducing in the probability of unemployment is less significant than other forms of contract. For example, for women temporary help jobs reduce the probability of unemployment by 7%, while for men other training contracts reduce this probability by 5%. However, in the regression with data for females the coefficients of the two dummies are not statistically significantly different from each other, while in the regression with data on males the coefficient of the other training contracts is not statistically significant.[24]

Having a tertiary education degree reduces the probability of unemployment slightly more for males, while for females there is no difference between those who have a secondary education degree and those with a lower than a secondary education degree.

When individuals with a tertiary education degree are excluded, results confirm that having had an apprenticeship contract reduces the probability of being unemployed in the next time period by about 6.3%.

In estimating the probability of having a permanent contract (Column I, in Table 3.3), it is clear that that apprenticeships represent a stepping stone towards stable employment. In fact, former apprentices have a 16% higher probability of a stable job than young workers on fixed-term contracts. There are no significant gender differences.

Table 3.3: Probability of having a permanent contract of individual who held a temporary contract in the previous wave (2006-2008-2010), ISFOL-PLUS

	Probability of holding a permanent contract -(Employees)		
Type of contract in the previous wave:			
Fixed-term contract (*tempo determinato*)	-	-	-
Other training contract (*contratto di formazione/inserimento*)	.304** (.121)	.243** (.124)	.243** (.124
Apprenticeship	.624*** (.095)	.543*** (.097)	.538*** (.098)
Temporary agency job (contratto con agenzia interinale)	-.160 (.143)	-.243* (.142)	-.245* (.143)

[24] The hypothesis that the difference between the two coefficients is different from zero is rejected.

Collaboration worker (*Co.Co.co e co.co.pro*)	-.491*** (.079)	-.492*** (.082)	-.496*** (.083)
Male	.095 (.061)	.024 (.065)	-.009 (.142)
Tertiary education degree	-.294** (.129)	-.157 (.133)	-.119 (.142)
Secondary education degree	-.209* (.116)	-.163 (.118)	-.132 (.122)
Age	.536** (.237)	.522** (.240)	.529** (.240)
Age squared	-.010** (.004)	-.009** (.004)	-.009** (.005)
Sector dummies	No	Yes	Yes
Occupational dummies	No	No	Yes
Year fixed effect	Yes	Yes	Yes
Regional fixed effect	Yes	Yes	Yes
Regional macro-economic variables(b)	Yes	Yes	Yes
Constant	-13.43*** (3.97)	-12.80 (3.74)	-12.94 (3.78)
R2	.08	.10	.10
Number of observations	**1,939**	**1,939**	**1,939**

Source: ISFOL PLUS

Furthermore, a clear order among temporary contracts with respect to the probability of a future permanent contract emerges, with apprenticeships at the top, followed by other training contracts, fixed-term contracts and temporary agency help jobs in the middle and collaborators at the bottom. Clearly mandatory training during a temporary contract turns out to be a key feature in determining the transition to stable employment. The probability of moving from a temporary to an open-ended employment contract increases with age and seems to decrease with the level of education. This counter-intuitive result may be due to unobserved heterogeneity and some kind of composition effects which are not controlled.[25] In order to better control for unobserved heterogeneity, one progressively added a set of 17 sector dummies (Column II Table 3) and a set of 11 occupational dummies (Column III, Table 3). As expected, the level of education turns immediately to be not statistically significant, while the whole set of former holders of temporary contracts gains in significance and the coefficients do not change significantly.

In summary, the above analysis demonstrates that apprenticeships reduce the probability of future unemployment more than the other temporary contracts because young individuals who were on an apprenticeship scheme have on average a significantly 5% lower probability of being unemployed. The effect of apprenticeships in reducing the probability of being unemployed in the next period is stronger (6.3%) for individuals with less than a tertiary education degree. Having been an apprentice increases the probability of having a permanent contract in the future: apprentices have a 16% higher probability of a stable job than young fixed-term workers. As a result, in a sense, the analysis shows that, compared to the other temporary work contracts available in Italy, apprenticeships can be considered the best stepping stone towards stable employment.

The causal effect of the 2003 Reform on the probability of being an apprentice and receiving training.

Estimating the causal effect of apprenticeships on individual outcomes is difficult because individuals may self-select into different types of contracts. For this reason, in order run a causal inference one needs to use a potentially exogenous variation in the probability of undertaking an apprenticeship. Italy represents in this respect a very peculiar case, due to the 2003 Biagi Law and its regional implementation.

[25] For example, half of individuals who were collaborators had a tertiary education degree.

This reform profoundly changed the apprenticeship-related legislation with the explicit aim of updating it, making the contract more suitable for both young people and firms and increasing its take-up. The reform introduced three different types of apprenticeships, two of which were new to the Italian labour market: the *apprendistato per l'espletamento del diritto-dovere all'istruzione e formazione*, (literally apprenticeship for the right/duty of education and training) and *apprendistato alto* (high-level apprenticeship). These two forms of apprenticeships were not part of the analysis presented here. The fact that regions have exclusive legislative power with respect to the first type of apprenticeship had delayed its implementation, while the number of parties involved in the second type of apprenticeship is very limited because regions have just had started implementing it. In the analysis below we examine the third type of apprenticeship, *apprendistato professionalizzante* (apprenticeship leading to an occupation), which is the most widely used and has further liberalized the existing apprenticeship system.

Legislation regulating apprenticeship contracts has existed for a long time in Italy and up to 2003 firms were required to give their apprentices time off work to attend external training courses. These were provided and controlled by local authorities and, upon successful completion of the contract, apprentices received a certification of the training received. In exchange, the social contributions of apprentices were paid by the central government (INPS) and thus their cost to employers was rather low. The amount of training (hours) was the same in each region and courses were organized and paid by the regional government.

In 2003, the 'Biagi Law' abolished the certification of qualifications and introduced the option of undertaking part of the training at the workplace as a substitute for external training courses, in an effort to reduce the apprenticeship-related cost for firms. In a recent study, Cappellari et al (2012), evaluated the effect of this reform on firms and concluded that the reform was successful because "it increased the turnover of workers, easing the adjustment process of firms, encouraged the substitution of external staff with apprentices and eventually increased productivity".

In Italy it is possible to use the regional and time variation of the 2003 apprenticeship legislation to identify the causal effect of apprenticeship on individual outcomes, owing to the fact that vocational education, apprenticeships and training provision are all administered at the regional level. Indeed, regional governments had to issue regional regulations before the 2003 Biagi Law could be implemented.

Given the substantial heterogeneity of the Italian regions in the ability to pass legislation, some introduced the new apprenticeship earlier than others and the percentage of on-the-job training allowed varied substantially across regions. As a result, in the analysis a dummy variable was defined which takes value one in the year in which each region issued the regional regulation (Table 3.4).[26] This dummy variable is used as an instrument to determine the probability of being an apprentice in two samples: (i) a sample of all employees; and (ii) a sample of employees on a temporary contract.

As Table 3.4 shows, when considering all employees**,** a positive effect of the Biagi Reform is the fact that firms increased the overall use of the apprenticeship contract. When considering only employees on temporary contracts the analysis results confirm those of Cappellari et al (2012) in that they show that, after the 2003 Reform, firms substituted other temporary contracts with the new apprenticeship ones.

[26] This is the approach used by Cappellari, L., Dell'Aringa, C., Leonardi, M., (2012).

Table 3.4: Year of implementation of the Biagi Law

2005	2006	2007	2008
Piemonte; Lombardia; Trentino Alto adige; Veneto; Liguria; Toscana; Abruzzo; Camapania; Puglia; Sicilia	Friuli Venezia Giulia; Marche; Basilicata; Calabria; Sardegna.	Lazio	Molise

One used six subsequent waves of the Italian LFS (from 2004 to 2009) and considered only individuals aged 18 to 30.

The dependent variable was the dummy apprenticeship. A linear probability model was estimated on repeated cross-sections and controlled for individual characteristics (e.g. a gender dummy, age and age squared, two educational dummies (lower vocational degree, secondary and tertiary degree in LFS), job characteristics (occupation dummies and sector dummies), years dummies, regional dummies, macroeconomics variables at a regional level (e.g. regional youth unemployment rates for those aged 15-29 and regional GDP per head). A control was added for the quarter in which the data were collected, as well as a dummy for the first three terms of 2008 where the definition of apprenticeships did not match perfectly that used in other quarters/waves and the observations were weighted on the basis of the official weights used by ISTAT.[27] The econometric model is as follows:

$$Yi = \hat{a}_1 + \hat{a}_2 J_{it} + \hat{a}_3 X_i + \hat{a}_4 R_{it} + \gamma_i + \tau_t + e_{it} \qquad (2)$$

where the suffix "i" denotes the i-th individual; Y is the dummy apprenticeship; J is the vector of job characteristics; X is a vector of individual control variables; R_{it} is the dummy reforms; γ is a vector of regional fixed effects; and τ_t are time-fixed effects.

Table 3.5: Descriptive statistics (LFS 2004-2009)

Variable	Sample means
Training intensity	7.02%
Apprenticeship	7.01%
University degree	9.9%
Secondary education degree	49.1%
Vocational secondary school	9.4%
Male	57,6%
Age	24.8
Region	
Piemonte	8.64
Valle d'Aosta	1.60
Lombardia	16.44
Veneto	6.80
Friuli Venezia Giulia	2.44
Liguria	1.93
Emilia Romagna	7.12
Toscana	5.78
Umbria	2.12
Marche	2.64
Lazio	5.04
Abruzzo	2.07
Molise	2.11
Campania	5.62
Puglia	5.49
Basilicata	2.36
Calabria	3.95
Sicilia	6.80
Sardegna	2.92
Bolzano	3.33
Trento	4.79

[27] In the first three quarters of 2008, the question about the type of contract is slightly more general than in other years/quarters. Specifically, both apprenticeship and other training contracts are grouped in the same answer

Regional GDP per capita	23.25
Young regional Unemployment rate	20.78%
Unweighted n° of observations	187,228
Weighted n. observations	18,087,388

Source: LFS 2004-2009

Overall, it is clear that the probability of being an apprentice is strongly, positively and significantly affected by the instrument REFORM (Table 6) in both samples. As a result, the analysis confirms that after the implementation of the new apprenticeship, firms increased the use of this contract when compared to both other temporary and permanent contracts. While the substitution of other temporary contracts can be considered good news, the reduction in permanent contracts available for Italian young people is not. One possible explanation is the age extension introduced by the Biagi Law, which extended the age limit of apprentices from 25 to 30. It is clear that before the implementation of the Biagi Law, an apprenticeship was rarely a possibility for individuals holding a university degree, due to the age limits, and the average graduation rate which was around 28 in 2001. However, after the university reform of 2001 which introduced a shorter university track, lowering the age of university graduation to 25.6 in 2006, apprenticeships became a real option also for individuals with a tertiary education degree.[28] To further investigate this issue, estimates in the econometric model were used in the sub-samples of employees with different level of education, whereby those with a secondary education degree and those with a tertiary education degree were examined separately.

Results are reported in Table 3.6. As expected, it can be seen that the reform had a greater effect (around seven times larger) on the probability of undertaking an apprenticeship for workers with a tertiary education degree. This may be a combined effect of the age extension for apprenticeships and the university reform of 2001.[29]

Table 3.6: The probability of having an apprenticeship contract (Linear probability model, LFS 2004-2009)

	Employees	Employees With a secondary education degree	Employees With a tertiary education degree	Employees with a temporary contract
DUMMY REFORM	.0008*** (.0003)	.001 ** (.0004)	.007*** (.001)	. 006 *** (.0009)
Other individual characteristics(a)	Yes	Yes	Yes	Yes
Year fixed effect	Yes (c)	Yes (c)	Yes (c)	Yes (c)
Regional fixed effect	Yes	Yes	Yes	Yes
Regional macro-economic variables(b)	Yes	Yes	Yes	Yes
R2	.257	.260	.165	.339
Number of observations	**18,087,388**	**8,852,353**	**1,871,548**	**5,189,046 (d)**

Source: LFS 2004-2009

Notes: (a) These include: a gender dummy, age and age squared, two educational dummies (secondary and tertiary degree), the sector of activity and the occupation; (b) these include: regional GDP per capita and regional rate of youth unemployment. The standard error are clustered with individuals; (c) a control for the quarter in which the interviews are conducted and a dummy for the first three quarters on 2008 in which the definition of apprenticeship is slightly different from the other years and quarters were also added; (d) weighted using official ISTAT weights .

To find whether this is the case, the source of exogenous variation introduced by the reform was used within an instrumental variables framework to estimate the probability of receiving training during an

[28] The university reform (called 3+2) introduced a shorter university degree (3 years) in 2001 and the first cohort which graduated from this short track entered the labour market in 2004. In 2006, the average graduation age was 25.8

[29] *Ibid.*

apprenticeship contract. As already stated, it is well documented that one of the key features of the apprenticeship contract is the amount of specific and general training received by young workers, which increases their productivity and thus their future employability. The 2003 Reform when enacted led to extensive debate, as many observers worried that it would cause a reduction of the amount and quality of training, weakening the positive effects of apprenticeship on youth employability.

The analysis used the sample of employees aged 18 to 30 from the LFS dataset. The dependent variable of the main equation (4) is the dummy training that takes the value one for each individual who has undergone any type of training during the last month. A IV estimates analysis was run in which the dummy apprenticeship was instrumented in the main equation (4) with the dummy reform as an instrument. We controlled for individual characteristics (e.g. a gender dummy, age and age squared, two educational dummies - vocational degree, secondary and tertiary education degree); job characteristics (occupation dummies and sector dummies); time-fixed effects; regional fixed effects; macroeconomics variables (regional youth unemployment rate for those aged 15-29 and regional GDP per head). We also added a control for the quarter in which the data were collected and a dummy for the first three quarters of 2008 where the definition of apprenticeship does not match perfectly that used in other quarters/waves. The model is as follows:

$$A_i = \delta_1 + \delta_2 J_i + \delta_3 X_i + \delta_4 R_{it} + \gamma_i + \tau_t + \mu_i \qquad (3)$$

$$Y_i = \hat{a}_1 + \hat{a}_2 J_i + \hat{a}_3 X_i + \hat{a}_4 A_i + \gamma_i + \tau_t + e_i \qquad (4)$$

where the suffix "i" denotes the i-th individual; Y_i is the dummy training; J is the vector of job characteristics; X is a vector of individual characteristics; A_{it} is the dummy apprenticeship; R_{it} is the dummy reforms; γ is a vector of regional fixed effects; and τ_t are time-fixed effects.

Table 3.7: IV estimates of training incidence and reduced form regression of the probability of unemployment (LFS 2004-2009)

	First stage regression Linear probability model- Probability of apprenticeship	Training incidence (IV estimates)
Apprenticeship contract	-	. 719* (.401)
DUMMY REFORM	.0008*** (.0000)	-
Age	-.019*** (.000)	.008 (.007)
Age squared	.0002*** (.0000)	-.000051
Male	-.004*** (.0001)	.004** (.001)
Vocational secondary school (less than 5 years)	.0006*** (.000)	-.003 (.002)
Secondary education degree	.016*** (.0001)	-.0008 (.006)
University degree	.0272*** (.000)	.030*** (.010)
Mining and energy	.027*** (.0007)	-.005 (.01)
Manufacturing	.019*** (.0003)	-.017** (.008)
Construction	.021*** (.003)	-.017** (.008)
Commerce	.032*** (.0003)	-.025** (.013)
Hotels and restaurants	.009*** (.0004)	-.0009 (.004)
Transport and communication	.024*** (.0004)	-.013 (.008)

Banking and finance	.031*** (.0004)	-.0002 (.012)
Services to private firms	.029*** (.0004)	-.015 (.011)
Public administration	.006*** (.0004)	.006** (.002)
Education and health	-.004*** (.0004)	.045*** (.001)
Other services	-.002*** (.0004)	.022*** (.001)
Occupational dummies	Yes	Yes
Year fixed effect (a)	Yes	Yes
Regional fixed effect	Yes	Yes
Regional macro-economic variables (ab)	Yes	Yes
F -test	7.59	-
Number of observations	18,087,388 (d)	

Source: LFS 2004-2009

Notes: (a) A control is added for the quarter in which the interviews are conducted and a dummy for the first three quarters on 2008 in which the definition of apprenticeship is slightly different from the other years and quarters; (b) they include: regional GDP per capita and regional rate of youth unemployment.

From the first stage estimation (Column I Table 3.7), it can be observed that the probability of apprenticeship is higher for females, decreases with age, increases with the level of education and is sector-specific, with commerce, banking and finance being the sector with the highest intensity.

In the estimation of the first stage, the analysis finds that the exogenous increase in the probability of being an apprentice also increased the incidence of training under apprenticeships when compared to other contracts (temporary as well as permanent). This was probably due to the financial support in the regions, which increased the amount of training funds available for apprenticeships when adopting the new law. Indeed, as can be seen in Table 3.8, almost all Italian regions (with the exception of Liguria, Emilia Romagna, Toscana, Molise, Sardegna and Bolzano) increased the amount spent each year in order to fund the apprenticeship training.

Table 3.8: Euro per capita spent by each region before and after the adoption of the new apprenticeship

Region	Before	After
Piemonte	14.4	38.4
Valle d'Aosta	n.a	53.6
Lombardia	9.31	11.7
Veneto	25.0	28.2
Friuli Venezia Giulia	61.8	76.3
Liguria	49.1	21.8
Emilia Romagna	42.6	27.7
Toscana	23.7	14.7
Umbria	15.7	19.1
Marche	17.4	24.4
Lazio	2.91	12.4
Abruzzo	7.6	12.3
Molise	12.6	11.9
Campania	2.9	2.8
Puglia	n.a	13.9
Basilicata	8.36	10.34
Calabria	n.a	8.10
Sicilia	n.a	16.8
Sardegna	7.7	6.33
Bolzano	264.96	254.89
Trento	23.6	43.8

Source: ISFOL (various years)

The effect of the 2003 Reform on the youth unemployment rate

Finally, the overall effect of the Reform was examined and the reduced form effect of the expansion of apprenticeships on the unemployment rate was estimated. In doing so, we sought to measure the overall effects of the Reform and disregarded the complex set of mechanisms that produce such effects. Individuals, both employed and unemployed, aged 18 to 30 were considered. The dependent variable of the equation (5) is the dummy unemployed. A linear probability estimate was run, into which the dummy reform was added. Individual characteristics (e.g. a gender dummy, age and age squared, three educational dummies (vocational, secondary and tertiary education degree); time-fixed effects; regional fixed effects; macroeconomics variables at regional level (regional youth unemployment rate for those aged 15-29 and regional GDP per head) were controlled for. A set of dummies were used for the quarter when the data were collected and a dummy for the first three quarters of 2008 where the definition of apprenticeship does not match perfectly that used in other quarters/waves. The model is as follows:

$$Y_i = \hat{a}_1 + \hat{a}_2 J_i + \hat{a}_3 X_i + \hat{a}_4 A_i + \gamma_i + \tau_t + e_{it} \qquad (5)$$

where the suffix "i" denotes the i-th individual; Y_i is the dummy unemployed; X is a vector of individual control variables; R_{it} is the dummy reforms; γ is a vector of regional fixed effects' and τ_t are time-fixed effects.

Table 3.9 shows the results of this exercise. It demonstrates that the reform reduced the probability of unemployment significantly. As a result, a reduction in unemployment can be seen as an indirect effect of the reform, together with the substitution of external staff with apprentices and the increase in firm productivity found by Cappellari et al (2012).

Table 3.9: IV estimates of Training incidence and reduced form regression of the probability of unemployment (LFS 2004-2009)

	Reduced form regression - Unemployment probability
Apprenticeship contract	**-**
DUMMY REFORM	-.0032*** (.00031)
Age	-.119*** (.0003)
Age squared	-.002*** (.0000)
Male	-.055*** (.000)
Vocational secondary school (less than 5 years)	-.014*** (.0002)
Secondary school	-.0118*** (.0001)
University degree	.0528*** (.0000)
Year fixed effect (a)	Yes
Regional fixed effect	Yes
Regional macro-economic variables(ab	Yes
F -test	-
Number of observations	**26,339,534**

Source: LFS 2004-2009

Notes: (a) A control for the quarter in which the interviews are conducted and a dummy for the first three quarters on 2008 in which the definition of apprenticeship is slightly different from the other years and quarters were added; (b) these include: regional GDP per capita and regional rate of youth unemployment.

3.4 Conclusions

This study provides both a descriptive and an empirical analysis of the school-to-work transition following a temporary contract in Italy. Such contracts, including apprenticeships, can lead to either unemployment or a permanent contract. The former can be considered an indirect test for the so-called "stepping stone" role played by temporary contracts, while the latter allows one to assess the extent to which different types of temporary contracts enhance the probability of securing a stable and permanent job, as opposed to a dead-end job.

The analysis finds that young people who were on an apprenticeship scheme have on average a significantly 5% lower probability of being unemployed compared to other temporary contracts. The effect of apprenticeship in reducing the probability of being unemployed in the next period is stronger (6.3%) for individuals with less than a tertiary education diploma. Furthermore, having been an apprentice increases the probability of having a permanent contract in the future - apprentices have a 16% higher probability of a stable job than young fixed-term workers. As a result, in a sense, an apprenticeship can be considered the best stepping stone towards stable employment when compared to the other temporary work contracts available in Italy.

The counterfactual analysis of the effects of the 2003 apprenticeship reform (which expanded the use of apprenticeships) shows an increase in the incidence of training under apprenticeships when compared to the other temporary contracts, probably due to the financial support of the regions. These results are line with those of a previous study on the effects of the 2003 Reform which found that the reform also led to an increase in apprenticeship employment, inducing a substitution of external staff with firms' apprentices, and an overall productivity-enhancing effect: added value per worker increased by 1.5%; sales per worker by 0.9%; and total factor productivity by1.6%.[30]

[30] Cappellari, L., Dell'Aringa, C., Leonardi, M., (2012).

References

Bertola, G. (1990), “Job security, employment, and wages”, European Economic Review, Vol. 34 No. 4, pp. 51-86.

Berton, F. , Devicienti, F. and Pacelli, L.(2009)"Are Temporary Jobs a Port of Entry into Permanent Employment? Evidence from Matched Employer-Employee Data," Working papers 6, Former Department of Economics and Public Finance "G. Prato", University of Torino.

Blanchard, O. J. and Landier, A. (2002). ‘The perverse effects of partial labour market reform: fixed duration contracts in France’, Economic Journal, vol. 112, pp. F214–44.

Booth, A., Francesconi, M. and Frank, J. (2002). ‘Temporary jobs: stepping stones or dead ends?’, Economic Journal, vol. 112, pp. F189–213.

Bruno, G., Caroleo, F.E., and Dessy O. (2012) Stepping stones versus dead end jobs: Exits from temporary contracts in Italy after the 2003, mimeo

De Graaf-Zijl, M. (2005), "The economic and social consequences of temporary employment: a review of the literature", in SEO Discussion Papers, no. 47.

Guadalupe, M (2003), “The Hidden Costs of Fixed-Term Contracts: The Impact on Work Accidents”, *Labour Economics* 10, 338-358.

Ichino, A., Mealli, F. and Nannicini, T. (2005), "Temporary work agency in Italy: a springboard towards permanent employment?", in Giornale degli Economisti, vol. 64, no. 1, pp. 1 – 27

ISFOL (various years) Rapporto annuale sull’apprendistato, ISFOL Roma.

ISFOL (2010) Rapporto ISFOL-PLUS 2008, ISFOL Roma.

OECD (2004). *Employment Outlook*, Paris, OECD.

OECD (2012) *Employment Outlook country notes: Italy*, OECD Paris

Tiraboschi, Michele (2012), Young Workers in Recessionary Times: A Caveat (to Continental Europe) to Reconstruct Its Labour Law?, The *E-Journal of International and Comparative Labour Studies* - Volume 1, No. 1-2, March-June 2012.

Annex – Description of the data bases

ISFOL-PLUS

The ISFOL-PLUS (Participation, Labour, Unemployment Survey) survey consists of four waves conducted in 2005, 2006, 2008 and 2010 on about 55,000 individuals aged 18-75 and representative of the regional and metropolitan areas' populations. It has four specific sub-population targets: (i) young people; (ii) women; (iii) older workers (50-64); and (iv) retired people (65-75).

This design allows the survey to produce statistically significant estimates of aggregates also relatively rare in the population (70,000 to 100,000 individuals). Individuals are interviewed using the CATI (Computer assisted telephone interview) technique.

The survey differs from the Labour Force household-based survey for the absence of proxy respondents (proxy free), reducing in this way the extent of measurement errors and partial non-responses.

The core goal of the survey is to provide reliable estimates of key labour market issues: the distribution of employment contracts (employee, self-employment, informal, etc.), job search activities, the labour market participation and career choices of women, young people and the over 50s, the choices for retirement, education and training, intergenerational dynamics, earnings and child care.

The longitudinal dimension of the survey, which is guaranteed by a large panel design (66% of total sample), allows study of these phenomena in a dynamic way.

LFS - ISTAT

The Italian Labour Force Survey (LFS) is a continuous survey carried out every week. Each quarter, the LFS collects information on almost 70,000 households in 1,246 Italian municipalities for a total of 175,000 individuals (representing 1.2% of the overall Italian population). The reference population of the LFS consists of all household members officially resident in Italy, even if temporarily abroad. Households registered as resident in Italy whose members habitually live abroad and permanent members of collective facilities (hospices, children's homes, religious institutions, army barracks, etc.) are excluded. A significant feature of the survey is the establishment of new criteria for identifying employed and unemployed individuals, as well as a far-reaching reorganisation of the data collection and production process

The LFS provides quarterly estimates of the main aggregates of labour market (employment status, type of work, work experience, job search, etc.), disaggregated by gender, age and territory/region (up to regional detail).

Source: ISTAT official web-site

4. Effectiveness and cost analysis of apprenticeships in the UK – Results of the quantitative analysis

Executive summary

Apprenticeships in the UK

Since the mid 1990s, both the Central Government and the devolved administrations of Wales, Scotland and Northern Ireland have invested heavily in the apprenticeship system. In England, for example, there are at present 162 apprenticeship frameworks leading to 258 specific intermediate vocational qualifications at Level 2 and Level 3, and 11 at Level 4 or above. These frameworks guide the industry-specific competencies, technical skills, theoretical concepts and relevant knowledge required to obtain a vocational qualification. Participation in Apprenticeships has increased steadily in England over the last eight years, while it has grown moderately in Scotland and Northern Ireland and decreased in Wales. In 2011/2012, there were over half a million people starting an apprenticeship in the UK.

Review of the existing evidence on the effectiveness of apprenticeships

Previous research on the returns to Apprenticeships in the UK found highly positive effects in terms of earnings and the probability of being employed. Using pooled data from the Labour Force Surveys of 2004 and 2005, McIntosh (2007) found that completing an Intermediate Apprenticeship is associated with a 16% wage increase, compared to those who have not completed one and whose highest qualification was at Level 1 or 2 Completion of an Advanced Apprenticeship was found to lead to an 18% increase, relative to having a Level 2 qualification and not completing an Apprenticeship. With regard to employment outcomes, completion of Advanced Apprenticeships was associated with a probability of being employed which is 15.7 percentage points higher, relative to not completing it and having Level 2 attainment. Completion of Intermediate Apprenticeships would lead to a 7.4 percentage point increase in this probability, relative to having Level 1 or 2 qualifications and no Apprenticeship qualification. More recent work developed by London Economics on the basis of LFS data and administrative surveys have confirmed the high returns to Apprenticeships in the UK. Their results based on LFS data point to a divergent trend in recent years, whereby the returns of Intermediate Apprenticeships have gone down slightly and the returns to Advanced Apprenticeships have increased. Based on administrative data, the estimated effects on employment were substantial but considerably lower than those obtained in McIntosh's study (2007).

An estimation of returns to Apprenticeships in the UK based on 2011 Annual Population Survey (APS) Data

In this paper, new, updated estimates of the returns to Apprenticeships in the UK are provided, based on data from the Annual Population Survey (APS) (April 2011-March 2012). The large sample size of this dataset means that no data pooling is required. The econometric method used to estimate the causal effects of Apprenticeships on wages and employment probability draws on the Mincer model and takes advantage of relevant control variables available in the APS, such as a set of 31 dummy variables which provide detailed information about all types of qualifications held (i.e. not only the highest qualifications). Since there are quite substantial numbers of non-achievers, and more

generally large numbers of people with lower qualifications, who could, but did not participate in apprenticeships, the relevant comparison group is people with Level 1 qualifications and no Apprenticeship completed.

Two regression analyses are run separately in order to estimate the effect of completing Level 2 and Level 3 Apprenticeships (Intermediate and Advanced). In terms of wage returns, the findings indicate that completion of a Level 2 Apprenticeship leads to a 14.7% increase in wages, relative to staying at Level 1 without completing an Apprenticeship. Completion of a Level 3 Apprenticeship is associated with a wage return of 23.6%, relative to people staying at Level 1 with no Apprenticeship. A logistic model is then used to estimate the effects of Apprenticeship completion on the probability of being employed, again using two models for each level of Apprenticeship. In the case of Level 2 Apprenticeships, the probability of being employed increases by 7.8 percentage points when this type of programme is completed, relative to having Level 1 qualifications and no Apprenticeship. Completion of a Level 3 Apprenticeship is associated with a 10.7 percentage point increase in this probability.

Cost-Benefit Analysis of Apprenticeships in the UK

The estimated impacts are then used to carry out a Cost-Benefit Analysis (CBA) of Apprenticeship programmes. The CBA framework takes into account costs and benefits to (i) employers (remuneration, supervision and administration costs, productive contribution of the apprentice, etc.); (ii) apprentices (opportunity costs of undertaking an apprenticeship, remuneration); and (iii) public budgets (costs of the programme, tax revenues and benefit expenditures) as well as society at large, using available estimates, our own impact estimates and a detailed collection of information regarding tax and benefits. The results of the CBA differ markedly for different stakeholders and also depend on whether short-term or long-term outcomes are considered. For example, by taking on apprentices, employers incur a cost in the short-run, but in the longer term there is a net benefit. A similar outcome is observed for apprentices, public budgets and society at large; in the latter cases, the calculations presented show a large net benefit, reflecting that Apprenticeships are an investment. They can be costly at present, but in the longer term they appear to yield substantial benefits for all stakeholders involved.

4.1 Background on apprenticeships in the UK

Apprenticeships in the UK economy

Apprenticeships have been the traditional way of qualifying for a range of occupations, in particular in the crafts sector, in most European countries from as early as the 12th century. Traditionally, the system allowed a master craftsman to employ young people and instruct them in their craft, which was a necessary condition for becoming a master of the craft, as was a period of time spent as a journeyman. In return, master craftsmen had access to a cheap source of labour as apprentices were usually only given food and lodging, but not a salary, and stayed with their master craftsmen for a long time, usually seven years.

With industrialisation and the liberalisation of many restrictions, the apprenticeship system lost importance in many European countries, including the UK. However, many technology-intensive industries such as manufacturing, utilities and the railways continued to operate apprenticeship systems in the UK in order to attract, retain and develop their workforce to intermediate and high level practical skills. With the decline of manufacturing from the early 1980s, the number of apprenticeship places also fell, while the growing service sector did not create a similar system of apprenticeships, which could have filled the gap. In addition, training levies imposed on employers to finance the Industry Training Boards (ITBs) and share the cost of training more evenly between employers, were stopped when ITBs were transformed to non-statutory bodies in most industries except construction and engineering, which further reduced the incentives to invest in employer-based training.

Since the mid-1990s, both the Central Government and the devolved administrations of Wales, Scotland and Northern Ireland have invested heavily in the apprenticeship system in order to increase its attractiveness to the service sector. This resulted in a number of new "framework agreements", set up by Sector Skills Councils from the mid-1990s, to help supply virtually all sectors of the economy with a labour force with intermediate and high level skills, knowledge and competence. As a devolved policy matter, government departments for England, Wales, Scotland and Northern Ireland complemented support for apprenticeships by offering young people (aged under 19 or under 25, depending on the location) full state funding for college education and assessment up to full intermediate qualification levels. In addition, as described above, the levy system was retained in some industries with high labour mobility to help ensure a sufficient supply of trained workers to whom both large and small business could have access by spreading training costs across larger and smaller employers.

Regulation

Apprentices work for an employer. They make a productive contribution to the firm and at the same time undertake a structured learning activity both in the company (on-the-job) and in programmes of specific learning providers or local colleges (off-the-job). Employers must follow a specific framework, which structures the learning activity undertaken by the apprentice. For example, there are currently 162 frameworks in existence in England leading to 258 specific intermediate vocational qualifications at Level 2 and 3 and 11 qualifications at Level 4 and above, which include Foundation degree studies at a Higher Education Institution. Frameworks are specific to England, Scotland, Wales and Northern Ireland, but they usually consist of three key elements:

- A competencies qualification achieved by the apprentice on performing the skill, trade or occupation to which the framework relates at Level 2 or 3 of the QCF, following National Occupational Standards (NOS) and approved by Sector Skills Council (SSC) or Sector Body (SB);

- A technical qualification (demonstrating achievement of the technical skills, knowledge and understanding of theoretical concepts and knowledge and understanding of the industry relevant to the framework) again following NOS Standards and approved by SSC/SB; and
- Achievement (or evidence of having achieved when starting apprenticeship) in Functional Skills in English and Mathematics and/or ICT if relevant for framework (level 2 or equivalent).
- Further regulation of apprenticeships exists in relation to the state-funding of courses in Further Education Institutions. In England, the Specification of Apprenticeship Standards for England (SASE) sets out the minimum requirements on the learning activity for levels 2 and 3, which are:
- Minimum of 37 credits on the 'Qualifications and Credit Framework' (QCF), awarding credits for the achievement of units and qualifications, which can be measured and compared;
- Specification of the number of Guided Learning Hours (GLH) that an apprentice must receive to complete the framework (Minimum: 280 GLH);
- At least 100 GLH or 30% (whichever is the greater) GLH off-the-job, i.e. in colleges or with other learning providers and another 180 GLH on-the-job, which have to be clearly evidenced; and
- A minimum duration of 12 months (for those aged 16-18).

Further policies promoting apprentices

With the recession affecting young people disproportionately more, various publicly funded schemes by each of the UK administrations have been set up in order to both retain/increase the number of apprenticeships and provide incentives for firms not yet offering them to engage in the process:

- An 'Adopt an Apprentice' Scheme in Scotland launched in 2009, for apprentices who had been unemployed previously, offered employers a grant of £2,000.[31]
- The 'ReAct' and 'ProAct' programmes in Wales offer a maximum subsidy of £2,500 for people who have been made redundant and who start suitable training, including apprenticeships, and offer additional support for employers (co-financed by the European Social Fund).[32]
- An Employer Incentive in England ('Apprenticeship Grant for Employers of 16 to 24 year olds') helping eligible employers to offer young people employment through the apprenticeship programme. In its current design, the programme intends to provide 40,000 apprenticeship grants to small to medium sized employers, who take on new apprentices (£1,500 from 2012, £2,500 previously, when the grant was restricted to 16-17 year olds).[33]

In April 2012, the UK Government launched a £1 billion 'Youth Contract' to provide half-a-million new employment opportunities for 18-24 years olds, including incentives for businesses to take on more apprentices in England.

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31 http://www.scotland.gov.uk/News/Releases/2009/06/10164847

32 http://www.assemblywales.org/11-005.pdf

33 http://www.apprenticeships.org.uk/employers/steps-to-make-it-happen/incentive.aspx

Participation in apprenticeships over time

Available data for England, Wales, Scotland and Northern Ireland on participation in apprenticeships (Table 4.1) show quite different trends by region of the UK. Participation in apprenticeships, as measured by the number of people starting an apprenticeship each academic year, has been growing fast in England and especially so in the last years. In 2005/06, 175,000 people started an apprenticeship, while in 2011/12 this figure had jumped to 520,600. Participation in such programmes also increased in Northern Ireland, although the available data show an irregular trend. In 2005/06, 5,587 apprenticeships were started, and in 2011/12 this figure was up to 8,395 starts.

Quite different trends are observed in Scotland and Wales. In Scotland, there was a downward trend in apprenticeship starts, with numbers falling from more than 20,000 starts in 2005/06 to 10,579 in 2008/09. However, between 2008/09 and 2011/12 participation surged, reaching 26,427 starts in the last year. In Wales, the number of starts appears to go up and down from year to year, but overall is seems that participation in apprenticeships has been going down in the last years. In 2005/2006, there were 27,990 starts, while in 2010/11 (last year available) this figure was down to 18,580.

Table 4.1 Apprenticeship starts in the UK

Academic year	England	Wales	Scotland	Northern Ireland
2005/06	175,000	27,990	20,196	
2006/07	184,400	19,590	16,913	
2007/08	224,800	21,530	15,803	5,587
2008/09	239,900	18,100	10,579	7,372
2009/10	279,700	16,355	16,655	6,973
2010/11	457,200	18,580	21,561	9,364
2011/12	520,600		26,427	8,395

Source: Data Service (England), SDS National Training Programme Statistics (Scotland), Department for Employment & Learning (Northern Ireland), Training Programmes Branch, LLL Records (Wales)

England by Levels 2 and 3 and age groups

The current system of apprenticeships in the UK was introduced in 1994, in response to a growing sense that intermediate vocational skills were in shortage (Level 2 and Level 3). These apprenticeships are modelled on the German dual system and generally last around three years (Machin and Vignoles, 2006). Level 2 Apprenticeships are aimed at people working at an operational level, while Level 3 Apprenticeships are often suited for those looking to progress into a supervisory or management role. For instance, a Level 2 Apprenticeship in the Licensed Hospitality sector would include topics such as Food Safety, Drug and Alcohol Awareness, Drinks Service and Working as Part of a Team. At Level 3, the Apprenticeship will instead include topics such as An Introduction to Leadership and Management, Marketing, Profit, Loss and Budget Control and Supervising Drinks Service in Licensed Hospitality Premises.[34]

Table 1.2 presents data on participation in apprenticeships at Level 2 and Levels 3 and 4 in the most popular frameworks, in 2011/12. The data is for England; no detailed data of this kind is published by the other devolved administrations. The total number of apprenticeship starts in England reached 329,000 at Level 2 and 191,600 at Level 3 and 4. At both levels, most participants were aged over 18

[34] BIIAB, Awarding Qualifications for Licensed Retail. Frequently Asked Questions on Apprenticeships. http://biiab.bii.org/apprenticeships/faqs#is. Accessed 20/05/2013.

years. The frameworks with most participants at Level 2 were Customer Service with 14% of all apprenticeship starts, and Health and Social Care, in which 12% of all starts occurred. The distribution by age group, however, reveals that these frameworks were especially popular among older participants (over 18 years); among 16-18 year olds, Business Administration had a larger share than other frameworks (13%). At Level 3, the most attractive programmes were Health and Social Care (17%) and Management (12%). These frameworks were especially popular among participants aged over 25 years, attracting a fifth and a fourth of all apprenticeship starts, respectively.

Table 4.2: Apprenticeship starts and achievements by age group in England, 2011/12

	Intermediate Level Apprenticeship ("Level 2")				Advanced and Higher Level Apprenticeships ("Level 3/4")			
	16-18	19-24	25+	All	16-18	19-24	25+	All
Total apprenticeship starts 2011/12	95,400	101,700	131,900	329,000	34,500	59,700	97,400	191,600
Starts in specific frameworks								
Business Administration	13%	9%	5%	8%	8%	9%	9%	9%
Children's Care Learning and Development	6%	3%	1%	3%	11%	11%	6%	9%
Construction	7%	3%	1%	3%	3%	3%	0%	1%
Customer Service	11%	15%	16%	14%	3%	8%	8%	7%
Hairdressing	10%	2%	0%	3%	6%	4%	1%	3%
Health and Social Care	4%	12%	17%	12%	2%	12%	25%	17%
Hospitality and Catering	7%	11%	8%	9%	1%	4%	4%	4%
Industrial Applications	4%	4%	8%	6%	0%	0%	0%	0%
Management	0%	6%	12%	7%	0%	6%	20%	12%
Retail	4%	9%	8%	8%	0%	4%	4%	3%
Percentage in most popular frameworks	67%	73%	75%	72%	35%	60%	78%	65%
Achievers	56,500	54,100	61,800	172,400	21,400	31,500	33,100	85,900

Source: Data Service, http://www.thedataservice.org.uk/Statistics/fe_data_library/Apprenticeships/

4.2 Evidence from previous econometric studies

4.2.1 Studies from the early 2000s

While the literature on the returns of education is vast, existing research explicitly focused on the returns to apprenticeships is relatively scarce. However, the number of articles focused on this specific type of training programmes has been growing steadily over the last decade, and some evidence exists now on the returns to apprenticeships in Germany, Austria, Switzerland, United States or Canada. With regards to the UK context, McIntosh (2004) made the first main contribution, which he updated and extended in his 2007 study (McIntosh, 2007). More recently, other pieces of research commissioned by the Department for Business, Innovation and Skills have also provided updated estimates for the returns to Apprenticeships in the context of broader analyses, using a similar methodology as McIntosh (London Economics, 2011a) and using different data sources (e.g. London Economics, 2011b).

Prior to McIntosh, Dearden et al. (2002) reported the returns to apprenticeships in the context of a wider study of the returns to education in the UK. However, they only provided estimates for those with an apprenticeship and no other qualifications, for which they found a very small and not statistically significant effect. Using Labour Force Survey data for the period 1996-2002, McIntosh (2004) explicitly focused on the returns to apprenticeships in the UK and also looked at different combinations of apprenticeships and other qualifications attained. Controlling for personal characteristics and other qualifications held by individuals apart of that associated with the Apprenticeship, the author estimated a wage increase for men associated with completing an apprenticeship of around 5-7%. Completing an apprenticeship was found not to be associated with wage increases among women. The wage return among men differs according to the qualifications held by individuals, and holding an NVQ at Level 3 together with the apprenticeship was found to lead to a wage premium twice as large as that concerning those with no such qualification. He also explored whether returns to apprenticeships differ by sector, and found that the increase of men working in manufacturing was larger than that among workers in the service sector.

Table 4.3 Earnings and Employment Returns of Modern Apprenticeship (McIntosh, 2007)

	Earnings (percentage change)			Employment probability (percentage points change)		
	Male	Female	Total	Male	Female	Total
Advanced Modern Apprenticeship (a)	22.3***	14.2**	17.7***	10.1***	16.2***	15.7***
Foundation Modern Apprenticeship (b)	19.8***	3.9	15.6***	4.6*	6.4	7.4**

*** significant at 1% Level. ** significant at 5% Level. * significant at 10% Level.
a=relative to Level 2, b=relative to Levels 1 and 2.
Source: McIntosh (2007)

More recently, London Economics (2011a) presented estimates based on a similar methodology as McIntosh (2007), but using more recent data of the Labour Force Survey for the period 2004-2009. Their findings suggest that in recent years there has been a divergent trend in the earnings returns of Intermediate and Advanced Apprenticeships: the estimates for Level 2 apprenticeships obtained by London Economics (2011a) is 12%, compared to 16% in the study of McIntosh based on 2004-05 data, while the estimate for Level 3 Apprenticeships is 22%, compared to 18% in the 2007 McIntosh study. However, there are small methodological differences between these two studies which make

them not strictly comparable, such as the fact that the London Economics study is based on hourly wages, while McIntosh uses weekly earnings.

In 2012, the National Audit Office prepared a report on the returns to apprenticeships also using Labour Force Survey data for the years 2004-2010. They estimated a wage return of 11% in the case of Level 2 apprenticeships, compared to individuals whose highest qualification was at Level 1 or 2. Their estimate for Level 3 apprenticeships was an 18% wage premium relative to individuals with Level 2 qualifications. Using these comparison groups, their estimates of the employment returns are notably lower than those obtained in previous research, partly because they only considered full-time employment. They found that Level 2 apprenticeships increase the probability by just 1.6 percentage points, and in the case of Level 3 apprenticeships the probability increases by 3.6 percentage points (National Audit Office, 2012).

Studies based on matched administrative data

More recently, a number of studies have looked at the impact of vocational qualifications in general on the basis of data of the public administration, which had been recently made available for evaluation studies commissioned by the UK's Department for Business, Innovation and Skills (BIS). Some of these studies include impact estimates specifically for Apprenticeships.

In their second study on impacts of intermediate qualifications, London Economics (2011b) used administrative data to estimate the wage and employment returns of different types of vocational qualifications, including Intermediate and Advanced Apprenticeships. These studies came up with slightly different results, although in the same direction. Table 4.4 compares the results obtained by London Economics based on cross-sectional data (LFS) and administrative data (ILR data and HMRC data):

Table 4.4 Wage and Employment Impacts of Apprenticeships as found in Studies by London Economics

	Wage returns (%)		Employment returns	
	LFS	Matched data	LFS (%)	Matched data (percentage points)
Advanced Apprenticeship (Level 3) (a)	22	17	14	5
Intermediate Apprenticeship (Level 2) (b)	12	12	10	5

a=relative to Level 2, b=relative to Levels 1 and 2.
Source: Cambridge Econometrics (2013) based on Economics (2011b)

A recent review of the literature on the returns to education in the UK (Cambridge Econometrics, 2013) identified as a systematic finding the result that, overall, Apprenticeships have the highest wage and employment returns of all vocational training programmes. However, it was also noted that research based on longitudinal data had found a relative erosion of the wage premium over time associated with the completion of an Apprenticeship.

Costs and benefits of apprenticeships

Finally, it is worth mentioning that McIntosh (2007) also carried out a Cost-Benefit Analysis of Apprenticeships using the impact estimates on earnings and employment similar to the analysis presented in Section 4 below. More recently, the National Audit Office (2012) also presented results of an updated Cost-Benefit Analysis.

The results from McIntosh (2007), comparing the lifetime benefits of the programme and the costs of delivering the qualification, indicate that there is a large positive net present value arising from the various apprenticeship programmes. He estimates that Modern Apprenticeships produce per apprenticeship a net positive present value of £105,000 at Level 3 and £73,000 at Level 2. This, in turn, translates in a total net positive present value of around £17 and £16 respectively per pound of public expenditure for the funding of further education. Similar results are reported by the National Audit Office (2012), which finds a return of £18 per pound of public investment. It is worth noting that these analyses do not present estimates on the full social returns to investment, given that these do not account for factors such as the opportunity cost of participation in the apprenticeship, which is a relevant component of the upfront social investment in apprenticeships.

Due to the higher wage returns estimated for apprenticeships when compared to other vocational qualifications, apprenticeships are found to be more cost-effective.

4.3 Econometric evaluation of returns to apprenticeships in the UK

This section presents updated estimates of the returns to apprenticeship completion in terms of earnings and employment outcomes. For this purpose, we follow previous work in this area, as reviewed above, although with some methodological differences. The estimation of impacts is based on the Mincer model, briefly presented in section 3.1. In the absence of experimental data, the main difficulty that arises when trying to estimate the causal impact of Apprenticeships is the identification of appropriate treatment and control groups, discussed in section 3.2. Section 2.3 presents the findings.

4.3.1 Apprenticeships in economic theory: Educational investment and increased life-time earnings

The human capital approach of the Mincer model, as presented in Mincer (1974), shows that educational and training decisions play an important role in the determination of life-time earnings. Workers who invest in schooling are willing and able to give up present earnings in return for future higher earnings. If it is assumed that people pursue the education level that maximizes the present value of lifetime earnings, education and training decisions then depend on the present value that different people attribute to expected earnings linked to alternative decisions. The present value given to future expected earnings can differ markedly according to people's perceptions and experiences, which affect how different people feel about giving up some of today's consumption in return for future rewards (Borjas, 2010).

The Mincer equation has the virtue of providing a parsimonious specification that fits the data remarkably well in most contexts, making the model one of the most widely used in empirical economics (Lemieux, 2003). Based on theoretical and empirical arguments, Mincer modelled the logarithm of earnings as a function of years of schooling and years of potential labour market experience (age minus years of schooling minus the age at which schooling starts). Mincer's 'human capital earnings function' usually models the log of earnings as the sum of a linear function of years of education and a quadratic function of years of potential experience.

In the European academic tradition, a set of dummy variables is used identifying the type and level of highest qualification attained by individuals, instead of using a numerical variable defining years of schooling. This has the advantage that it allows estimating different effects for different types of qualifications. We use a similar approach in order to estimate the impact of apprenticeship completion on employment, using logistic models to estimate the effects of apprenticeship completion on the probability of being employed as opposed to being unemployed.

4.3.2 Methodology to estimate the causal impact of apprenticeships on wage and employment outcomes

Data and empirical strategy

The econometric impact evaluation of apprenticeships carried out here is based on data from the Annual Population Survey (APS). This dataset has the advantage that it provides a larger sample size compared to the Labour Force Survey (LFS). Thanks to this it is not necessary to pool data from several years, as is the case when LFS data is used. Moreover, APS data is available for natural years as well as for tax years, the latter being particularly convenient for the purpose of the Cost-Benefit Analysis presented below.

The APS contains a variable indicating whether the respondents have completed a recognised apprenticeship, which can be used to compare people who achieved apprenticeships to a counterfactual outcome of not having achieved these. This approach allows us to estimate the causal effect of apprenticeship completion as long as people with achieved qualifications from apprenticeships and non-achievers are identical in all other respects. Similarly to other studies on the impact of apprenticeships (London Economics 2012, McIntosh 2007), estimating such causal effects of apprenticeships implicitly relies on the assumption that the incremental return of the full achievement of apprenticeship-related qualifications can be compared to non-achievers of apprenticeships, i.e. people whose post-apprenticeship qualification is below the level they had aimed for. This is realistic as there are quite substantial numbers of non-achievers (see Section 1.2 above) and more generally, large numbers of people with lower qualifications, who did not participate in apprenticeships, but can be used to estimate the counterfactual outcome.

At the same time, and for the purpose of the Cost-Benefit Analysis, we want to estimate what is the effect of completing an apprenticeship in the case of people whose qualifications allow them to access apprenticeship programmes. While in the first case we will compare people with the same level of qualifications, in the second we will compare people with Level 1 qualification against people who undertake an apprenticeship and obtain Level 2 or Level 3 qualifications. The specification of our models allows us to look at these two types of effects at the same time.

In order to approximate as much as possible a situation in which achievement/non-achievement of the apprenticeship is the only characteristic in which people differ in the empirical observations in APS data, a number of filters and control variables are used:

First, people who have obtained qualifications at Higher Education or A/A2/AS Levels are excluded. The purpose is to exclude from our comparison people who have completed an apprenticeship but have later on achieved higher qualifications, given that this would affect their earnings and employment probabilities.

As a second filter, we remove observations of earnings below the first percentile or above the 99th percentile of the distribution of hourly wages. This is usual practice in this type of studies and is justified by the existence of outliers which can distort the estimations of mean impacts, given that their exceptional earning levels are unlikely to fit into the general pattern that the model provides. The sample used is made of people in working age (16-65 years old).

Finally, a number of control variables available in the APS are included in the regression models used for the estimation of impacts. We follow McIntosh (2007) and include the following control variables in the estimation of earnings returns, in addition to work experience in linear and quadratic form as is the standard specification of Mincer-type empirical earnings functions. These control variables control for mean differences between achievers and non-achievers for (i) gender; (ii) ethnicity; (iii) geographical region; (iv) public or private sector of employment; (v) size of the organisation in which the respondent

is employed; and (vi) all other qualifications held. In the model for employment returns, the variables relevant for characterising employed and unemployed people are (i) gender; (ii) ethnicity; (iii) region of residence; and (iv) all other qualifications held.

The inclusion of these control variables allows us to estimate coefficients for the variables of interest based on the comparison of individuals with similar socio-demographic characteristics. [35]

Among these covariates, the variable "all other qualifications held" is particularly important. This variable consists on 31 dummies which provide information about all the qualifications held by each individual, i.e. not only the highest qualification achieved but the whole structure of qualifications obtained. Therefore, the estimated coefficients are obtained from the comparison of individuals who have the same underlying structure of qualifications, but who differ in that they have reached certain NVQ levels and/or have completed a recognised apprenticeship.

Specification and estimation of the returns to apprenticeships

Two models are run separately: one model is used to estimate the effects of having completed a recognised apprenticeship among people whose highest qualification is at Level 2, and another model is used to estimate the effects of having completed an apprenticeship among people with Level 3 qualifications. Each of these models includes an indicator variable to show whether the respondent achieves Level 2 or 3 qualifications, and an interaction term indicates whether the respondent has also completed an Apprenticeship. The sum of the coefficients estimates in these models provide the measure for returns to apprenticeships relative to those groups included in the samples whose qualifications are below the specific level and who have not participated in apprenticeships:

- In the model for Level 2, the sample used consists of people with either Level 1 or Level 2 qualifications.
- In the model for Level 3, the sample is made up of people with either Level 1 or Level 3 qualifications as in many cases, Level 3 apprenticeships are begun after secondary school qualifications not sufficient to progress to upper secondary/academic learning, which are equivalent to a Level 1 qualification.

The parameters of interest in the model, therefore, are to be interpreted as follows:

- The coefficient of the Level 2/Level 3 dummy variable indicates the wage premium associated with having this level of qualifications and no completed apprenticeship, relative to having Level 1 qualifications only.

[35] We are aware that this maybe only the second-best option as the current state of the art in the econometric estimates of microeconomic impacts of learning tends towards semi-parametric methods, in particular propensity score matching (Rosenbaum and Rubin 1983), which can address observable differences between achievers and non-achievers more flexibly than regression functionals. However, we decided (at this stage) not to implement these methods because of two reasons:

First, we wanted to produce evidence on the returns to apprenticeships, which can be more clearly contextualised to existing evidence, such as the studies *London Economics* (2012) and McIntosh (2007), which are based on regression models rather than non-parametric methods.

Second, the application of semi-parametric methods is much more computational-intensive, not least because appropriate standard errors can only be obtained in costly bootstrapping algorithms (Abadie and Imbens, 2008) and the choice of crucial parameters such as the bandwidth (Galdo et al. 2008) of the related semi-parametric estimator requires repeated estimations. With overall apprentice numbers in the UK still being small, we found that the application of these methods would be limited by the sample sizes. It would however be worthwhile undertaking such research if appropriate sample sizes, e.g. by using administrative data, had been made available for this project as for studies commissioned by the UK Central Government.

- The coefficient of the interaction term indicating whether individuals with Level 2 or 3 qualifications have also completed an apprenticeship indicates the wage premium associated with having completed an apprenticeship, relative to having the same level of qualification (Level 2 or 3 depending on the model) but not having completed an apprenticeship.
- Finally, the sum of the two coefficients (that for the main effects of the Level 2/3 dummy and that for the interaction term) indicate the wage premium associated with obtaining a Level 2/3 qualification and completing an apprenticeship, relative to having Level 1 qualifications and no completed apprenticeship. Given that people with Level 1 qualifications can access Level 2 and Level 3 apprenticeships, this total effect is the parameter of interest for the Cost-Benefit Analysis presented below.

In these models, people reporting to have Trade Apprenticeships as their highest qualification have been regarded as having Level 2 qualifications. This is likely to be true in most cases, but some of these will not achieve Level 2 and have instead only Level 1 qualifications. In such cases, the consequence will be an underestimation of the true effect, because people with Level 1 apprenticeships are likely to earn less and have a lower probability of being employed than people with Level 2 apprenticeships. This assumption, therefore, makes our estimates somewhat conservative.

4.3.3 Findings of the econometric analysis

Earnings increases resulting from apprenticeships

Table 6.1 presents the estimated coefficients for the variables of interest, obtained from the full model for the estimation of earnings returns as described in the previous section. In this table, each row relates to a different model. The first row contains the estimated coefficients for the effects of having Level 2 vocational qualifications relative to having Level 1 qualifications only, and the effects of having Level 2 vocational qualifications and completed apprenticeships relative to Level 1 qualifications only. The coefficient for the Level 2 dummy can be interpreted as the percentage change on the level of hourly wages associated with having this level of vocational qualifications, instead of Level 1 qualifications only. Having Level 2 qualifications is associated with a wage premium of 6%. If, in addition to having Level 2 qualifications, the individual has completed an apprenticeship, the wage premium is expected to be an additional 9.1% higher compared to people with Level 2 qualifications and no apprenticeship. The sum of these two coefficients indicates that individuals whose highest qualification is at Level 1 would earn 15.1% more per hour if they did an apprenticeship and reached Level 2 qualifications.

The second row provides equivalent impact estimates for the effects of having Level 3 vocational qualifications and an apprenticeship. The estimates show that having Level 3 qualifications has a much greater impact than just Level 2, leading to a 15.5% increase in hourly wages. At this level of qualification, the additional effect of 7.4% of having completed an apprenticeship is very similar than at Level 2. The sum of the two coefficients suggests that people with Level 1 qualifications would earn 22.9% more if they completed an apprenticeship and obtained Level 3 qualifications.

Table 4.5 Earnings Returns of Apprenticeship Completion and Standard Errors (in parentheses) Level 2 and Level 3

Level 2	0.060***	Level 2 and Recognised Apprenticeship	0.091***
	(0.009)		(0.009)
Level 3	0.155***	Level 3 and Recognised Apprenticeship	0.074***

	(0.009)		(0.010)

**** Statistically significant at 1% significance level*
Source: Annual Population Survey. Own estimations

Employment gains resulting from apprenticeships

In order to estimate the effects of apprenticeship completion on the probability of being employed, logistic models including similar covariates as before are used. In these models, the response variable of interest is a binary variable which can take values "employed" or "unemployed". In these instances, the response variable predicted by a regression model can take values different to 0 and 1, which can be interpreted as probabilities of being in status "1". However, a linear regression model can predict values below 0 and above 1, which are not meaningful probabilities. In order to avoid this, a link function (here the Logit link) can be used, which transforms the dichotomous response variable into a continuous variable. A linear regression can then be fitted to this continuous variable, which can be transformed back to a probability with values within the [0, 1] interval.

In order to interpret the linear coefficients as effects on the original response variable in probability terms, the coefficients can be transformed to marginal effects at the mean value of the independent variables. The relevant control variables used in the estimation of employment returns differ from the models of earnings returns because unemployed people are now present in the sample. Besides the Level 2 or 3 qualifications and Apprenticeship indicators, the explanatory variables included are (i) gender; (ii) ethnicity; (iii) region of residence; and (iv) all other qualifications held.

Table 1.2 provides the estimated marginal effects obtained from the logistic models used to estimate the impact of apprenticeship completion on the probability of being employed as opposed to being unemployed. The marginal effects are interpreted as additive effects in percentage points over the probability of being in employment. The first row presents the marginal effects associated with having Level 2 vocational qualifications. Relative to having Level 1 qualifications only, the probability of being employed increases by 3.9 percentage points when Level 2 qualifications are held, and this effect is statistically significant at 1%. Additionally, having completed an apprenticeship increases this probability by another 2.8 percentage points, this effect being significant at 1%. The sum of these two coefficients suggests that the probability of being in employment for people with only Level 1 qualifications would increase by 6.8 percentage points if they completed an apprenticeship and achieved Level 2 qualifications.

As shown in the second row of Table 1.2, achieving Level 3 as opposed to Level 1 qualifications is associated with a 7.4 percentage point higher probability of being employed, and the effect is statistically significant at 1%. Similar to what was observed in terms of earnings, the effect of Level 3 qualifications is very large. If, in addition to having Level 3 qualifications and apprenticeship has been completed, the probability of employment increases by another 2.3 percentage points (statistically significant at 1%). These two coefficients added up indicate that the probability of being employed for people at Level 1 and with no apprenticeship completed would increase by 9.7 percentage points if they reached Level 3 and completed an apprenticeship.

Table 4.6 Employment Returns of Apprenticeship Completion and Standard Errors (in parentheses) Level 2 and Level 3

Level 2	0.039***	Level 2 and Recognised Apprenticeship	0.028***
	(0.000)		(0.000)
Level 3	0.074***	Level 3 and	0.023***

		Recognised Apprenticeship	
	(0.000)		(0.000)

*** *Statistically significant at 1% significance level*
Source: Annual Population Survey. Own estimations

These results can be compared to previous estimates, although it has to be noted that the comparison groups used in previous research differ from the ones used here. Previous estimations of the employment effects of Apprenticeship completion based on administrative data (see Section 2.2. above) were more conservative, with an estimated effect of a 5 percentage point increase in the probability of being employed, both for Level 2 and Level 3 apprenticeships. Estimations based on LFS data from different years produced more positive results. McIntosh (2007), for instance, estimated a 7.4 percentage point increase in the probability of being employed due to completion of a Level 2 apprenticeship, and a 15.7 percentage point increase when completing a Level 3 apprenticeship.

Our results fall somewhere in the middle. In the case of Level 2 apprenticeships, our effect of a 6.8 percentage point increase is more positive than previous estimates based on administrative records, which can be partly due to the fact that our reference group is people with Level 1 achievement instead of Level 1 or 2 achievement. The effects of Level 3 apprenticeships, estimated as a 9.7 percentage point increase in the probability of being employed, is more positive than estimates from administrative data but less positive than previous findings from LFS data. This effect is quite conservative considering that the reference group for our estimate is people with Level 1 achievement instead of Level 2, as is the case in other estimates.

4.4 Cost-Benefit analysis

4.4.1 Description of relevant costs and benefits

Costs and benefits are relevant both during the time it takes people to undertake an apprenticeship and in the longer term. They affect the stakeholders involved in apprenticeships differently at various points in time and have to be valued in present and future values. In the following, we briefly outline the costs and benefits which need to be taken into account in this analysis. In the second part of this chapter, we describe market prices and further parameters used in order monetise costs and benefits to employers, apprentices and public budgets.

Employers

Summary of costs and benefits to employers

It is difficult to capture all relevant apprenticeship-related costs for employers, but the most relevant are staff costs and costs relating to appropriately setting up the workplace, administration overheads and costs for fees of learning not paid for by the government. We follow basic ideas as outlined in Hogarth (2012) and the more comprehensive approach suggested by Pfeiffer et al. (2009) for the German case. The most important costs as specified in these papers are:

- Staff costs for apprentices (wages, Employer National Insurance Contributions, discretionary payments, pension contributions);
- Staff costs of supervisors (wages, related employer National Insurance Contributions, discretionary payments, pension contributions); and

- Other costs (set up costs, learning materials/other consumables, administrative and recruitment costs, training workshops in house, course fees if not paid for by the government).
- On the other hand, there are substantial benefits to firms, both while people work as apprentices and following successful completion of the apprenticeship:
- Productive contribution during the apprenticeship ("apprentice product");
- Reduced recruitment costs for skilled workforce, relative to the cost of regular workers with similar qualifications; and
- Further benefits (which can or cannot be easily estimated) such as saving of downtime due to lack of skilled staff; a better public image (corporate social responsibility/offering opportunities to young people); enhanced organisational attractiveness for talent because of the training opportunity offered in apprenticeships; further firm-effects, e.g. when combining apprentice training with further training for existing staff).

A further important benefit from apprenticeships is a "return to investment" for employers, which implies that some of the productivity gain resulting from a successful apprenticeship contributes to both an increase in wages, once apprentices are fully qualified, and some post-apprenticeship gains for the employers. This mechanism is crucial to understand why employers engage in apprenticeships, which we further describe in the following section.

Employers' post-apprenticeship return to the skills investment

Recent papers for the UK (e.g. McIntosh 2007, Hogarth 2012) and other countries (e.g. Pfeiffer et al. 2009 for Germany) show evidence of substantial net costs of apprenticeships for employers, i.e. the apprentice product is not sufficient to recover all costs that employers incur when employing apprentices. This suggests that employers would have to recoup some of the rent from this investment in skills by paying post-apprenticeship employees below their marginal revenue product. If there was no such "rent sharing", employers would have few incentives to take on apprentices because they would not be able to recover net apprenticeship costs.

Hogarth et al. (2012), Gambin et al. (2010: 136) and Dearden, Reed and Van Reenen (2005) suggest that there is indeed a positive employer rent from skills investment. According to these papers, about half of the productivity gain brought about by training results in an "employer return to skills investment" accruing over a post-apprenticeship period, repaying the initial investment (subject to discounting). Depending on whether this return is temporary or permanent, this stream of cash flow would repay the initial investment and deliver further firm revenues, which could be interpreted as a ‘return on investment’.

However, the existence of such a permanent return to the skills investment to employers rent is in contrast to standard microeconomic theory, which suggests that wages and marginal productivity of workers align. Standard microeconomic theory expects both factors of production, capital and labour, to be allocated and paid for in accordance to its marginal products (under perfect competition, but this may be a useful model at least in the longer term). This would make a permanent return to employers quite unlikely: workers paid below their true level of productivity would find alternative employment in the longer term, so that wages and productivity align.

There may be some reasons for an extended return of the skills investment to employers, i.e. discounted income streams exceeding the repayment of the initial training costs, for example:

Apprentices remain with their employer for some time to gain post-apprenticeship experience (i.e. the true skills investment period for apprentices exceeds the duration of the apprenticeships);

Firm/industry-specific human capital resulting from an apprenticeship would restrict labour mobility (e.g. monopsonistic labour demand, which is likely in some industries and in particular regions); and

Local labour markets lack suitable alternatives and workers would have to accept high costs to achieve higher wages (e.g. regional mobility), which would offset the wage gain (or other forms of market rigidity).

Such circumstances are more likely for some sectors and less for others depending on (i) learning requirements; (ii) characteristics of the occupational labour market; (iii) firm-specific human capital; (iv) value of post-apprenticeship experience and further qualifications; and (v) regulatory requirements affecting competition. In conclusion, we believe that a permanent employer return is unlikely as most of the apprentices are undertaken in relatively competitive sectors such as retail, hospitality and care. On the other hand, it is reasonable to think that long-term benefits to businesses result from the indirect processes of skills investment like spill-over effects across the workforce, general improvements in the firm's human capital stock and the capacity to produce more effectively than competitors or be more innovative.

Further economic returns to employers

In addition to the direct productivity effect of apprenticeships, there are likely further positive returns resulting from diffusion processes within the firm, along its supply chain and across industry (e.g. when people change jobs). Such diffusion processes arise when apprenticeships benefit other workers in the firm, for example when improved practices acquired by apprentices can be shared in the workplace and increase the productivity of other workers. A recent London Economics (2012) survey of international empirical evidence reported that an additional nine to 12% return results from intra-firm diffusion, i.e. increased wages of workers not directly involved in training, and therefore, are non-private returns to the educational investment. Ignoring these externalities understates the full impacts arising from up-skilling, while cost-benefit estimates which do not take these into account are likely to underestimate the gains to employers.

Apprentices

Costs of an apprenticeship for the apprentices are monetary costs as well as opportunity costs (e.g. gains from alternative activities not undertaken), the latter of which are not accounted for in existing cost-benefit analyses (e.g. McIntosh 2007). Two types of costs can be distinguished:

Costs with clear monetary values: "opportunity costs" for apprentices in the form of lower wages, relative to the wage they could earn in regular employment. Alternatively, if people would have claimed out of work benefits, losing such benefits would equally constitute "opportunity costs" with monetary value. There are also direct costs incurred when taking up apprenticeships, such as travel or childcare costs, albeit these may be of minor importance for the specific population starting apprenticeships.

Costs without clear price tag, such as the loss of leisure time because of engagement in structured learning activity (which is likely to exceed weekly working times), the effort to learn and achieve specific learning outcomes and further costs (increased stress/anxiety, expectations, etc.).

Likewise, two types of benefits for apprentices can be identified:

Clear monetary benefits from apprenticeships, such as the apprentice's wage during the apprenticeship, potentially complementary public in-work benefits such as Working Tax Credits/ Child

Tax Credit (although, again, the latter is unlikely for most young people) and improvements in post-apprenticeship wages and employment probability, estimated in Part Two above.

Non-monetised benefits result from increased happiness and satisfaction because of the intrinsic value of work for individuals ('doing work for its own sake'), improved long-term wealth, health and family circumstances due to the improved socio-economic position relative to not having undertaken apprenticeships. A positive impact on communities should also be taken into account.

It is important to emphasise that some potential benefits which can occur over the long-term can lead to very large monetary returns. For example, there are important lifetime costs ('scarring' effects, see Bell and Blanchflower 2009) associated with being NEET, which some apprentices will avoid thanks to engaging in apprenticeships. This is associated with important gains at the level of the individual and the society at large. However, there is little reliable quantitative evidence in this regard, since few estimates have been produced. Coles et al. (2010) estimate that the lifetime cost to the public purse of the 208,196 young people aged 16-18 who were NEET at the end of 2008 will be close to £12 billion. Unfortunately, our cost-benefit analysis in this section will not be able to incorporate such benefits, and therefore the individual, social and public budget benefits are likely to be underestimated.

Society and public budgets

Aggregation of individual benefits and further social benefits

Under the assumption that wages (or more precisely, total remuneration) represent a credible measure of the value contribution of workers in the economy, social costs and benefits can be derived from the impact of apprenticeships on individual worker's wages through aggregation of individual costs and benefits. This also requires the assumption that employer returns are solely about recovering the initial skills investment (and hence, the net costs of the apprenticeship) and that no further benefits from apprenticeships, such as spill-over effects and further benefits due to diffusion, exist. Both these assumptions are unlikely to hold. There is evidence that further firm and sector effects exist. In addition, economic growth theory suggests that the improvements in the human capital stock is one of the key drivers of economic growth, so that in the longer term, indirect effects of skills investment are likely to result in social benefits which by far exceed aggregated individual benefits.

On the other hand, very few empirical studies have aimed to estimate the size of these effects. Apart from Dearden et al (2005) and the recent study by London Economics (2012) on the impact of skills investment on sectors and firms, we do not know of credible estimates of the impact of apprenticeships beyond the individual apprentice. Therefore, we will focus on aggregations of the microeconomic impacts in the following, in a similar vein to what is done in the 2007 McIntosh's study.

Costs and benefits for public budgets

Understanding the costs and benefits for public budgets involves accounting for spending in relation to apprenticeships (e.g. on fees paid for the learning of apprentices) as well as relatively lower revenues in social insurance contributions and direct and indirect taxes in the short-term. Over time, positive outcomes at the individual level such as increased employment probability and higher average wages can translate into net benefits resulting from cost reductions (reduction of out-of-work benefit payments) and increased tax incomes. If apprenticeships are a cost-effective programme, then subtracting the initial investment from the present values of all relevant future outcomes should result in a non-negative amount for the public budgets. Such a positive fiscal effect would indicate that the programme increases economic efficiency, i.e. resources are allocated in a way that yields higher productivity and prosperity for society than in the absence of the programme.

Relevant costs of apprenticeships to the public budgets are:

- Funding of further education in relation to apprenticeships (further education colleges and related tests/certificates);
- Reduced tax/NIC during apprenticeship compared to a counterfactual status of working at a lower qualification level;
- Increased Working Tax Credit and other in-work benefits for people starting apprenticeships out of benefit claimant status, which represent additional costs for the public budget; and
- Lower indirect tax revenues because of relatively lower incomes/spending during apprenticeship).

However, the time spent on apprenticeships also results in some instantaneous gains for public budgets, particularly in the case of people who had been unemployed/benefit claimants before starting the apprenticeship. For these the position of public budgets improves immediately as there are cost savings (termination of out-of-work benefits and related payment such as housing benefit/council tax benefits) and positive revenues to public budgets (income tax from apprenticeship wages, employee and employer National Insurance Contributions and increased indirect taxes, as apprenticeship wages are likely to result in improved household incomes relative to claiming benefits).

The largest gains for the public budgets, however, arise in the long run, in particular as productivity and wages are higher and employment opportunities improve relative to the counterfactual outcome. These individual gains result in sustained revenue increases for public budgets such as:

- Increased income tax/National Insurance Contributions of employment income compared to alternative employment income at lower levels of qualification or out-of work-benefits, and higher indirect taxes because of higher consumption spending.
- Reduction of out-of-work benefits (and related housing and council tax benefit) as employment opportunities improve over counterfactual outcome.

In addition, it is likely that further positive outcomes for public budgets exist, arising more generally from improvements in individual well-being because of the economic and non-economic impact of better work, higher income and greater quality of life. Such improvements in public budgets would result from improved health, reduced crime, improved welfare of children and related longer-term outcomes (reduction of poverty). Such budget impacts cannot be estimated at present as we lack suitable information about the magnitude of such effects.

Other effects for public budgets that cannot be accounted for in this cost-benefit analysis (at least at this stage) result from improvements in employee skills levels, affecting firm profitability. Such impacts are very likely to occur – as outlined before – and would result in positive effects on public budgets in the longer term through a variety of mechanisms:

- An **employer rent** with substantial medium-term benefits to employers beyond recovering the costs of apprenticeships would lead to increased profitability, affecting tax revenue through various mechanisms.
- **Diffusion/positive externalities of skills investment** would increase work incomes and related tax revenue/welfare spending of people not participating in apprenticeships.

While the employer rent is unlikely to remain a permanent source of further budget revenues, the diffusion on new knowledge and skills is one of the most important mechanisms causing long-term growth in the light of economic growth theory. In this analysis, we restrict the public budget impacts to wage-related revenue increases resulting from the microeconomic impacts on individuals as estimated in Part Three above. As discussed above, the cost-benefit estimates presented below are very likely to

underestimate public budget and social gains. However, in the absence of sound evidence for the effects beyond the individual return and wage/employment impacts of apprenticeships, there are no suitable parameters for such impacts to be included in the social cost-benefit analysis or more narrowly in relation to the position of public budgets.

4.4.2 Costs-benefit analysis for employers

Values used to estimate employer costs

Wage costs for apprentices

Wage costs for apprentices are the most important cost component for employers apart from supervision costs. The values used here were taken from the BIS Survey of Apprentice Pay in the UK (2011), which provides representative data for sectors as well as specific groups. We used hourly gross wages for apprentices in specific sectors, which were matched to the different apprenticeship frameworks as shown in Table A.2 in the Appendix. Total monthly and annual apprentice pay was then calculated for each specific framework, assuming full-time work, paid statutory leave and public holidays. In addition, we deduct Employer National Insurance Contributions (NIC, 13.8%) from apprentices' incomes in excess of £7,488 p.a. We disregard any incentive or other discretionary pay elements for apprentices as no data is available and these are of minor importance to apprentice wage costs in most sectors of the economy.

Time and costs of apprentice supervision

Existing surveys such as the IFF/IER Survey on Employers of Apprentices or qualitative studies do not currently offer systematic quantitative evidence on the time and costs firms spend on supervision of apprentices, which could be readily applied to this cost-benefit analysis. Hogarth et al. (2012) is the only paper offering on the basis of qualitative case studies of a limited number of employers some recent estimates of supervision costs for apprentices in the UK for some, relative broadly defined Level 2 and Level 3 apprenticeships in construction, engineering, retail, etc.

In the following discussion, we approximate apprentices' supervision costs on the basis of institutional framework information. More specifically, we adjust the regulatory minimum number of Guided Learning Hours (GLH) apprentices must spend in the firm in "on the job" training using a multiplier, which is specific for every individual framework (between 1 and 2.5 hours of supervision time per hour of on-the job training). This multiplier is high (2.5) for technology/capital and human capital intensive industries (engineering/science/energy/construction) and services (IT/policing/armed forces/fire and rescue services); medium (1.5) for other manufacturing/crafts and business services/education; and low (1) for personal services (health, social care and leisure/hospitality).[36] The resulting in-the-firm supervision time was then multiplied by the average wage costs of occupations involved in apprenticeship supervision.[37] Using this approach, we were able to estimate the total time spent and costs required for apprenticeship supervision for every individual apprenticeship programme. We benchmarked these estimates with supervision costs published by Hogarth et al. (2012). Our estimates are very similar to these published supervision costs obtained in case studies, although there are some exceptions (business/administration and health/social care), which are however in line with what the case studies suggest.

[36] Table A.1 of the Appendix provides details on the multiplier used for the specific frameworks.

[37] Table A.3 of the Appendix provides full detail of the group of people involved in apprenticeship supervision for each framework. We use industry-specific hourly wages from Labour Force Survey (LFS) data for the third quarter 2011 linked to apprenticeship frameworks. We further adjust these wages by Employer NIC and occupational pensions to account for full compensation costs rather than wages. As Employer NIC only applies above a specific income threshold, an average hourly contribution based on averaged full-time equivalent costs of apprentice supervision is used.

Other costs

A representative German survey suggests 3-5% of overhead costs with substantial variation across sectors (Pfeiffer et al. 2009). However, we cannot account for these costs as there is no systematic information for UK firms. We also assume that internal workshops and further internal training supervision are fully accounted for in apprenticeship supervision costs. We add further cost components as presented in Hogarth et al. (2012) on recruitment/management of apprentices and some costs for assessment fees, but we exclude further costs to employers for the participation of apprentices in further education as full funding for 16-18 year old apprentices and part-funding for those aged 19-24 is available.

Table 4.7 gives an overview of relevant apprenticeship costs for employers and how the values have been specified:

Table 4.7 Employer Costs

	Monetary Value	Source/ Further Information
Staff Costs of Apprentice		
Wages	Average hourly pay for apprentices 16-24 in sector. Full-time working week. Minimum paid statutory leave (28) and bank holidays Assume no discretionary payments	Wages: BIS Apprentice pay survey, 2012; own calculations Apprentice wages linked to frameworks at sector level, see Appendix 1, Table 1 Paid leave/Bank Holidays: http://www.gov.uk
Employer NIC	13.8% on income exceeding £7,488 p.a.	http://www.gov.uk/
Staff Costs of Supervision		
Staff time spent for supervision and training	Supervision = On-the-job Guided Hourly Learning (GLH) X Multiplier Multiplier: 1-2.5 hours supervision per OJT GLH (Framework specific)	Apprentice framework information
Wages paid for supervision	Average hourly wages of those engaged in apprentice supervision Assume no discretionary payments	Labour Force Survey linked to frameworks at industry level (Appendix Table A.1) Average pay for groups engaged in supervision (Appendix Table A.3)
Employer NIC	Calculated per hour NIC-contribution of FTE-wages (applicable on income £7,488 +/13.8% p.a.)	http://www.gov.uk/
Occupational Pension	Assume 7% on gross wages	Mercer MC[38]
Other Costs/Consumables		
Administrative & recruitment costs	£200.00 -£500.00	Similar to Hogarth et al. (2012), assume £500 for manufacturing and construction, £200 for others
Course/assessment fees	£250.00- £500.00	Similar to Hogarth et al. (2012), assume £250 for most services, £750 for specific services and others

[38] http://uk.mercer.com/press-releases/Employer-and-employee-pension-contributions-fall

Values used to estimate employer benefits

Apprentice product

Based on the information of the apprentice frameworks, we estimate the apprentice time spent contributing to firm production by subtracting the total minimum Guided Learning Hours (as stated in the individual frameworks) from the total working time of the apprenticeship, and further adjusting this to account for paid holiday and average sickness rates. This 'productive' time is then valued using average per hour industry wages for people reporting 'no qualifications' in the specific industry obtained from LFS data plus contributions for employer NIC and occupational pensions (similar to Pfeiffer et al. 2009). The resulting monetary value represents the total value of the apprentice's product.[39]

It should be noted that this value is related to the full duration of the apprenticeship, which in most cases is slightly longer than a year. Regardless of this, we believe that the estimated value of the productive contribution represents a present value, with no need to use a discount rate for this magnitude.

Post-apprenticeship returns to employers

Similarly to Hogarth et al. (2012) following Dearden, Reed and Van Reenen (2005), it is assumed here that post-apprenticeship returns to the skills investment repays the firm's initial investment into the apprenticeship. Following the approach of these studies, we quantify the employer return as half the difference of the post-apprenticeship wages (Levels 2 or 3) and the previously observed contribution at 'no qualification' levels using observed values of industry-specific wage levels from LFS data linked to apprentice frameworks (see Appendix Table A.2). Since the employer rent accrues over time after the end of the apprenticeship, these returns have to be discounted. However, since an employer return is unlikely to persist due to worker mobility, we disregard future/post-recovery benefits to employers assuming that the employer benefit repays the investment (subject to discounting) and results in initial cost savings (i.e. saving recruitment costs for qualified staff). Therefore, we do not explicitly model an income stream for employers beyond the repayment of the initial investment. This may lead to some degree of underestimation of the gains that employers reap.

[39] Please note that we use average wages for unskilled workers of all age groups because young people may be paid below their marginal product. There are some sectors like agriculture or other services, for which LFS data show relatively high wages for people reporting 'no qualifications'. In such situations we used the wages of people reporting qualifications 'below Level 2' instead.

Table 4.8: Employer Benefits

	Monetary Value	Source/ Further Information
During Apprenticeship		
Productive contribution of apprentices	Calculate hours of productive contribution (all non-GLH hours minus leave and average sickness Value productive contribution per hour industry-specific 'no qualification' Assume marginal product to also recover employer NIC and pension	Similar to Pfeiffer et al. (2009) Labour Force Survey, Q4/2011, own calculations Wages linked to frameworks at industry levels (Appendix Table A.2) Paid leave/Bank Holidays: http://www.gov.uk Sickness absence: ONS[40]
After the end of the Apprenticeship		
Reduced recruitment costs for skilled staff (t=1, to PV)	Use occupation-specific costs for recruitment (averages): Adm., secretarial and technical £1,545 Services £1,350 Manual/craft workers £700	CIPD[41]
Temporary employer rent (t=1,…T, to PV)	50% of the productivity gain from upskilling going to employer Corresponds to 50% of the difference of marginal product at achieved level of qualification (including employer NIC and Pension) and equivalent pre-completion ('No qualifications' compensation costs)	Hogarth et al. (2012)
Discount rate	3.5%	HM Treasury Green Book[42]

Results

Table 4.9 summarises costs and benefits to employers separately for Level 2 and Level 3 apprenticeships. These estimates are based on the specific sector composition of apprenticeships based on data for the academic year 2011/12[43]. The employer cost-benefit analysis accounts for the differences in apprenticeship frameworks, which affect various cost and benefit components.

The highest costs are caused by the apprentice remuneration costs, which account on average for about £13,000 for a Level 2 apprenticeship of an average duration of 13.4 months and £19,000 for a Level 3 apprenticeship, which takes slightly longer to complete (19.7 months). In addition, there are average supervision costs of £7,131 (Level 2) and £10,600 (Level 3). The value obtained for the apprentice product is slightly below the wage costs incurred, and along with supervision costs, there are net costs to employers by the time an apprenticeship is successfully completed. These costs

[40] http://www.ons.gov.uk/ons/rel/lmac/sickness-absence-in-the-labour-market/2012/rpt-sickness-absence-in-the-labour-market---2012.html#tab-Sickness-absence-in-the-UK-labour-market

[41] http://www.cipd.co.uk/binaries /recruitment_retention_turnover_annual_survey_2009.pdf

[42] http://www.hm-treasury.gov.uk/d/green_book_complete.pdf

[43] http://www.thedataservice.org.uk/Statistics/fe_data_library/Apprenticeships/

amount to £8,244 and £10,777 for Level 2 and Level 2 apprenticeships, respectively. Employer benefits as a result of achieved apprenticeships are positive for a range of outcomes, such as savings in recruitment costs of qualified staff and further positive effects on the firm that cannot be quantified. However, the employer return (in present values) must at least recover the initial level of investment for it to be an economically rational decision, i.e. it must be at least equal to net cost incurred at the time of completion of the apprenticeship. As discussed above, evidence presented in Hogarth et al. (2012) suggests that the employer return on skills investment is much more sustainable and results in increased profitability in the medium and longer term.

Table 4.9 Costs and Benefits for Employers

Costs of apprenticeship	**L2**	**L3**
Apprentices' remuneration costs	£12,982	£19,072
Supervision/admin costs	£7,131	£10,600
Benefits during apprenticeship		
Apprentice product	£11,869	£18,894
Public image	+	+
Social status	+	+
Net benefit of apprenticeship	**-£8,244**	**-£10,777**
Benefits following the end of the apprenticeship	**+**	**+**
Savings in recruitment/induction costs	+	+
Temporary employer rent	> £8,244	> £10,777
Firm level effects	+	+
Effects along supply chain etc.	+	+
Employer benefits		
Total benefits and NPV net benefit	**+**	**+**

Source: Framework data, LFS data, apprentice starts in England, 2011/12

4.4.3 Costs and benefits for individual apprentices

Parameters relevant to individuals

Skills investments and returns

Apprenticeships increase the productivity of individual workers relative to qualifications at levels below apprenticeships, i.e. no qualifications/only school-leaving qualifications. The productivity gain translates into higher earnings and is the principal mechanism in understanding the costs and benefits to individuals. An individual apprentice makes an economically rational decision to start an apprenticeship if the earnings increase achieved after the apprenticeship justify the temporarily reduced earnings during the apprenticeship. This reduction in earnings during the apprenticeship due to relatively lower wages represents an opportunity cost and is part of the initial investment. In contrast, the post-apprenticeship wage gain relative to the counterfactual of working at lower skills levels is the most relevant monetary benefit, which over time over-compensates for the initial investment. In addition, apprenticeships reduce the risk of experiencing unemployment, while a complementary return arises from the increase in employment rates.

Both wages and employment returns have been estimated in Part 3 above. The findings suggested strong returns to both employment and wages, with employment rates increasing by 6.8 (Level 2) or 9.7 (Level 3) percentage points and wages increasing by 15% (Level 2) and 23% (Level 3) relative to people at lower qualification levels (in this case Level 1). The estimates for Level 2 apprentices are

very similar to most of the published evidence, while those for the Level 3 apprentice premium are slightly below some of the published estimates, which may be due to modelling the counterfactual outcome in a different way.

For the purpose of the Cost-Benefit Analysis, similarly to McIntosh (2009) we approximate life-time earnings by assuming that the estimated returns persist over the working life, which vary between 40 and 47 years depending on the age of the person starting an apprenticeship when people are between 16 and 25 years old. In addition, both earnings after apprenticeship completion and counterfactual wages in the absence of vocational qualifications would grow with a linear trend in real terms (2% per annum). Then, the sum of the discounted annual differences between both levels of earnings represents the gain in monetary terms per period. This sum is adjusted using a discount factor for the specific period, and this discount factor (3.5% for the first 35 years and 3% after that) is modelled as suggested by the UK Treasury's Green Book on policy evaluation and appraisal.[44]

Modelling the opportunity costs/investment costs of undertaking an apprenticeship

We model the costs of the apprenticeship to individuals as the average outcome of both employment and wages observed for people with no reported qualifications based on the data we used to estimate post-apprenticeship returns. The average employment rates for this group based on APS data is 83.6%, which corresponds to an average of 43.6 weeks employment per year for all people observed with this skill level. Hourly gross wages observed for this group are about £9.05 and assuming full-time employment for the weeks worked in a year and relevant NIC and occupational pensions, this would result in total remuneration costs of £18,215 per year.

With average minimum durations of apprenticeships based on the institutional framework information being 13.42 years for a Level 2 and 19.72 years for a Level 3 apprenticeship for the cohorts of apprentices starting in 2010/11 data, we estimate a counterfactual non-apprenticeship remuneration of employment of the same duration. It would have amounted to £20,376 for a Level 2 and £29,934 for a Level 3 apprenticeship.

Taking into account the specific employment and wage levels, the lower apprentice compensation actually earned can be subtracted from these alternative levels of earnings which provide an approximation of the initial costs to individuals. The 2011 BIS Survey of Apprentices provides information of the hourly wages of apprentices under the age of 25 (£5.02). Multiplying this by the average full-time working time and working days (251) in a year, we calculate remuneration costs for the specific duration of the apprenticeships, assuming a full employment rate over the duration of the apprenticeship.

In the short-term, the resulting benefits of apprenticeship for individuals (Level 2: £12,982, Level 3: £19,072) are substantially lower than those obtained from regular employment at low-skilled levels, which show that individuals face significant investment costs.

Further costs and benefits/caveats

While the on- and post-apprenticeship differences in wage levels constitute investment costs and returns for individuals, a number of further variables would need to be considered in a full cost-benefit analysis, which cannot be performed here. These would result from further valuation of time not spent in employment, receipt of non-working benefits if people are not employed and the value of non-market time, which could be used for alternative activities such as care for children/family. Without sufficient information on family circumstances and more broadly, the income and benefit situation of

[44] http://www.hm-treasury.gov.uk/greenbook

the apprentices' households, such measures cannot be derived in the context of this analysis. However, what can be said is that our estimate of the counterfactual outcome, which is solely based on market time spent in employment and does not account for potential further gains from non-market activities, implies a clear understatement of the opportunity costs of apprenticeships. In addition, without further information on potential further costs of engaging in apprenticeships, i.e. some measure of how much it costs to individuals to make the effort to complete an apprenticeship, the instantaneous gain while being on the apprenticeship is also likely to be overstated (see Greenberg et al. 2011 for further discussion on this).

On the other hand, our measure of benefits, which is based exclusively on wage returns, disregards further substantial benefits to individuals for which no adequate data exists for valuation purposes. These affect non-financial benefits from higher skills levels and better quality of work, which in consequence increases life quality, health and other measures of individual utility. In the long-term, these can have large and positive financial implications both to individuals and society. Since we are unable to take these factors into account, our estimates of the benefits are likely to be very conservative.

Results

Based on the impact estimates shown in Table 4.5 and Table 4.6 , the cost-benefit analysis of apprenticeships at an individual level shows high positive returns for both Level 2 and Level 3 apprenticeships. Individuals would have earned between £7,400 (Level 2) and £10,900 (Level 3) more in regular non-apprenticeship employment, had they not engaged in an apprenticeship, resulting in substantial individual opportunity costs. However, over time, there is a difference in the present value lifetime earnings £131,000 or £200,883 resulting from successful apprenticeships based on the parameters found in the impact evaluation compared to the life-time earnings at lowest skills levels. Therefore, successful achievers receive around £18 per Pound initially invested.

However, as there is a substantial risk not to achieve an apprenticeship, the expected value of this return has to be adjusted for the fact that not everybody starting an apprenticeship receives the related benefits. At the onset of the apprenticeship, we know that only about 75% of all Level 2 apprentices and 79% of all Level 3 apprentices are achieving the lifecycle return, so that the expected value needs to account for this. The resulting increase in post-apprenticeship lifetime earnings is in present values about £99,000 for a Level 2 and £158,000 for a Level 3 apprenticeship, which is still very positive. Subtracting the initial outlay by individuals (i.e. the foregone incomes of alternative employment during the apprenticeship relative to the achieved apprenticeship wages), the net present value net benefit to individuals is £92,000 in the case of a Level 2 apprenticeship and £147,000 in the case of a Level 3 apprenticeship. These figures are above those reported in McIntosh (2009), which is the only other study that estimates net present values of apprenticeships for individuals. The difference is likely to arise from differences in the definition of the counterfactual outcome, with relatively higher earnings in the McIntosh's study (2009).

Table 4.10 Apprentice Costs and Benefits

	L2	L3
Benefits (during apprenticeship, in present values)		
Apprentice remuneration	£12,982	£19,072
Non-financial benefits/wellbeing	+	+
Social status	+	+
Costs (during apprenticeship, in present values)		
Remuneration in alternative non-apprenticeship employment of same duration	£20,376	£29,934
Costs for FE	£0	£0
Learning materials	+	+
Effort/loss of leisure	+	+
Net benefit in apprenticeship (present values)	**-£7,394**	**-£10,862**
Benefits post-apprenticeship		
Increased life time earnings if achieved successfully (in present values)	£131,571	£200,883
X Achievement rate	75%	79%
= Expected value of increased life time earnings (in present values)	£99,073	£157,894
Further long-term non-financial benefits	+	+
Net benefit in present value at onset of apprenticeship	**£91,679**	**£147,032**

Source: APS data and own estimations on the returns to apprenticeships, published achievement rates (http://www.publications.parliament.uk/pa/cm201012/cmselect/cmbis /writev/1843/app118.htm), own calculations

4.4.4. Social and public budgets costs and benefits

Social cost-benefit analysis

It is difficult to carry out a comprehensive social cost-benefit analysis based on the parameters obtained from cost-benefit analyses of individuals and employers; in particular, because quantitative evidence beyond the microeconomic impact of skills investment is limited. Therefore, a simple aggregation of the private returns to skills investments is unlikely to reveal the full impact of apprenticeships. However, based on the analysis provided so far, the following can be summarised:

The output produced during the apprenticeship is lower compared to alternative employment at lower skills levels, resulting in a substantial loss of production while people undertake an apprenticeship.

Public funding of further education constitutes a second source of social costs, and its value was shown in Hogarth et al. (2012) to be around £2,500 (Level 2) and £3,500 (Level 3 apprenticeship). Since funding is resourced from public budgets, it reduces social resources in the period of the apprenticeship, although this is a rational decision (see below) if the future returns outweigh these costs in real present values.

In addition, there are net costs for employers at least in the period when the apprenticeship is undertaken. These costs would have to be added to the initial social costs. However, employers are likely to (at least) recoup the initial investment plus some return on the investment: rational employers would not engage in apprenticeships if it led to lower firm profitability in the long run. Therefore, the employer returns at least compensate for the initial costs to employers, while further employer benefits are likely to result in net gains to employers, which increase firm profitability. Whether firms can

achieve sustained long-term gains depends on the specific nature of the labour market; however, given the characteristics of the UK apprentices (service sector dominance), worker mobility is likely to limit the time during which pay levels can be kept below the marginal productivity of workers.

Finally, the long-term impact of apprenticeships is likely to result in further benefits beyond the microeconomic level. Based on empirical growth theory, it is well known that investments in the human capital stock of a country result in economic growth through further diffusion processes. The latter being unknown means that scaling up the microeconomic/ceteris paribus effect on individual wages and employment outcomes underestimates the true social benefits.

Nonetheless, a statement can be made that there is a lower threshold of social benefits (of expected values in present day £) of £88,000 for every person starting a Level 2 apprenticeship and of £143,500 for every person starting a Level 3 apprenticeship. In relation to the initial costs to society for every person beginning an apprenticeship (£11,000 for a Level 2 and £14,300 for a Level 3 apprenticeship), this is a return of £8 (Level 2) or £10 (Level 3) per Pound initially spent by the society as a whole on apprenticeships. This is lower than the figures published by McIntosh (2007) of £16 or £17 per Pound invested, but in this paper, initial spending was restricted to the costs of further education funding. However, there is – as was demonstrated earlier – additionally a loss of production as apprentices spend less time on productive contribution than people not participating in learning, which need to be included in the social cost-benefit analysis. As a consequence, our return estimate is below what was described in the previous cost-benefit analysis for the UK.

Table 4.11 Social Cost-Benefit Analysis

	L2	L3
During apprenticeship		
Costs		
Value contribution of counterfactual non-apprenticeships employment	£20,376	£29,934
Public FE funding	£2,500	£3,300
Benefit		
Apprentice product	£11,869	£18,894
Social net benefit in apprenticeship	**-£11,007**	**-£14,340**
Post-apprenticeship		
EV of increased in output valued as life time remuneration increase in (in present values)	£99,073	£157,894
Firm level profitability	+	+
Positive externalities	+	+
Economic growth at aggregate levels	+	+
Social net benefit post-apprenticeship	**>£99,073**	**>£157,894**
NPV net benefit	> £88,066	> £143,554

Source: APS data and own estimations on the returns to apprenticeships, published achievement rates (http://www.publications.parliament.uk/pa/cm201012/cmselect/cmbis /writev/1843/app118.htm), Hogarth et al. (2012) and own calculations

Public budgets

Some relevant parameters in order to understand the full impact of apprenticeships on public budgets have been outlined under section 4.2.1 above. While the initial spending on publicly funded further education and reduced taxation revenues relative to counterfactual (full-time) work at lower qualification levels represent clear fiscal costs in the phase of the apprenticeship, the returns to the exchequer are much more complicated to estimate. What can be said with certainty is that higher earnings and longer employment duration (plus further, indirect effects on employers and wider benefits to the community) result in increased tax revenues. However, the difference between total compensation costs to the employer and the net take-home pay of the employee depends on a range of personal circumstances, such as income taxes, employer social security contributions and further taxes on earned incomes and potential in-work benefits (e.g. tax credits or entitlement for public housing), primarily dependent on household characteristics.

In addition, employment rates of people successfully achieving apprenticeships are also higher than those of people with lower level qualifications. There is, therefore, a lower risk of being unemployed, while related benefits are being paid to people with post-apprenticeship qualifications. With reduced unemployment rates, public expenditure on out-of-work benefits is lower relative to the counterfactual outcome. Such cost savings constitute further benefits for public budgets, which can only be correctly quantified if we have information on further personal circumstances like the size of the family, age of children and whether people live in public or private housing.

Given the complexity of the tax and benefits system and unknown family circumstances, a full appreciation of cost savings due to reduced out-of-work benefits cannot be undertaken. However, what can be clearly shown is the higher fiscal budget impact after the apprenticeships relative to the counterfactual. This fiscal cost-benefit analysis applies a "tax wedge" to the wage returns. The tax wedge provides a useful measure for understanding total fiscal revenues from work incomes by showing the difference between compensation costs to employer and net take-home pay of the employee as a percentage of the total compensation costs.[45]

In other words, the tax wedge summarises all direct net fiscal revenues in relation to work incomes, i.e. the sum of personal income tax, employee plus employer social security contributions, further payroll tax minus the amount of in-work benefits (such as tax credits or further benefits like housing subsidies).

Obviously, the tax wedge also varies by family types and income levels and can be low or even negative on average for singles with young children in many countries. For the UK, OECD data suggests a tax wedge of average wages ranging between 26.4% for married couples with 2 children and 32.5% for singles without children. It seems, therefore, plausible to assume that about 30% of the total return to apprenticeships for society constitutes revenues to public budgets, assuming that the relatively lower taxation due to children in the household do not span over the entire working life. Applying this to the social net benefit shown in Table 4.5 above results in the following public budget impacts:

[45] http://www.oecd.org/ctp/tax-policy/taxburdens2011estimates.htm

Table 4.12 Public Budget Net Impact (Based on Marginal Tax Rates)

	L2	L3
During apprenticeship		
Costs		
Net tax revenue from counterfactual employment	£6,112.94	£8,980.18
FE funding	£2,500	£3,300
Benefit		
Net tax revenue (Tax-Benefit) from apprenticeship	£3,560.72	£5,668.23
Social net benefit in apprenticeship	-£5,052.22	-£6,611.95
Post-apprenticeship		
Increased returns to public budgets resulting from wage returns for apprentices (EV's/adjusting for achievement rates) as the sum of present value difference in total remuneration costs multiplied with tax wedge over all post-achievement periods	£29,721.92	£47,368.27
Deadweight (apprenticeships, which would have been undertaken anyway and cannot be attributed to public policy intervention)	53%	53%
PV net of deadweight	£15,753	£25,105
Reduced payments of out-of-work benefits	+	+
Increases in indirect tax revenues through increases in household incomes and consumption	+	+
Long-term returns (further indirect effects, spill-overs, growth)	+	+
NPV net benefit	>£10,700	>£18,493

Source: APS data and own estimations on the returns to apprenticeships, published achievement rates (http://www.publications.parliament.uk/pa/cm201012/cmselect/cmbis /writev/1843/app118.htm), Hogarth et al. (2012) and own calculations

As with all further cost-benefit analysis, the initial investment phase also reduces the public budget revenues in the period when the apprenticeship is undertaken relative to the counterfactual. In addition, there is public spending on further education, which increases the initial investment.

However, due to the substantial wage and employment benefit to apprentices, the returns resulting from the relative higher life cycle earnings (in expected values and expressed as present value £s) over time repay the investment and result in substantial net present values. This finding holds when assuming that about half of the apprentices are pure deadweight (similar to Hogarth et al 2012) and would have been undertaken even in the absence of any public intervention.

4.4.5 Summary

The central conclusion of our analysis is that apprenticeships result in considerable social benefits, albeit initially requiring substantial investment by employers, individual apprentices and society/public budgets.

The long-term impact is creating a very high positive net social benefit (in present values), which in this analysis is under-represented as many further, longer term impacts of apprenticeships cannot be included based on the micro econometric analysis undertaken in the context of this study.

We also emphasise that our measure for the public budget is incomplete as we currently do not account for two important additional sources of fiscal benefits:

- The higher work incomes relative to the counterfactual, which causes additional returns to public budgets from indirect taxation, as consumption increases;
- Improved employment rates also reduce benefit dependency: the number of weeks on benefit over the working life for people successfully completing apprenticeship is lower than the counterfactual, which would have to be monetised using the relevant eligibility criteria and family circumstances.

We recommend a further analysis of the impact of apprenticeships using some aggregated data, for example for local areas or industry aggregates, which may be able to reveal higher returns (in particular resulting from firm-level or sector-level impacts) and to investigate the full extent of impact of apprenticeships on benefit dependency and public spending.

References

Bell D and Blanchflower D (2009). *Youth Unemployment: Déjà Vu?* IZA Discussion Paper No. 4705

Cambridge Econometrics (2013), "Review of the Economic Benefits of Training and Qualifications as shown by research based on cross-sectional and administrative data", *BIS Research Paper* 105

Coles B, Godfrey C, Keung A, Parrott S, Bradshaw J (2010). *Estimating the Life-time Cost of NEET: 16-18 Year Olds Not in Employment, Education or Training*, Research undertaken on Behalf of the Audit Commission, Department of Social Policy and Social Work and Department of Health Sciences, University of York

Dearden L, Reed J, Van Reenen J (2005). *The Impact of Training on Productivity and Wages: Evidence from British Panel Data*, CEP Discussion Papers dp0674, Centre for Economic Performance, LSE

Hogarth T, Gambin L, Winterbotham M, Baldauf B, Briscoe G, Gunstone B, Hasluck C, Koerbitz C, Taylor C (2012). *Employer Investment in Apprenticeships and Workplace Learning: The Fifth Net Benefits of Training to Employers Study*, Research paper 67, Department for Business, Innovation and Skills

Machin, S. and Vignoles, A. (2006), "Education Policy in the UK", CEE DP 57, Centre for the Economics of Eduction, London School of Economics.

Mincer J (1974) *Schooling, Experience, and Earnings*, (New York: Columbia University Press for the National Bureau of Economic Research).

London Economics (2011a) 'Returns to Intermediate and Low Level Vocational Qualifications'. *BIS Research Paper* 53

London Economics (2011b) "The Long-Term Effect of Vocational Qualifications on Labour Market Outcomes". *BIS Research Paper* 47

London Economics (2012). *Estimating the Impact of Training on Productivity using Firm-level Data*, Research paper 72, Department for Business, Innovation and Skills

McIntosh, S. (2007) 'A Cost-Benefit Analysis of Apprenticeships and Other Vocational Qualifications'. DfES Research Report 834

McIntsoh S, Garrett R (2009), *The Economic Value of Intermediate Vocational Education and Qualifications*, UK Commission for Employment and Skills Evidence Report 11, December 2009

National Audit Office (2012), *Adult Apprenticeships. Estimating economic benefits from apprenticeships – Technical Paper.* Department for Innovation, Business and Skills, Skills Funding Agency and National Apprenticeship Service.

Pfeiffer H, Dionisius R, Schoenfeld G, Walden G, Wenzelmann F (2009). *Kosten und Nutzen der betrieblichen Berufsausbildung*. Forschungsbericht BiBB 2.1.203, Bonn: Bundesinstitut fuer Berufsforschung

Appendix: Parameters derived from institutional regulation

Table A.1 Frameworks specific parameters

Framework title	ID	Level (s)	OTJ-multiplier*	Admin/ recr. costs (low =200; high =500)	Course fees to employer (high =750 low =250)	Recruit. costs for qualified staff	L 2 fees[&]	L 3 fees[&]
Accounting	01424	2,3	1.5	200	750	1,350	1,850	1,950
Activity Leadership	01418	2	1	200	250	1,350	2,000	2,950
Advanced Engineering Construction	00867	3	2.5	500	750	1,545	4,300	10,000
Advanced Spectator Safety	01021	3	1	200	250	1,350	2,000	2,950
Agriculture	00719	2,3	1.5	200	750	700	4,000	5,200
Animal Care	01087	2,3	1.5	200	750	700	4,000	5,200
Aviation Operations on the Ground	00173	2,3	1	200	250	1,350	2,500	3,300
Barbering	01009	2,3	1	200	250	1,350	2,500	3,300
Beauty Therapy	01001	2,3	1	200	250	1,350	2,500	3,300
Bookkeeping	00760	2,3	1.5	200	750	1,350	1,850	1,950
Building Energy Management Systems	01542	3	2.5	500	750	700	6,125	7,350
Building Products Industry Occupations	01413	2	2.5	500	750	1,545	4,300	10,000
Building Services Engineering Technology and Project Management	01230	3	2.5	500	750	700	6,125	7,350
Bus and Coach Engineering and Maintenance	01492	2,3	1	200	250	1,350	2,500	3,300
Business & Administration	01322	2,3	1	200	250	1,350	1,850	1,950
Cabin Crew	00983	2	1	200	250	1,350	2,500	3,300
Campaigning	01064	3	1	200	250	1,350	1,850	1,950
Ceramics Manufacturing	00506	2	2.5	500	750	1,545	4,300	10,000
Children and Young People's Workforce	01285	2,3	1	200	250	1,350	2,200	2,600
Cleaning and Environmental Services	01300	2	1	200	250	1,350	2,500	3,300
Coaching	01594	2,3	1	200	250	1,350	2,000	2,950
Combined Manufacturing Processes	00885	2,3	2.5	500	750	1,545	4,300	10,000
Commercial Moving	01185	2	1.5	200	750	1,350	2,500	3,300
Community Arts	00627	2,3	1.5	200	750	1,545	2,500	3,300

Framework title	ID	Level (s)	OTJ-multiplier*	Admin/ recr. costs (low =200; high =500)	Course fees to employer (high =750 low =250)	Recruit. costs for qualified staff	L 2 fees[&]	L 3 fees[&]
Construction	01349	2,3	1.5	500	750	700	6,125	7,350
Construction Civil Engineering	01497	2,3	1.5	500	750	700	6,125	7,350
Construction Specialist	01583	2,3	1.5	500	750	700	6,125	7,350
Construction Technical and Professional	01589	3	1.5	500	750	1,545	6,125	7,350
Contact Centre Operations	01335	2,3	1	200	250	1,350	1,850	1,950
Costume and Wardrobe	00632	2,3	1.5	200	750	1,545	2,500	3,300
Court, Tribunal and Prosecution Operations	01430	2,3	1	200	250	1,350	1,850	1,950
Craft Cuisine	01214	2,3	1	200	250	1,350	2,000	2,950
Creative and Digital Media	01357	3	1.5	200	750	1,350	4,300	10,000
Cultural and Heritage Venue Operations	00802	2,3	1.5	200	750	1,545	2,500	3,300
Custodial Care	01331	2,3	2.5	200	250	1,350	2,200	2,600
Customer Service	01337	2,3	1	200	250	1,350	1,850	1,950
Design	00538	2,3	1.5	200	750	1,545	2,500	3,300
Domestic Heating	01513	2,3	2.5	500	750	700	6,125	7,350
Drinks Dispense Systems	00544	2	1	200	250	1,350	2,000	2,950
Driving Goods Vehicles	01503	2,3	1.5	200	750	1,350	2,500	3,300
Electrotechnical	01543	3	2.5	500	750	700	6,125	7,350
Emergency Fire Service Operations	01263	3	2.5	200	250	1,350	2,200	2,600
Employment Related Services	01552	3	1.5	200	750	1,350	1,650	1,850
Engineering Construction	01268	2	2.5	500	750	1,545	4,300	10,000
Engineering Manufacture (Craft and Technician)	00922	3	2.5	500	750	1,545	4,300	10,000
Engineering Manufacture (Operator and Semi-skilled)	00920	2	2.5	500	750	1,545	4,300	10,000
Enterprise	01298	3	1	200	250	1,350	1,850	1,950
Environmental Conservation	01195	2,3	1.5	200	750	700	4,000	5,200
Equine	00761	2,3	1.5	200	750	700	4,000	5,200
Exercise and Fitness	01435	2,3	1	200	250	1,350	2,000	2,950
Extractives and Mineral Processing Occupations	00996	2,3	2.5	500	750	1,545	4,300	10,000
Facilities	01578	2,3	1	200	250	1,350	2,500	3,300

Framework title	ID	Level (s)	OTJ-multiplier*	Admin/ recr. costs (low =200; high =500)	Course fees to employer (high =750 low =250)	Recruit. costs for qualified staff	L 2 fees[&]	L 3 fees[&]
Management								
Farriery	00721	3	1.5	200	750	700	4,000	5,200
Fashion and Textiles	01358	2,3	1.5	200	750	1,350	4,300	10,000
Fencing	00753	2	1.5	200	750	700	4,000	5,200
Fish Husbandry and Fisheries Management	01070	2	1.5	200	750	700	4,000	5,200
Floristry	00781	2,3	1.5	200	750	700	4,000	5,200
Food and Drink	01259	2,3	2.5	500	750	1,545	4,300	10,000
Fundraising	01065	3	1	200	250	1,350	1,850	1,950
Funeral Operations and Services	01396	2,3	1	200	250	1,350	1,650	1,850
Furniture, Furnishings and Interiors	01611	2,3	2.5	500	750	1,545	4,300	10,000
Game and Wildlife Management	00360	2,3	1.5	200	750	700	4,000	5,200
Glass Industry	01488	2,3	2.5	500	750	1,545	4,300	10,000
Hairdressing	01007	2,3	1	200	250	1,350	2,500	3,300
Health (Allied Health Profession Support)	01568	3	1	200	250	1,350	2,200	2,600
Health (Blood Donor Support)	01570	3	1	200	250	1,350	2,200	2,600
Health (Clinical Healthcare Support)	01564	2,3	1	200	250	1,350	2,200	2,600
Health (Dental Nursing)	01573	3	1	200	250	1,350	2,200	2,600
Health (Emergency Care Assistance)	01567	2	1	200	250	1,350	2,200	2,600
Health (Healthcare Support Services)	01576	2,3	1	200	250	1,350	2,200	2,600
Health (Informatics)	01575	2	1	200	250	1,350	2,200	2,600
Health (Maternity and Paediatric Support)	01577	3	1	200	250	1,350	2,200	2,600
Health (Optical Retail)	01574	2,3	1	200	250	1,350	2,200	2,600
Health (Pathology Support)	01569	3	1	200	250	1,350	2,200	2,600
Health (Perioperative Support)	01572	3	1	200	250	1,350	2,200	2,600
Health (Pharmacy Services)	01571	2,3	1	200	250	1,350	2,200	2,600
Health and Social Care	01302	2,3	1	200	250	1,350	2,200	2,600
Heating and Ventilating	01544	2,3	2.5	500	750	700	6,125	7,350
HM Forces	00778	2	2.5	200	250	1,350	2,200	2,600
Horticulture	01223	2,3	1.5	200	750	700	4,000	5,200

Framework title	ID	Level (s)	OTJ-multiplier*	Admin/ recr. costs (low =200; high =500)	Course fees to employer (high =750 low =250)	Recruit. costs for qualified staff	L 2 fees[&]	L 3 fees[&]
Hospitality and Catering	01344	2,3	1	200	250	1,350	2,000	2,950
Housing	01456	2,3	1	200	250	1,350	2,500	3,300
Improving Operational Performance	01403	2	2.5	500	750	1,545	4,300	10,000
International Trade and Logistics Operations	01002	2	1.5	200	750	1,350	2,500	3,300
IT Application Specialist	01405	2,3	2.5	200	750	1,350	3,200	5,100
IT, Software, Web & Telecoms Professionals	01404	2,3	2.5	200	750	1,350	3,200	5,100
Jewellery, Silversmithing and Allied Trades	01149	2,3	1.5	200	750	1,545	2,500	3,300
Laboratory and Science Technicians	00940	2,3	1.5	200	750	1,545	4,300	10,000
Land-based Engineering	01373	2,3	1.5	200	750	700	4,000	5,200
Learning and Development	00894	3	1.5	200	750	1,350	2,200	2,600
Legal Services	00202	3	2.5	200	250	1,350	2,200	2,600
Leisure Management	00914	3	1	200	250	1,350	2,000	2,950
Leisure Operations	00912	2	1	200	250	1,350	2,000	2,950
Libraries, Archives, Records and Information Management Services	00514	2,3	1.5	200	750	1,350	2,200	2,600
Licensed Hospitality	01390	2,3	1	200	250	1,350	2,000	2,950
Live Events and Promotion	00990	2,3	1.5	200	750	1,545	2,500	3,300
Local Taxation and Benefits	00978	3	1	200	250	1,350	2,500	3,300
Locksmithing	01548	2	1	200	250	1,350	2,500	3,300
Logistics Operations	01178	2,3	1.5	200	750	1,350	2,500	3,300
Mail and Package Distribution	01177	2	1.5	200	750	1,350	2,500	3,300
Management	01310	2,3	1	200	250	1,350	1,850	1,950
Maritime Occupations	01437	2,3	1.5	200	750	1,350	2,500	3,300
Marketing	01308	2,3	1	200	250	1,350	1,850	1,950
Music Business	01264	2,3	1.5	200	750	1,545	2,500	3,300
Nail Services	01006	2,3	1	200	250	1,350	2,500	3,300
Nuclear Working	00140	2	2.5	500	750	1,545	4,300	10,000
Nursing Assistants in a Veterinary Environment	01476	2	1.5	200	750	700	4,000	5,200
Operations and Quality	01168	3	2.5	500	750	1,545	4,300	10,000

Framework title	ID	Level (s)	OTJ-multiplier*	Admin/ recr. costs (low =200; high =500)	Course fees to employer (high =750 low =250)	Recruit. costs for qualified staff	L 2 fees[&]	L 3 fees[&]
Improvement								
Outdoor Programmes	00577	3	1	200	250	1,350	2,500	3,300
Passenger Carrying Vehicle Driving	01050	2	1	200	250	1,350	2,500	3,300
Payroll	00758	2,3	1.5	200	750	1,350	1,850	1,950
Photo Imaging	01356	3	1.5	200	750	1,350	4,300	10,000
Playwork	01423	2,3	1	200	250	1,350	2,000	2,950
Plumbing and Heating	01518	2,3	2.5	500	750	700	6,125	7,350
Policing	00128	3	2.5	200	250	1,350	2,200	2,600
Polymer Processing Operations	01301	2,3	2.5	500	750	1,545	4,300	10,000
Print and Printed Packaging	01420	2,3	2.5	500	750	1,545	4,300	10,000
Process Manufacturing	01073	2,3	2.5	500	750	1,545	4,300	10,000
Production of Coatings	00508	2,3	2.5	500	750	1,350	4,300	10,000
Property Services	01388	2,3	1	200	250	1,350	2,500	3,300
Providing Financial Services	01426	2,3	1.5	200	750	1,350	1,850	1,950
Providing Mortgage Advice	01434	3	1.5	200	750	1,350	1,850	1,950
Providing Security Services	01059	2	1	200	250	1,350	2,500	3,300
Rail Engineering (Track)	00984	2	2.5	200	250	1,350	2,500	3,300
Rail Infrastructure Engineering	00961	3	2.5	200	250	1,350	2,500	3,300
Rail Services	01207	2,3	1	200	250	1,350	2,500	3,300
Rail Traction and Rolling Stock Engineering	00864	3	2.5	200	250	1,350	2,500	3,300
Refrigeration and Air Conditioning	01514	2,3	2.5	500	750	700	6,125	7,350
Retail	01370	2,3	1	200	250	1,350	1,650	1,850
Sales & Telesales	01305	2,3	1	200	250	1,350	1,850	1,950
Security Systems	00779	2,3	1	200	250	1,350	2,500	3,300
Set Crafts	01359	3	1.5	200	750	1,350	4,300	10,000
Signmaking	00619	2,3	2.5	500	750	1,545	4,300	10,000
Smart Meter Installations (Dual Fuel)	01336	2	2.5	500	750	1,545	4,300	10,000
Social Media and Digital Marketing	01313	3	1	200	250	1,350	1,850	1,950
Spa Therapy	00997	3	1	200	250	1,350	2,500	3,300
Spectator Safety	01451	2,3	1	200	250	1,350	2,000	2,950
Sporting Excellence	00617	3	1	200	250	1,350	2,000	2,950
Sports Development	01156	3	1	200	250	1,350	2,000	2,950

Framework title	ID	Level (s)	OTJ-multiplier*	Admin/ recr. costs (low =200; high =500)	Course fees to employer (high =750 low =250)	Recruit. costs for qualified staff	L 2 fees[&]	L 3 fees[&]
Supply Chain Management	01502	2,3	1.5	200	750	1,350	2,500	3,300
Supporting Teaching and Learning in Schools	00799	2,3	1.5	200	750	1,350	2,200	2,600
Surveying	00789	3	1	200	250	1,350	2,500	3,300
Sustainable Resource Management	01074	2,3	2.5	500	750	1,545	4,300	10,000
Taxi and Private Hire Driving	01416	2	1	200	250	1,350	2,500	3,300
Technical Theatre: Lighting, Sound & Stage	00994	2,3	1.5	200	750	1,545	2,500	3,300
The Gas Industry	01452	2,3	2.5	500	750	1,545	4,300	10,000
The Power Industry	00786	2,3	2.5	500	750	1,545	4,300	10,000
The Water Industry	01346	2,3	2.5	500	750	1,545	4,300	10,000
Traffic Office	01004	2,3	1.5	200	750	1,350	2,500	3,300
Travel Services	01299	2,3	1	200	250	1,350	2,000	2,950
Trees and Timber	00728	2,3	1.5	200	750	700	4,000	5,200
Vehicle Body and Paint	01094	2,3	1.5	200	750	1,545	4,300	10,000
Vehicle Fitting	01096	2,3	1.5	200	750	1,545	4,300	10,000
Vehicle Maintenance and Repair	01155	2,3	1.5	200	750	1,545	4,300	10,000
Vehicle Parts	01098	2,3	1.5	200	750	1,545	4,300	10,000
Vehicle Sales	01092	2,3	1.5	200	750	1,545	4,300	10,000
Veterinary Nursing	01137	3	1.5	200	750	700	4,000	5,200
Volunteer Management	01066	3	1	200	250	1,350	1,850	1,950
Warehousing and Storage	01504	2,3	1.5	200	750	1,350	2,500	3,300
Witness Care	00203	3	2.5	200	250	1,350	2,200	2,600
Wood & Timber Processing and Merchants Industry	01596	2	2.5	500	750	1,545	4,300	10,000
Youth Work	00844	2,3	1.5	200	750	1,350	2,200	2,600

Table A.2: Documentation of link of LFS data and BIS Apprentice Pay Survey to frameworks

Framework title	Linked LFS Wage Information (SIC-1)	Linked Apprentice pay Sector (BIS Survey 2011)
Accounting	K Financial and insurance activities	Business Administration
Activity Leadership	S Other service activities	Other
Advanced Engineering Construction	C Manufacturing	Engineering (all)
Advanced Spectator Safety	S Other service activities	Other
Agriculture	A Agriculture, forestry and fishing	Other
Animal Care	A Agriculture, forestry and fishing	Other
Aviation Operations on the Ground	H Transport and storage	Other
Barbering	S Other service activities	Other
Beauty Therapy	S Other service activities	Other
Bookkeeping	K Financial and insurance activities	Business Administration
Building Energy Management Systems	F Construction	Construction
Building Products Industry Occupations	C Manufacturing	Other
Building Services Engineering Technology and Project Management	F Construction	Construction
Bus and Coach Engineering and Maintenance	H Transport and storage	Other
Business & Administration	N Admin and support services	Business Administration
Cabin Crew	H Transport and storage	Other
Campaigning	J Information and communication	Business Administration
Ceramics Manufacturing	C Manufacturing	Other
Children and Young People's Workforce	P Education	Childcare and L&D
Cleaning and Environmental Services	S Other service activities	Other
Coaching	S Other service activities	Other
Combined Manufacturing Processes	C Manufacturing	Other
Commercial Moving	H Transport and storage	Other
Community Arts	R Arts, entertainment and recreation	Other
Construction	F Construction	Construction
Construction Civil Engineering	F Construction	Construction
Construction Specialist	F Construction	Construction
Construction Technical and Professional	F Construction	Construction
Contact Centre Operations	N Admin and support services	Business Administration
Costume and Wardrobe	R Arts, entertainment and recreation	Other
Court, Tribunal and Prosecution Operations	J Information and communication	Business Administration
Craft Cuisine	I Accommodation and food services	Hospitality and catering

Framework title	Linked LFS Wage Information (SIC-1)	Linked Apprentice pay Sector (BIS Survey 2011)
Creative and Digital Media	C Manufacturing	Other
Cultural and Heritage Venue Operations	R Arts, entertainment and recreation	Other
Custodial Care	O Public admin and defence	Other
Customer Service	J Information and communication	Business Administration
Design	R Arts, entertainment and recreation	Other
Domestic Heating	F Construction	Construction
Drinks Dispense Systems	I Accommodation and food services	Hospitality and catering
Driving Goods Vehicles	H Transport and storage	Other
Electrotechnical	F Construction	Construction
Emergency Fire Service Operations	O Public admin and defence	Other
Employment Related Services	P Education	Childcare and L&D
Engineering Construction	C Manufacturing	Engineering (all)
Engineering Manufacture (Craft and Technician)	C Manufacturing	Other
Engineering Manufacture (Operator and Semi-skilled)	C Manufacturing	Other
Enterprise	J Information and communication	Business Administration
Environmental Conservation	A Agriculture, forestry and fishing	Other
Equine	A Agriculture, forestry and fishing	Other
Exercise and Fitness	S Other service activities	Other
Extractives and Mineral Processing Occupations	C Manufacturing	Other
Facilities Management	S Other service activities	Other
Farriery	A Agriculture, forestry and fishing	Other
Fashion and Textiles	C Manufacturing	Other
Fencing	A Agriculture, forestry and fishing	Other
Fish Husbandry and Fisheries Management	A Agriculture, forestry and fishing	Other
Floristry	A Agriculture, forestry and fishing	Other
Food and Drink	C Manufacturing	Other
Fundraising	J Information and communication	Business Administration
Funeral Operations and Services	G Wholesale, retail, repair of vehicle	Retail
Furniture, Furnishings and Interiors	C Manufacturing	Other
Game and Wildlife Management	A Agriculture, forestry and fishing	Other

Framework title	Linked LFS Wage Information (SIC-1)	Linked Apprentice pay Sector (BIS Survey 2011)
Glass Industry	C Manufacturing	Other
Hairdressing	S Other service activities	Other
Health (Allied Health Profession Support)	Q Health and social work	Health and Social Care
Health (Blood Donor Support)	Q Health and social work	Health and Social Care
Health (Clinical Healthcare Support)	Q Health and social work	Health and Social Care
Health (Dental Nursing)	Q Health and social work	Health and Social Care
Health (Emergency Care Assistance)	Q Health and social work	Health and Social Care
Health (Healthcare Support Services)	Q Health and social work	Health and Social Care
Health (Informatics)	Q Health and social work	Health and Social Care
Health (Maternity and Paediatric Support)	Q Health and social work	Health and Social Care
Health (Optical Retail)	Q Health and social work	Health and Social Care
Health (Pathology Support)	Q Health and social work	Health and Social Care
Health (Perioperative Support)	Q Health and social work	Health and Social Care
Health (Pharmacy Services)	Q Health and social work	Health and Social Care
Health and Social Care	Q Health and social work	Health and Social Care
Heating and Ventilating	F Construction	Construction
HM Forces	O Public admin and defence	Other
Horticulture	A Agriculture, forestry and fishing	Other
Hospitality and Catering	I Accommodation and food services	Hospitality and catering
Housing	S Other service activities	Other
Improving Operational Performance	C Manufacturing	Other
International Trade and Logistics Operations	H Transport and storage	Other
IT Application Specialist	J Information and communication	Business Administration
IT, Software, Web & Telecoms Professionals	J Information and communication	Business Administration
Jewellery, Silversmithing and Allied Trades	R Arts, entertainment and recreation	Other
Laboratory and Science Technicians	C Manufacturing	Other
Land-based Engineering	A Agriculture, forestry and fishing	Other
Learning and Development	P Education	Childcare and L&D
Legal Services	O Public admin and defence	Other
Leisure Management	S Other service activities	Other
Leisure Operations	S Other service activities	Other
Libraries, Archives, Records and Information Management Services	P Education	Childcare and L&D
Licensed Hospitality	I Accommodation and food services	Hospitality and catering
Live Events and Promotion	R Arts, entertainment and recreation	Other

Framework title	Linked LFS Wage Information (SIC-1)	Linked Apprentice pay Sector (BIS Survey 2011)
Local Taxation and Benefits	S Other service activities	Other
Locksmithing	S Other service activities	Other
Logistics Operations	H Transport and storage	Other
Mail and Package Distribution	H Transport and storage	Other
Management	N Admin and support services	Business Administration
Maritime Occupations	H Transport and storage	Other
Marketing	J Information and communication	Business Administration
Music Business	R Arts, entertainment and recreation	Other
Nail Services	S Other service activities	Other
Nuclear Working	C Manufacturing	Other
Nursing Assistants in a Veterinary Environment	A Agriculture, forestry and fishing	Other
Operations and Quality Improvement	C Manufacturing	Other
Outdoor Programmes	S Other service activities	Other
Passenger Carrying Vehicle Driving	H Transport and storage	Other
Payroll	K Financial and insurance activities	Business Administration
Photo Imaging	C Manufacturing	Other
Playwork	S Other service activities	Other
Plumbing and Heating	F Construction	Construction
Policing	O Public admin and defence	Other
Polymer Processing Operations	C Manufacturing	Other
Print and Printed Packaging	C Manufacturing	Other
Process Manufacturing	C Manufacturing	Other
Production of Coatings	C Manufacturing	Other
Property Services	S Other service activities	Other
Providing Financial Services	K Financial and insurance activities	Business Administration
Providing Mortgage Advice	K Financial and insurance activities	Business Administration
Providing Security Services	S Other service activities	Other
Rail Engineering (Track)	H Transport and storage	Other
Rail Infrastructure Engineering	H Transport and storage	Other
Rail Services	H Transport and storage	Other
Rail Traction and Rolling Stock Engineering	H Transport and storage	Other
Refrigeration and Air Conditioning	F Construction	Construction
Retail	G Wholesale, retail, repair of vehicle	Retail
Sales & Telesales	N Admin and support services	Business Administration
Security Systems	S Other service activities	Other
Set Crafts	C Manufacturing	Other

Framework title	Linked LFS Wage Information (SIC-1)	Linked Apprentice pay Sector (BIS Survey 2011)
Signmaking	C Manufacturing	Other
Smart Meter Installations (Dual Fuel)	D Electricity, gas, air cond supply	Electrotechnical
Social Media and Digital Marketing	J Information and communication	Business Administration
Spa Therapy	S Other service activities	Other
Spectator Safety	S Other service activities	Other
Sporting Excellence	S Other service activities	Other
Sports Development	S Other service activities	Other
Supply Chain Management	H Transport and storage	Other
Supporting Teaching and Learning in Schools	P Education	Childcare and L&D
Surveying	S Other service activities	Other
Sustainable Resource Management	D Electricity, gas, air cond supply	Electrotechnical
Taxi and Private Hire Driving	H Transport and storage	Other
Technical Theatre: Lighting, Sound & Stage	R Arts, entertainment and recreation	Other
The Gas Industry	D Electricity, gas, air cond supply	Electrotechnical
The Power Industry	D Electricity, gas, air cond supply	Electrotechnical
The Water Industry	D Electricity, gas, air cond supply	Electrotechnical
Traffic Office	H Transport and storage	Other
Travel Services	I Accommodation and food services	Hospitality and catering
Trees and Timber	A Agriculture, forestry and fishing	Other
Vehicle Body and Paint	C Manufacturing	Engineering (all)
Vehicle Fitting	C Manufacturing	Engineering (all)
Vehicle Maintenance and Repair	C Manufacturing	Engineering (all)
Vehicle Parts	C Manufacturing	Engineering (all)
Vehicle Sales	C Manufacturing	Engineering (all)
Veterinary Nursing	A Agriculture, forestry and fishing	Other
Volunteer Management	J Information and communication	Business Administration
Warehousing and Storage	H Transport and storage	Other
Witness Care	O Public admin and defence	Other
Wood & Timber Processing and Merchants Industry	C Manufacturing	Other
Youth Work	P Education	Childcare and L&D

Table A.3: Groups engaged in apprentice supervision

Framework title	SOC-Groups engaged in supervision				
Accounting	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Activity Leadership	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Advanced Engineering Construction	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Advanced Spectator Safety	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Agriculture	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Animal Care	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Aviation Operations on the Ground	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Barbering	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Beauty Therapy	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Bookkeeping	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Building Energy Management Systems	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Building Products Industry Occupations	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Building Services Engineering Technology and Project Management	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Bus and Coach Engineering and Maintenance	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Business & Administration	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Cabin Crew	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Caring/ Leisure/ Other
Campaigning	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Ceramics Manufacturing	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Children and Young People's Workforce	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Cleaning and Environmental Services	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	Caring/ Leisure/ Other
Coaching	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Combined Manufacturing Processes	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	

Framework title	SOC-Groups engaged in supervision				
Commercial Moving	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Community Arts	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Construction	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Construction Civil Engineering	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Construction Specialist	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Construction Technical and Professional	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Contact Centre Operations	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Costume and Wardrobe	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Court, Tribunal and Prosecution Operations	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Craft Cuisine	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Creative and Digital Media	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Cultural and Heritage Venue Operations	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Custodial Care	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Customer Service	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Design	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Domestic Heating	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Drinks Dispense Systems	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Driving Goods Vehicles	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Electrotechnical	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Emergency Fire Service Operations	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Employment Related Services	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Engineering Construction	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Engineering Manufacture (Craft and Technician)	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Engineering Manufacture (Operator and Semi-skilled)	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Enterprise	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	

Framework title	SOC-Groups engaged in supervision				
Environmental Conservation	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Equine	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Exercise and Fitness	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Extractives and Mineral Processing Occupations	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Facilities Management	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	Caring/ Leisure/ Other
Farriery	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Fashion and Textiles	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Fencing	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Fish Husbandry and Fisheries Management	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Floristry	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Food and Drink	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Fundraising	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Funeral Operations and Services	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Furniture, Furnishings and Interiors	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Game and Wildlife Management	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Glass Industry	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Hairdressing	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Health (Allied Health Profession Support)	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Health (Blood Donor Support)	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Health (Clinical Healthcare Support)	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Health (Dental Nursing)	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Health (Emergency Care Assistance)	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Health (Healthcare Support Services)	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/	

Framework title	SOC-Groups engaged in supervision				
					Other
Health (Informatics)	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Health (Maternity and Paediatric Support)	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Health (Optical Retail)	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Health (Pathology Support)	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Health (Perioperative Support)	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Health (Pharmacy Services)	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Health and Social Care	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Heating and Ventilating	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
HM Forces	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Horticulture	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Hospitality and Catering	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Housing	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	Caring/ Leisure/ Other
Improving Operational Performance	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
International Trade and Logistics Operations	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
IT Application Specialist	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
IT, Software, Web & Telecoms Professionals	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Jewellery, Silversmithing and Allied Trades	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Laboratory and Science Technicians	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Land-based Engineering	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Learning and Development	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Legal Services	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Leisure Management	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/	

Framework title	SOC-Groups engaged in supervision				
					Other
Leisure Operations	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Libraries, Archives, Records and Information Management Services	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Licensed Hospitality	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Live Events and Promotion	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Local Taxation and Benefits	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	Caring/ Leisure/ Other
Locksmithing	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Logistics Operations	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Mail and Package Distribution	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Management	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Maritime Occupations	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Marketing	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Music Business	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Nail Services	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Nuclear Working	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Nursing Assistants in a Veterinary Environment	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Operations and Quality Improvement	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Outdoor Programmes	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Passenger Carrying Vehicle Driving	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Caring/ Leisure/ Other
Payroll	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Photo Imaging	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Playwork	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Plumbing and Heating	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Policing	Mgrs/ Dir./	Profess.	Ass. Pr./	Adm./ Secret.	

Framework title	SOC-Groups engaged in supervision				
	Sen. Off.		Technical		
Polymer Processing Operations	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Print and Printed Packaging	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Process Manufacturing	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Production of Coatings	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Property Services	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	Caring/ Leisure/ Other
Providing Financial Services	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Providing Mortgage Advice	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Providing Security Services	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Rail Engineering (Track)	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Rail Infrastructure Engineering	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Rail Services	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Rail Traction and Rolling Stock Engineering	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Refrigeration and Air Conditioning	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Retail	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Sales & Telesales	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Security Systems	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Set Crafts	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Signmaking	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Smart Meter Installations (Dual Fuel)	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Social Media and Digital Marketing	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Spa Therapy	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Spectator Safety	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Sporting Excellence	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Sports Development	Mgrs/ Dir./	Profess.	Ass. Pr./	Caring/ Leisure/	

Framework title	SOC-Groups engaged in supervision				
	Sen. Off.		Technical	Other	
Supply Chain Management	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Supporting Teaching and Learning in Schools	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Surveying	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	Caring/ Leisure/ Other
Sustainable Resource Management	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Taxi and Private Hire Driving	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Caring/ Leisure/ Other
Technical Theatre: Lighting, Sound & Stage	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
The Gas Industry	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
The Power Industry	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
The Water Industry	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Traffic Office	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Travel Services	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	
Trees and Timber	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Vehicle Body and Paint	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Vehicle Fitting	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Vehicle Maintenance and Repair	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Vehicle Parts	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Vehicle Sales	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Veterinary Nursing	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Volunteer Management	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Warehousing and Storage	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	Skilled Tr.
Witness Care	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Adm./ Secret.	
Wood & Timber Processing and Merchants Industry	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Skilled Tr.	
Youth Work	Mgrs/ Dir./ Sen. Off.	Profess.	Ass. Pr./ Technical	Caring/ Leisure/ Other	