

Discussion Paper No. 13-053

Do Employment Subsidies Reduce Early Apprenticeship Dropout?

Jan Fries, Christian Göbel,
and Michael F. Maier

ZEW

Zentrum für Europäische
Wirtschaftsforschung GmbH

Centre for European
Economic Research

Discussion Paper No. 13-053

Do Employment Subsidies Reduce Early Apprenticeship Dropout?

Jan Fries, Christian Göbel,
and Michael F. Maier

Download this ZEW Discussion Paper from our ftp server:

<http://ftp.zew.de/pub/zew-docs/dp/dp13053.pdf>

Die Discussion Papers dienen einer möglichst schnellen Verbreitung von
neueren Forschungsarbeiten des ZEW. Die Beiträge liegen in alleiniger Verantwortung
der Autoren und stellen nicht notwendigerweise die Meinung des ZEW dar.

Discussion Papers are intended to make results of ZEW research promptly available to other
economists in order to encourage discussion and suggestions for revisions. The authors are solely
responsible for the contents which do not necessarily represent the opinion of the ZEW.

Das Wichtigste in Kürze

In vielen Ländern spielt das Berufsausbildungssystem eine wichtige Rolle für den Übergang von Schulabgängern in den Arbeitsmarkt. Trotz der Bedeutsamkeit des Ausbildungsabschlusses sind Abbrüche häufig: in Deutschland brechen über 20 Prozent der Auszubildenden die Ausbildung vorzeitig ab. Frühe Abbrüche sind dabei vorherrschend — die Hälfte aller Abbrüche geschieht innerhalb des ersten Ausbildungsjahres, ein Drittel während der Probezeit.

Im Jahr 2008 hat die Deutsche Bundesregierung den Ausbildungsbonus eingeführt, um benachteiligte Jugendliche zu unterstützen. Der Ausbildungsbonus soll ihnen helfen, einen Ausbildungsplatz zu finden und einen Ausbildungsabschluss zu erlangen. Nur Jugendliche, die nach dem Schulabschluss mindestens ein Jahr lang erfolglos nach einem Ausbildungsplatz gesucht haben, können gefördert werden. Das Programm bietet eine Subvention von 4.000 bis 6.000 € für Unternehmen, die einem förderfähigen Jugendlichen einen Ausbildungsplatz anbieten. Die zweiteilige Subvention wird nach Abschluss der Probezeit und nach Bestehen der Abschlussprüfung ausgezahlt.

Die Subvention durch den Ausbildungsbonus verringert die Lohnkosten der geförderten Auszubildenden substanziell. Unternehmen können die Subvention mit den geförderten Auszubildenden teilen, indem sie ihnen höhere Löhne zahlen, oder indem sie einen nichtmonetären Transfer herstellen. Ein nichtmonetärer Transfer kann beispielsweise in besserer Beratung und Anleitung, mehr Geduld und Entgegenkommen, Ermunterung und Unterstützung gegenüber den geförderten Auszubildenden oder besseren Arbeitsbedingungen bestehen. Wenn die Subvention zwischen Unternehmen und geförderten Auszubildenden aufgeteilt wird, kann die Förderung durch den Ausbildungsbonus Ausbildungsabbrüche reduzieren.

Wir untersuchen, ob der Ausbildungsbonus Ausbildungsabbrüche bei benachteiligten Jugendliche reduziert. Um den Effekt des Programms zu identifizieren, vergleichen wir frühe Abbruchraten von Auszubildenden, die durch den Ausbildungsbonus gefördert werden, mit förderfähigen aber tatsächlich ungeforderten Auszubildenden. Wir verwenden detaillierte Daten mit umfassenden Informationen über beide Gruppen von Auszubildenden. Umfang und Qualität des Datensatzes rechtfertigen die Annahme, dass selektive Maßnahmenteilnahme in den Daten vollständig beobachtbar ist.

Unter Verwendung von Propensity Score Matching finden wir keinen signifikanten Effekt des Ausbildungsbonus auf monatliche Abbruchraten innerhalb der ersten 12 Monate der Ausbildung. Unsere Ergebnisse zeigen, dass eine subventionierte Berufsausbildung den Ausbildungsabbruch nicht beeinflusst. Jedoch passt das zeitliche Muster der Effekte auf die monatlichen Abbruchraten zur Anreizstruktur des Ausbildungsbonus. Die Punktschätzer sind in den ersten vier Monaten negativ, nach denen die erste Zahlung der Subvention erfolgt. Danach werden die Punktschätzer positiv. Dies legt die Vermutung nahe, dass der Ausbildungsbonus während der Probezeit im Ansatz einen dämpfenden Einfluss auf Ausbildungsabbrüche hat.

Non-technical summary

In many countries, apprenticeship training plays a major role for school leavers to enter the labour market. Despite the importance of the apprenticeship degree, dropout of apprenticeship training is frequent: in Germany more than 20 per cent of apprentices drop out before the end of training. Early dropout is prevalent, as about half of all dropouts occur during the first year of apprenticeship training, and one third occur during the first four months (i.e. during the probationary period).

In 2008, the German Federal Government introduced the Apprenticeship Bonus to support disadvantaged young people. The Apprenticeship Bonus should help them to find an apprenticeship position and to obtain the degree. Only young people who have unsuccessfully searched for apprenticeship positions after leaving school for at least one year are eligible for Apprenticeship Bonus. The programme provides a 4,000 to 6,000 € subsidy to firms who offer a position to an eligible apprenticeship seeker. The two-part payment is conditional on completing the probationary period and on completing the final exam.

The subsidy provided by the Apprenticeship Bonus decreases labour costs of entitled apprentices by a substantial share. It can be shared with apprentices by higher wages, or firms could pass non-monetary transfers to subsidised apprentices. Non-monetary transfers can comprise, for example, more guidance, higher commitment, more patience and concessions, more encouragement and support towards the apprentice, or better working conditions. If the rent is shared between the firm and the apprentice we expect the subsidy to reduce dropout from apprenticeship training.

We investigate whether the Apprenticeship Bonus is an effective measure to reduce dropout of apprenticeship training for disadvantaged apprentices. In order to identify the effect of the programme, we compare early dropout rates of apprentices subsidised by Apprenticeship Bonus with eligible but unsubsidised apprentices. We use detailed survey data containing extensive information on both groups of apprentices. The amount and quality of our data justify an evaluation approach that is based on selection on observables in order to control for selective programme participation.

Using propensity score matching, we find no significant effects of Apprenticeship Bonus on monthly dropout rates during the first 12 months of apprenticeship training. Our findings state that subsidised vocational training is ineffective in decreasing dropout. However, the time pattern of the insignificant effects fits the incentive structure provided by the Apprenticeship Bonus. Estimates are negative in the first four months, when the first payment is transferred after completing the probationary period. Estimates turn positive afterwards. This suggests that during the probationary period there is a notion of a favourable impact of Apprenticeship Bonus on dropout risk.

Do employment subsidies reduce early apprenticeship dropout?*

Jan Fries[‡]

Christian Göbel[§]

Michael F. Maier^{**}

16th August 2013

Abstract

We evaluate the effect of the Apprenticeship Bonus, an employment subsidy programme, on early dropout of apprenticeship. Eligibility to the programme is restricted to school leavers who have actively searched for apprenticeship training to start immediately after leaving school, but were unsuccessful in finding a position. Our analysis is based on rich survey data that has been collected specifically for this study. Using this data, we describe the characteristics of school leavers who have searched for apprenticeship positions unsuccessfully directly leaving school and analyse the effect of the subsidy on the risk of apprenticeship dropout. Even though the subsidy provides strong incentives to prevent dropout, we do not find significant effects of the programme. Our finding suggests that financial incentives are not effective in increasing the probability to finish vocational in-firm training successfully.

Keywords: Apprenticeship, vocational training, subsidized employment, dropout.

JEL classification: I21, J08, J38.

*This paper is based on the evaluation study 'Effects of the Apprenticeship Bonus on the apprenticeship market and on public finance', which was conducted on behalf of the German Federal Parliament. We gratefully acknowledge the provision of data by the German Federal Employment Agency and the Institute for Employment Research (IAB). We have benefited from discussions in the ZEW seminar, at the ESPE Annual Conference, and IZA workshop on Youth Unemployment and Labor Market Integration. We are also grateful to Bernd Fitzenberger and Thomas Zwick for helpful comments, and to Annette Hillerich and Markus Zimmermann for excellent research assistance. Contact address of the authors: Centre for European Economic Research (ZEW), PO Box 103443, D-68034 Mannheim, Germany.

[‡]ZEW Mannheim, fries@zew.de.

[§]HdBA Mannheim and ZEW Mannheim, christian.goebel@hdba.de.

^{**}ZEW Mannheim, maier@zew.de.

1 Introduction

In many countries, apprenticeship training plays a major role for skill formation during school-to-work transition (Ryan, 2001). About two thirds of German school leavers, in particular those who finish lower or intermediate secondary schooling, enter the labour market via the apprenticeship system (BMBF, 2010). Finishing apprenticeship training leads to a formal degree that certifies the acquisition of vocational qualification in form of work experience and specific skills. In Germany, this formal degree often serves as an “admission ticket” for future jobs, and unemployment rates are high for workers who did not finish apprenticeship training successfully. Accordingly, in many cases dropout of apprenticeship will affect future career prospects (Winkelmann, 1996; Lüdemann et al., 2006; Oreopoulos, 2007). Despite the importance of the apprenticeship degree, dropout of apprenticeship training is frequent. For example, in Germany more than 20 per cent of apprentices drop out before the end of training (see Table 1). Early dropout is prevalent; approximately half of the dropouts occurs during the first year of apprenticeship training, and one third occurs during probationary period. Apprenticeship training in Germany takes between 2 and 3.5 years.

Table 1: Dropout rates for apprenticeship training in Germany

	Dropout rate in first year of apprenticeship	Dropout rate in probationary period/first 3 months	Overall dropout rate
2001	0.12	0.06	0.24
2002	0.12	0.06	0.24
2003	0.11	0.06	0.22
2004	0.09	0.05	0.21
2005	0.09	0.05	0.20
2006	0.09	0.05	0.20
2007	0.09	0.05	-
2008	0.11	0.07	0.21
2009	0.12	0.07	0.23
2010	0.12	0.08	0.23
2011	0.13	0.08	0.24

Source: German Federal Institute for Vocational Education and Training (BiBB). No data available for 2007.

In 2008, the German Federal Government introduced the Apprenticeship Bonus¹, a programme that aims to support disadvantaged young people. The Apprenticeship Bonus should help the eligible group to find an apprenticeship position and to obtain the formal degree of a qualified worker. Only young people who have searched without success for an apprenticeship position to start training after leaving school are eligible for an Appren-

¹Apprenticeship Bonus denotes the German programme *Ausbildungsbonus*.

ticeship Bonus.² The programme provides a 4,000 to 6,000 € subsidy to employers who employ an eligible apprenticeship seeker. The employer has to meet additional conditions in order to get the subsidy, which is split into two equal payments. The first payment is conditional on the apprentice's completion of the probationary period, which is typically three to four months after the start of apprenticeship training. The second payment is conditional on the registration of the apprentice for final examination, which is typically two to three months before the end of the training period.

We investigate whether the Apprenticeship Bonus is an effective measure to reduce dropout of apprenticeship training for disadvantaged apprentices. First, we analyse characteristics of eligible apprentices in order to assess whether they are actually disadvantaged. In the main part, we estimate the effect of participation in Apprenticeship Bonus on dropout during the first year of apprenticeship training. In order to identify the effect of the programme, we compare early dropout rates of apprentices subsidised by Apprenticeship Bonus with eligible but unsubsidised apprentices.

This study is closely related to research on the effect of subsidised employment, dropout of education, and the effect of subsidies on educational attainment. To our knowledge, this is the first study evaluating the effect of a subsidy on dropout for apprenticeship training. In classical evaluation studies, dealing with the effect of subsidies on employment duration or employment probability, the typical outcome is non-subsidised regular employment. Gerfin et al. (2005), Jaenichen and Stephan (2011) and Göbel (2006, 2008), for example, examine the impact of subsidised employment on the probability of prospective regular employment, considering subsidised employment as non-desirable. Accordingly, Bell et al. (1999) and Dorsett (2006) evaluate the British program New Deal for Young People with respect to the employability of subsidised youth.

In contrast, the Apprenticeship Bonus has the explicit goal to prevent dropout from subsidised apprenticeship training. In our case, the subsidy aims to reduce dropout from apprenticeship training. Staying in apprenticeship training until the final examination is considered desirable since completion of apprenticeship training serves as an important signal to future employers. Evaluation studies on subsidised apprenticeship training are rare. A related study by Dettmann and Günther (2009) analyses the effect of subsidised vocational training on employment opportunities after the end of the training for East Germany. Using a matching approach, they conclude that subsidised apprentices are negatively discriminated in finding adequate employment after the end of vocational training.

Our study shares traits with the vast literature on the determinants for dropout of schooling, post-compulsory schooling, or apprenticeship training. Bessey and Backes-Gellner (2008), for example, provide evidence on the determinants for dropout of vocational training in Germany. Furthermore, there is literature on the effects of subsidies on educational attainment. Dynarski (2003), for example, evaluates the effects of a subsidy

²Young people who cannot finish apprenticeship training because the firm goes bankrupt are eligible for Apprenticeship Bonus, too. This case is not studied here.

for college students on the probability of college attendance and completion in the US. The study shows that schooling attendance and completion are positively affected by the subsidy. Dearden et al. (2009) evaluate the impact of means-tested grants for students on retention in post compulsory education in the UK. The grant has a significant positive impact on the participation rate at the beginning of post compulsory education and one year later. Though, these studies evaluate subsidies that are paid directly to the students or their parents.

The German apprenticeship system is a dual track system, and apprentices work in the firm most of the time and spend one to two days per week at vocational schools, where they follow specific and general classes. Private firms play an important role. They provide most of the vocational training and therefore bear most of the costs. Firms consequently expect to receive the lion's share of the returns from apprenticeship. Their returns to apprenticeship training depend on the productivity of apprentices, the time the apprentices work in the firm and the supply of qualified workers at the labour market. Profit maximising firms can be expected to decide over the course of apprenticeship training whether to continue apprenticeship training or dismiss the worker by considering expected costs and returns. As an incentive for private firms to hire and to train apprentices, policy makers tend to pay subsidies for training costs (compare Becker, 1962; Wolter and Ryan, 2011).

The subsidy provided by the Apprenticeship Bonus decreases labour costs of entitled apprentices by a substantial share. As the payment of the Apprenticeship Bonus is split into two parts, *ceteris paribus* the subsidy provides an incentive for firms to prevent the entitled apprentices from dropping out. The subsidy can either be shared with apprentices by higher wages, or firms could pass non-monetary transfers to subsidised apprentices. Non-monetary transfers can comprise, for example, more guidance, higher commitment, more patience and concessions, more encouragement and support towards the apprentice, or better working conditions. If the rent, provided by the subsidy, is shared between the firm and the apprentice or if the firms put forth extra effort in order to receive the subsidy, then we expect the subsidy to reduce dropout from apprenticeship training.

For the empirical analysis, we use detailed survey data on apprentices to evaluate the effect of Apprenticeship Bonus on early dropout. The data contain extensive information on apprentices who are subsidised by Apprenticeship Bonus and apprentices who are eligible for the programme but not subsidised. We use detailed information on apprentices' characteristics such as education, socio-economic and family background. The data also comprise information on apprentice's behaviour, activities and decisions for the time between leaving school and start of apprenticeship training. The latter includes the search strategy in order to find an apprenticeship position between leaving school and starting apprenticeship. We argue that amount and quality of our data justify an evaluation approach that is based on selection on observables in order to control for selective programme participation.

Using propensity score matching, we find no significant effects of Apprenticeship Bonus on monthly dropout rates during the first 12 months of apprenticeship training. Still, the

time pattern of the insignificant differences between monthly dropout rates fits the incentive structure provided by the Apprenticeship Bonus. The estimates suggest that dropout rates are slightly decreased by the Apprenticeship Bonus during the first four months after the start of apprenticeship. After the fourth month, the Apprenticeship Bonus has a tendency towards higher dropout risk. Apparently, the Apprenticeship Bonus decreases the dropout rates insignificantly until the end of the probationary period, when the first payment takes place. Once firms have received the first payment of the Apprenticeship Bonus, the dropout rates increase, and one year after the start of apprenticeship training, the survival rates with and without the programme are roughly the same. Our findings suggest that subsidising vocational training is ineffective in decreasing total dropout. Overall dropout is not reduced 12 months after the start of vocational training.

The study is structured as follows: In Section 2, we briefly introduce the German apprenticeship system and describe the mechanism of Apprenticeship Bonus regarding dropout risk. The used data set and a descriptive analysis of the characteristics of apprentices that are subsidised by Apprenticeship Bonus or unsubsidised but still eligible are presented in Section 3. Section 4 discusses the identification strategy and refers to potential factors relevant for dropout risk. Section 5 concludes.

2 The Apprenticeship Bonus

The German apprenticeship system has a long tradition in training young school leavers to enter the labour market.³ Compared to many other countries, Germany faces relatively low unemployment rates for young people, and labour market integration of school leavers works well. Therefore, in the economic literature, the German apprenticeship system is often considered as exemplary for other countries as well (Oulton and Steedman, 1994; Steedman, 2001; Harhoff and Kane, 1997; Wolter and Ryan, 2011). The German educational system offers several alternatives to school leavers at the end of compulsory schooling. Apprenticeship training is one important option besides university or direct entry into the labour market. About two thirds of German school leavers enter the apprenticeship system⁴, and for most of them apprenticeship training is a stepping stone into the labour market.

After leaving compulsory school, the young people can apply at firms for apprenticeship training without further prerequisites. Apprenticeship training lasts from two to three and a half years.⁵ At the end of apprenticeship training, there is a central examination of practical and theoretical professional knowledge and skills. For school leavers with low degrees, the apprenticeship system offers an opportunity to get profound professional

³See (Franz and Soskice, 1995) for an overview. Some other countries like Switzerland, Austria and Denmark have apprenticeship systems that are similar to the German system.

⁴In 2009, 64.8 per cent of German school leavers enter the apprenticeship system (BMBF, 2010).

⁵The duration of apprenticeship training depends on occupation and the previously obtained school degree or vocational degree of the apprentice. Higher school degrees reduce the duration of apprenticeship by about one year. Formally, the apprenticeship duration takes 18 to 42 months.

training. On the other hand, non-completion of apprenticeship can hamper future career prospects. For example, Lüdemann et al. (2006) report shorter unemployment duration for workers who successfully finish apprenticeship training compared to workers without complete apprenticeship training. Winkelmann (1996) also finds favourable employment prospects of apprentices regarding the first full-time employment. Recent figures show that 22 per cent of workers without a vocational training degree or university degree are unemployed. In contrast, only 7 per cent of workers with vocational degree are unemployed (IAB, 2011).

The theoretical part of apprenticeship training is provided by public vocational schools for one to two days per week.⁶ For the other days, apprentices are trained on the job. Thus, an important part of apprenticeship training is provided by the firm. In the course of apprenticeship training, apprentices actually work in the firm and gain working experience. The relationship between the apprentice and the firm is therefore comparable to the relationship normal employees have with their employer, apart from the fact that apprentices earn less and spend part of the time at the vocational school. In larger firms, specific instructors are assigned to support apprentices. As for regular employment, the match quality between the apprentice and the firm is important for the stability of the position.

In July 2008, the German Federal Parliament introduced the Apprenticeship Bonus⁷ as a programme for disadvantaged young people. The Apprenticeship Bonus has two main goals: first, to facilitate young people's access to apprenticeship positions and second, to stabilise apprenticeship training for entitled apprentices. The Apprenticeship Bonus offers a subsidy, paid to the employer for a newly hired apprentice under the following conditions: First, apprentices have to "prove" that they have unsuccessfully searched for an apprenticeship position after leaving school. Either they provide evidence that they applied unsuccessfully for an apprenticeship position at least three times, or they are officially registered as "searching for apprenticeship position" at the unemployment office.⁸ Besides this *eligibility criterion* on the individual level, there is a second *additionality criterion* for the firm. To obtain the subsidy, the provided apprenticeship position has to be "additional". The additionality is legally defined as the number of offered apprenticeship positions that has to be higher than the average number of apprenticeship positions offered during the last three years.⁹

⁶We distinguish three types of apprenticeship training schemes in the German apprenticeship system: A combination of schooling and in-firm training in the private sector, a combination of schooling and in-firm training in the public sector, and training that is provided full-time by vocational schools. Since the Apprenticeship Bonus is only provided for the private sector, we focus on the first scheme. To start apprenticeship training at private sector firms, people have to apply for an apprenticeship position directly at the firm.

⁷The *Ausbildungsbonus* is regulated by § 421r of the German Social Security Code III.

⁸Apprenticeship Bonus can also be provided for slow learners, socially deprived, or apprentices who suffer from firm closure. This study, however, focuses only on workers who have unsuccessfully searched for a position after leaving school.

⁹Since many firms fulfil this criterion anyway, it is apparent that it can not ensure that the subsidised apprenticeship position is created as a result of the Apprenticeship Bonus.

The Apprenticeship Bonus has direct implications for cost-benefit considerations made by the firms. Depending on how much of the Apprenticeship Bonus is shared with the apprentice, the subsidy lowers the labour costs and hence the net costs of employing an apprentice for the firm. The total amount of the subsidy can be 4,000, 5,000, or 6,000 €, depending on the monthly wage in the first year of apprenticeship training.¹⁰ With respect to gross labour costs of apprenticeship, the amount of subsidy is substantial. Wenzelmann et al. (2009) report that the average labour costs of training per apprentice are about 9,500 € per year. For three years of apprenticeship training, the subsidy reduces labour costs substantially, as shown in Table 2.

Table 2: Amount of subsidies by Apprenticeship Bonus with respect to labour costs

amount of subsidy	paid for monthly wages	reduction of labour costs *
4,000 €	< 500 €	> 22 %
5,000 €	500 – 750 €	18 – 28 %
6,000 €	> 750 €	< 22 %

* Average labour costs calculated over an assumed apprenticeship duration of three years.

Apprenticeship Bonus is divided into two equal payments. The first payment is conditional on finishing the probationary period, which ranges by law from one to maximal four months after the start of apprenticeship. The second payment is conditional on the registration of the apprentice for final exams. Registration for the final exam is typically two to four months before the end of the apprenticeship training. As the Apprenticeship Bonus is split into two payments, firms *ceteris paribus* have an incentive to prevent subsidised apprentices from dropping out before receiving the payments. If firms react to this incentive, subsidised apprentices should be less likely to drop out than comparable unsubsidised apprentices.¹¹

Apprenticeship wages are quasi fixed by collective bargaining agreements, and the subsidy is paid directly to the firms. Nevertheless, profit maximising firms are able to share the rent via non-monetary transfers to the subsidised apprentices. To prevent dropout, firms could for example pass on incentives to subsidised apprentices through higher commitment, more patience, concessions, and encouragement, or providing better working conditions. Despite fixed apprenticeship wages there is evidence that the subsidy could also be passed on to apprentices by higher wages. In our survey we asked apprentices why they dropped out of apprenticeship. Significantly less subsidised apprentices compared to the unsubsidised apprentices state that the reason was a too low wage. Non-monetary reasons like working hours or conflicts with colleagues or supervisors do not differ between

¹⁰The subsidy amount is 4,000 € if first year monthly wage is not more than 500 €; 5,000 € if first year monthly wage is between 500 and 750 €; and 6,000 € if first year monthly wage is equal to or more than 750 €.

¹¹After dropping out, the apprentice can not take the Apprenticeship Bonus to another firm. With a new firm that is willing to hire him, the application procedure has to be passed anew.

subsidised and unsubsidised apprentices.¹²

Firms bear net costs of apprenticeship training and take most of the benefits. As apprentices work during apprenticeship training, they account for a certain part of firms' production outcome. However, apprentices are less productive than comparable skilled workers, which is reflected by lower wages.¹³ Nonetheless, specific firms actually choose to train apprentices when they face substantial costs when labour market imperfections after apprenticeship lead to restricted mobility of workers and therefore allow firms to collect returns of investments into training (Acemoglu and Pischke, 1998, 1999). As Wolter and Ryan (2011) point out, subsidising training costs offers incentives for firms to hire and train apprentices.

From a study of the implementation of the programme (BMAS, 2010) we have insight into the selection process associated with Apprenticeship Bonus. This analysis indicates that selection into Apprenticeship Bonus is to some extent driven by firms. Simultaneously to or before hiring, many firms look out for possible programmes which offer financial or other support in association with an apprenticeship position. As the provision of an apprenticeship position is of public interest, support is often provided by public facilities, and most firms are aware that disadvantaged youths are eligible to be funded by public means. Accordingly, descriptive evidence from our survey indicates that apprentices are in general not aware of the fact that they are actually subsidised by the Apprenticeship Bonus. Only 30 per cent of the subsidised apprentices know about the programme Apprenticeship Bonus.

As subsidies are likely to increase hiring of apprentices, they typically entail low utilisation and substantial deadweight losses (Katz, 1998). When subsidies for training costs are poorly targeted, firms might be seduced to take the payment and displace unsubsidised training positions. The payments for apprenticeship positions which would also be offered without the subsidy are deadweight losses (compare Wolter and Ryan, 2011).¹⁴

3 Data description

Our analysis is based on comprehensive survey data that were specifically collected for this study between October and December 2009. The survey was conducted by telephone interviews among 4,000 apprentices who have unsuccessfully searched for an apprenticeship

¹²In the literature some evidence for – mostly downward – discrimination in apprenticeship wages can be found. Muehleemann et al. (2013) find that having fewer competitors for skilled workers is related with lower pay for trainees on the establishment level. Ryan et al. (2013) examine cross-country evidence on metalworking apprentices' pay from on-site interviews with managers. They also suggest that besides union power the supply of potential trainees can be an influencing factor on apprentice pay. Mohrenweiser et al. (2011) suggest that employers could pay higher apprenticeship wages to avoid poaching.

¹³In fact, empirical evidence regarding net costs of apprenticeship training is ambiguous. Based on a questionnaire, Wolter and Schweri (2002) report varying cost-benefit structures during apprenticeship training for Switzerland. Mohrenweiser and Zwick (2009) find evidence for net costs in German firms only in manufacturing occupations. Schönfeld et al. (2010) also report substantial net costs mainly in manufacturing occupations.

¹⁴Another shortcoming of apprenticeship subsidies can be stigmatisation of the apprentices, making it harder to find employment after the end of the subsidised training period.

position at the end of schooling and who have been hired as an apprentice at least one year after leaving school. Contact addresses of these apprentices were randomly drawn from administrative data by the Federal Employment Agency.

Our sample contains a treatment group of 800 apprentices who are subsidised by the Apprenticeship Bonus. We compare those subsidised apprentices to 3,200 unsubsidised apprentices. Participants as well as non-participants have all been unsuccessfully searching for an apprenticeship position after the end of schooling.¹⁵ All apprentices in the sample, subsidised as well as unsubsidised, are eligible for Apprenticeship Bonus. Beyond eligibility, the fact that 70 per cent of subsidised apprentices do not know that they are promoted by Apprenticeship Bonus adds even more randomisation to our analysis. This ensures from the outset that subsidised and unsubsidised apprentices are comparable with respect to promotion by Apprenticeship Bonus, which is important for the assessment of apprenticeship dropout in Section 4. Although selectivity can not be ruled out, this setup is favorable for the analysis of the effect of Apprenticeship Bonus.

Subsidised and unsubsidised apprentices likewise started their apprenticeship in autumn 2008, typically in September. Our sample of apprentices allows to compute results for the population of German apprentices who were unsuccessfully searching an apprenticeship position after schooling and found an apprenticeship position only later.¹⁶

We have comprehensive individual information to characterise subsidised and unsubsidised apprentices. Firstly, the data contain educational and social characteristics as well as the economic background of apprentices. School performance is measured by the highest obtained degree and by school grades in the last school year. We proxy the socio-economic background by the migration status, by questions on financial or psychological problems and by welfare recipient status.

To convey a broad picture of apprentices who enter apprenticeship at least one year after leaving school, the data comprise detailed information on activities of apprentices for the time between leaving school and entering apprenticeship training, including information on job search behaviour and biographical information for this period. This includes self assessed reasons why school leavers have originally been unsuccessful in finding an apprenticeship position and the time they spent until finding a position. The apprentices' search effort is reflected by the number of applications they wrote and the number of job interviews they obtained. We also have information on the job search channels they used and how they finally found their apprenticeship position.

The following paragraphs describe important characteristics of apprentices who have unsuccessfully searched for an apprenticeship position after the end of school and who have been hired as an apprentice one year after leaving school or later. Although both groups, subsidised and unsubsidised apprentices, can be considered as being disadvantaged

¹⁵Throughout the paper we refer to the group of non-participants with the short term “unsubsidised apprentices”. Any deviation from this will be indicated in the text.

¹⁶The data were drawn from the population with respect to selected stratification variables: sex, migration status, firm size, and region. All results in this study are weighted in order to obtain results for the underlying population.

compared to apprentices who found a position immediately after school, we find some differences between subsidised and eligible but unsubsidised apprentices. In the following, we depict mean values for characteristics of subsidised and eligible but unsubsidised apprentices in Table 5.

In our survey we ask why the apprentices did not start an apprenticeship immediately after the end of schooling. The comparison of means between subsidised and unsubsidised apprentices in our sample shows no significant difference: About the same share of apprentices in the treatment and the comparison group stated their applications were not successful (48 per cent compared to 46 per cent). Participants as well as non-participants provide virtually the same explanations for this: another applicant was favoured, grades were not good enough, or they were too late with applications. The fraction of the various reasons why applications were not successful does not differ between subsidised and unsubsidised apprentices.

A further reason that apprentices did not find an apprenticeship after leaving school could be inability or lack of skills. Firstly, our data contain variables on secondary school attainment. On average, we find significantly more subsidised apprentices with a lower secondary degree (53 per cent compared to 34 per cent).¹⁷ The share of subsidised apprentices with a middle or upper secondary degree is significantly lower, respectively (37 per cent to 42 per cent with a middle secondary degree and 7 per cent to 21 per cent with a upper secondary degree). Subsidised apprentices therefore have on average a lower degree than apprentices in the comparison group. Secondly, we also have measures of school performance, measured by grades in the last school year. Subsidised apprentices have on average worse grades in German (3.03 compared to 2.90).¹⁸ On the other hand, we do not find a significant difference in Maths grades between subsidised apprentices and the comparison group. Overall, our measures on school performance do not provide evidence for one group being more disadvantaged than the other.

Besides educational attainment, socio-economic factors and family background can also influence the individual decision not to take up apprenticeship training immediately after leaving school. Among subsidised apprentices there are significantly more migrants (12 per cent to 9 per cent). Subsidised apprentices are more likely to have financial problems or debts before they enter apprenticeship training. But they are less likely to suffer from psychological or addiction problems compared to unsubsidised apprentices.

Search effort serves as an indicator for motivation, which is likely to influence the success of applications in terms of actual job interviews. We find differences between subsidised and unsubsidised apprentices with respect to both the number of applications and the number of job interviews before school leavers found an apprenticeship position. On average, subsidised apprentices report 35.6 applications. Unsubsidised apprentices have written significantly more applications (42.1). On the other hand, the average num-

¹⁷A lower secondary degree contains nine or ten years of schooling.

¹⁸The German school grade system is represented by a scale reaching from 1 (very good) to 6 (unsatisfactory).

ber of job interviews is significantly lower for subsidised apprentices (5.9 job interviews compared to 6.7). Fewer applications by the subsidised apprentices can reflect positive selection: they stopped writing further applications when they found an apprenticeship position.

The biography of apprentices can shed light on the question why applicants do not enter apprenticeship training immediately after leaving school. Subsidised apprentices start their apprenticeship on average 32 months after leaving school, which is significantly later than unsubsidised apprentices (28 months). After leaving compulsory school, subsidised apprentices are more likely to choose further schooling or enter evening classes (9 per cent). They are also more likely to enroll in vocational schools (40 per cent).¹⁹ We do not find significant differences between subsidised and unsubsidised apprentices in the likelihood to enter active labour market programmes between school and start of apprenticeship.²⁰ Subsidised and unsubsidised apprentices also do not differ in their biography in terms of completing longer internships or staying for more than four weeks on holiday or abroad.

We investigate whether subsidized and unsubsidized apprentices differ on average in their chosen professional occupation. As we stated in Section 2, costs of apprenticeship differ substantially across occupations. Thus, it could be that the likelihood to receive Apprenticeship Bonus varies across professional occupations and industries. We compare the most frequent occupations chosen among the groups of subsidised and unsubsidised apprentices. Table 4 shows no distinct differences between the treatment and comparison group. Despite some changing in the order of occupations, we find the same occupations among the five most chosen occupations in both groups. In addition, there is no particular concentration on a certain occupation within both groups and the shares of each occupation within subsidised and eligible unsubsidised apprentices are similar. Apprenticeship Bonus seems not to be a matter of occupation.

Lastly, we also have information on the apprentices' destination of dropout. One could argue that dropout of apprenticeship is an economically efficient behaviour and preventing apprenticeship dropout would be an inefficient measure. In this respect, dropout would be efficient if the destination of dropout provided an alternative opportunity for a youth to succeed on the labour market immediately and in the long run. Table 7 provides evidence of the status after three, six and twelve months since apprenticeship has started for all apprentices who dropped out until then. We differentiate between the status working, unemployed, further education or (alternative) military service, and no relation to labour market. For all three time points, apprentices who drop out until then mainly state that they are unemployed afterwards. Specifically, twelve months after start of apprenticeship 54 percent of all subsidised apprentices who dropped and 40 percent of all unsubsidised apprentices who dropped out are unemployed. From this evidence, we infer that dropout of apprenticeship is mainly not an alternative opportunity for youth. Therefore, the

¹⁹Vocational schools or *Berufsfachschulen* in Germany are typically full-time, where pupils have the possibility to earn a qualifying vocational degree.

²⁰See figures for basic vocational year, basic training, job preparing training, job application training, occupational orientation courses, and temporary extra courses in Table 5.

prevention of dropout from apprenticeship in this respect can be regarded as a positive outcome.

In summary, we find differences between the group of subsidised apprentices and unsubsidised apprentices with respect to their educational and socioeconomical characteristics and their search behaviour. These differences, however, give a mixed picture. The figures do not suggest that apprentices subsidised by Apprenticeship Bonus are generally more disadvantaged than unsubsidised apprentices who are also eligible for Apprenticeship Bonus.

4 The effect of Apprenticeship Bonus on early apprenticeship dropout

This section analyses descriptive statistics on dropout of apprenticeship and estimates the causal effect of the Apprenticeship Bonus on early dropout. In Section 4.1, we present descriptive evidence on dropout of apprenticeship in our sample. Further, we introduce how we measure dropout rates as our outcome variable. Section 4.2 discusses identification of the causal effect of Apprenticeship Bonus and the fulfilment of the conditional independence assumption. Section 4.3 states how the matching estimator is specified, and section 4.4 discusses the estimation results.

4.1 Descriptive statistics on apprenticeship dropout

Ceteris paribus, apprentices who are subsidised by Apprenticeship Bonus should be less likely to drop out. This is the case since firms have an incentive to prevent apprentices from dropping out as they only receive the subsidy in the course of apprenticeship. The first payment is conditional on survival of the probationary period and the second payment is conditional on enrolment for the final exams towards the end of apprenticeship training.

The descriptive statistics in Table 8 indeed show that dropout due to the firm's decision occurs less frequently among the group of subsidised apprentices. 22 per cent of subsidised apprentices state that the firm dissolved the apprenticeship contract.²¹ This is a significantly lower share than that of the unsubsidised group, where 32 per cent report that dropout occurs due to the firm's decision.

Considering reasons for dropout, we find significant differences between subsidised and unsubsidised apprentices. Table 9 presents different reasons for dropout, which are reported by subsidised and unsubsidised apprentices who actually dropped out of apprenticeship. The two most important reasons for dropout are that the occupation did not meet the expectations of the apprentices and that they had personal problems with their colleagues or supervisors. Both reasons do not differ significantly between the group of subsidised and unsubsidised apprentices. Differences in the reported reasons for dropout can be found with respect to general health problems or low earnings. Health problems

²¹This information was surveyed in November 2009, i.e. about 14 months after start of apprenticeship.

that not due to apprenticeship which lead to dropout more frequently among unsubsidised apprentices. Dropout due to low wages has been especially reported by unsubsidised apprentices. 11 per cent state this reason compared to only 3 per cent among the subsidised apprentices.

For our empirical analysis we measure apprenticeship dropout rates for every month t since start of apprenticeship training. Since we have individual dropout data, we construct the share of apprentices who dropped out in each month since apprenticeship started. Dropout rates for month t denote apprentices who dropped out until month t as a fraction of all apprentices who started in month $t = 0$. We study early dropout rates between the first and the twelfth month since start of apprenticeship.²² This allows us to investigate the impact of the first payment of Apprenticeship Bonus, which takes place at the end of the probationary period, typically three months after the start of apprenticeship training, on dropout risk.

Figure 2 shows unconditional Kaplan-Meier survival functions for the first twelve months after the start of apprenticeship training. During the whole period, survival rates for subsidised apprentices are higher than those for unsubsidised apprentices. For every month since the start of apprenticeship there is a higher share among the subsidised apprentices who remains in apprenticeship compared to the unsubsidised apprentices. Monthly hazard rates in 3 indicate that monthly drop out rates are notably higher for unsubsidised apprentices. This is in line with the argument that subsidised firms *ceteris paribus* have an incentive to prevent dropouts, if only until the first payment takes place, which is typically after three months. For the time after the first payment took place, we observe rather higher monthly hazard rates for subsidised apprentices as compared to unsubsidised apprentices. In this period, Apprenticeship Bonus provides no payment and the second payment is still far-off. As a consequence, the incentive to prevent dropout diminishes. After twelve months of apprenticeship, 13 percent of apprentices dropped out of apprenticeship in the group of unsubsidised apprentices. Comparably, for the group of subsidised apprentices the drop out rate is 14 percent.

4.2 Identification strategy

As we are interested in the causal effect of participation in the Apprenticeship Bonus on dropout, we compute the average treatment effect on the treated (ATT) (compare Rubin, 1974)

$$\Delta_{ATT} = E(Y^1|D = 1) - E(Y^0|D = 1). \quad (1)$$

Apprentices can be in two treatment states: Either $D = 1$ if the apprentice participates in the Apprenticeship Bonus, or $D = 0$ if the apprentice does not participate. Y is the *monthly dropout rate*: Y^1 denotes the outcome for the case of participation and Y^0 denotes the outcome for the case of non-participation. Equation 1 defines the average treatment

²²Data on late dropout is not available so far.

effect on the treated as the difference between the average outcome of apprentices who have participated in Apprenticeship Bonus and their average outcome if they had not participated. The second term in Equation 1 is a counterfactual term and can therefore not be observed in the data.

In order to estimate the effect of the Apprenticeship Bonus on dropout risk, we use a matching estimator that relies on selection on observables. Equation 1 can then be written as

$$\Delta_{ATT} = E(Y^1|X, D = 1) - E(Y^0|X, D = 1). \quad (2)$$

in which observables X enter the conditioning set of the expected values of Y^0 and Y^1 . We estimate the counterfactual term $E(Y^0|X, D = 1)$ using the average outcome of comparable unsubsidised apprentices $E(Y^0|X, D = 0)$. We assume mean independence between participation in Apprenticeship Bonus and the outcome for the case of non-participation Y^0 conditional on observable characteristics X , i.e. $E(Y^0|X, D = 1) = E(Y^0|X, D = 0)$. This weaker version of the conditional independence assumption, which does not require independence between treatment status and the outcome of both the participants and the non-participants, is sufficient as we estimate treatment effects on the treated only.

To fulfil conditional mean independence, all factors that influence both participation in Apprenticeship Bonus and dropout risk need to be observed in order to estimate the causal effect of the Apprenticeship Bonus. As mentioned in Section 3 our sample is restricted to apprentices who were not successful in finding an apprenticeship position immediately after leaving school but after one year or later. The apprentices in our sample are therefore either subsidised by Apprenticeship Bonus or eligible for Apprenticeship Bonus but not subsidised.

In order to identify the effect of Apprenticeship Bonus on dropout we consider the influencing factors which are referred by the literature on the determinants of dropout. We particularly refer to studies that consider dropout of apprenticeship, although such studies are rare. We further consider the literature on dropout of post-compulsory education. Apprentices and students in post-compulsory education are to some extent comparable as both face the decision whether to invest further in education or to enter the labour market directly.

Recent empirical literature on dropout identifies various relevant individual and social background factors. Bradley and Lenton (2007) show evidence for the relevance of ethnic, migrational and other socio-economic factors in explaining dropout of post-compulsory education in the UK. They find that youths with ethnic minority background are less likely to dropout of post-compulsory education. The authors also show that youths who live in social housing – an indicator for low household income – are more likely to dropout. The study also reveals that parental occupation matters for the propensity to dropout. Youths with parents in professional or managerial occupations are less likely to dropout,

which could be an indication for an income effect, or at least a taste-for-education effect.

In our analysis, we control for individual characteristics like gender, age, and migrational status. An apprentice is classified migrant when he or she is born outside Germany or both parents are born outside Germany. We account for the social background by several variables. First, the parents' educational degree is reported. Second, we have information on the number of books at home when the apprentices are at the age of 15. This variable is a well known predictor for the households financial situation as well as the cultural and social capacity of household members.²³ Other indicators for household income and the social background of apprentices at the age of 15 we control for are whether the household has separate bedrooms for children, a personal computer, a car, or a garden. To display the taste-for-education, we use the parental involvement in schooling – proxied by the fact that parents show up regularly at parent-teacher conferences. This represents the parents' support concerning their children's education and their encouragement.

The risk to dropout of apprenticeship can be related to the standard human capital model by Becker (1964). Dropout of education or dropout of apprenticeship can occur due to a change in the ratio of expected returns to education as compared to associated costs. In our case, individual expected returns could turn lower than costs during apprenticeship and thus lead to dropout of apprenticeship. In this respect, Bradley and Lenton (2007) mention three theoretical reasons for dropout of post-compulsory education which should also be considered in the case of apprenticeship. First, apprentices could perceive that they have reached their optimal amount of education. Second, apprentices could have underestimated costs associated with apprenticeship, or could have overestimated their returns to apprenticeship. Third, dropout could also arise from non-pecuniar costs, for example psychological or social problems.

We are not able to fully consider individual allocations and perceptions of expected returns and costs of education. But we provide variables which proxy some of the non-pecuniar costs of apprenticeship training. Our survey includes information on health, psychological or addiction problems of apprentices. We also know whether apprentices have to care for sick or old family members. We further control for the commuting time to the firm and whether apprentices have a driver's license as a further non-pecuniar cost category. The information whether apprentices have a side job, which could reflect opportunity costs, is also included.

A further reason for dropout of apprenticeship may be the match quality between employers and apprentices which can be linked to the concept of job match between employers and employees by Jovanovic (1979). The model could serve as a rationale in our context although it is not fully applicable. The author assumes two-sided information imperfection. At job entrance, both the worker and the firm do not know how well the worker's productivity fits the position. Both sides update their information on the current match or potential alternatives during the employment relationship, which could lead to a quit

²³The question is taken from the PISA study; compare e.g. Q22 in the 2009 questionnaire: http://pisa2009.acer.edu.au/downloads/PISA09_Student_questionnaire.pdf .

or lay-off. In our context, a mismatch would be revealed after some time of apprenticeship and could therefore be responsible for dropout. A non-representative survey by Schöngen (2003) reports reasons for dropout of apprenticeship which are based on information updates of the apprentices. The prevalent reasons are conflicts with supervisors which arise during the training or that apprentices become aware that the chosen occupation does not meet their expectations.

Referring to the match quality approach, search strategy and search effort might matter for dropout risk. If the applicant's search strategy is thorough, he might find a position with a better match quality than otherwise. Besides, an internship prior to an apprenticeship at the same employer could reveal the quality of the potential match – for example in having more information on the occupation – in advance and therefore lead to lower dropout risk. We account for this with information both on the apprentices' general search strategy after leaving school and by the search channel via they have actually found their apprenticeship position. We also have biographical information whether apprentices have done internships, participated in programmes like occupational orientation courses or had a job already before.

The empirical literature on apprenticeship dropout considers education a relevant factor related to stability of the apprenticeship position (Bessey and Backes-Gellner, 2008; Bilginsoy, 2007; Mangan and Trendle, 2008). A higher level of schooling leads to a lower propensity to dropout. This reflects the general fact that better educated apprentices are *ceteris paribus* less likely to dropout of training because their individual cost-benefit ratio implies higher returns to education. We therefore take into account the apprentices educational degree and their marks in German and Math.

There is some evidence that dropout is related to the state of the regional labour market. According to Card and Lemieux (2001), higher regional unemployment rates lead to a decrease of dropout rates from high school. Bessey and Backes-Gellner (2008) do not find a significant effect of regional unemployment rates on dropout of apprenticeship. Our analysis includes a regional indicator whether the place of residence is in West or East Germany.

Empirical education economics highlights “soft skills” as driving factors for a successful start into working life. In our case, drop out is likely to be driven by such factors, e.g. the apprentices' motivation, preparedness for working life, and the overall match quality with the employers. Preparedness for working life could, as an example, indicate a specific ability to attain an apprenticeship degree. The apprentices have influence on match quality by their personal occupational orientation and career ambitions. All these factors are typically unobserved. In this study, we use biographical information on apprentices' activities after they have left school and before they started apprenticeship. This information serves as a proxy for the apprentices' motivation, preparedness and abilities to successfully pass apprenticeship training.

Empirical literature on educational outcomes or educational attainment is concerned with the influence on unobservable categories like motivation and ability (e.g. Heckman

et al., 2006). We suspect that motivation and ability are likely to influence dropout. The presumption is that the more able and the higher motivated apprentices are, the less likely they are to drop out of apprenticeship. The biographical information on the search strategy and search effort serves as a proxy for the apprentice’s motivation and ability with regards to the achievement of an apprenticeship degree.

In our survey, we asked apprentices about the reasons why they have unsuccessfully searched for an apprenticeship. On the one hand, these reasons reflect ability which is specific to the position. Some of the apprentices’ applications were unsuccessful because their grades were too bad or they could not compete with other applicants. On the other hand, reasons reflect motivation and preparedness of young school leavers. Some of them have not searched for an apprenticeship position after school because they could not decide on an occupation or they did not want to work yet. Another reason why apprentices did not apply for an apprenticeship position was further schooling. This could also be a signal for higher ability and high motivation directed at educational attainment.

Ability and motivation are also reflected by the apprentices’ activities between leaving school and starting apprenticeship. Applicants who have been travelling after the end of schooling or have been inactive (leisure) could also be more motivated and determined to complete their apprenticeship leading presumably to lower dropout rates. Our data comprise information on the effort associated with searching for an apprenticeship position which could reflect ability as well as motivation. We proxy search effort by the number of written applications and the number of job interviews before starting apprenticeship. Many applications or job interviews could reflect the motivation and commitment of the apprentice. Motivated and committed apprentices are less likely to dropout. On the other hand, many applications or job interviews could also reflect a selection of applicants who have been rejected often at previous applications, and hence are less able or loose motivation due to the experience of failure.

Based on the above discussion, we argue with respect to the outcome of monthly dropout rates that the available information justifies an identification strategy based on selection on observables. Our data set contains a large set of covariates, covering characteristics like motivation, effort, and biographical information of first-year apprentices.

4.3 Specification of the matching estimator

To control for the selection bias related to observable characteristics X , it suffices to compare subsidised and unsubsidised apprentices on the basis of a one-dimensional index known as propensity score $p(x)$ (Rosenbaum and Rubin, 1983). The propensity score provides a one-dimensional representation of the conditional probability of treatment participation, in our case participation in Apprenticeship Bonus. Using the propensity score the conditional mean assumption between participation D and Y^0 is still valid.

To find the closest match for each participant among the non-participants, we apply kernel matching (see Heckman et al., 1997, 1998). Kernel matching estimators use

Table 3: Summary on the distribution of the standardised bias before and after matching

	before matching	after matching
median	4.535	1.106
mean	6.483	1.379
std. dev.	6.440	1.217
pseudo R2	0.145	0.009
LR chi2	566.790	18.810
p>chi2	0.000	1.000

Computation of the standardised bias following Rosenbaum and Rubin (1985).

a weighted sum of the non-participants' outcomes to compare it with a participant's outcome. We trim the estimation sample by dropping participants whose propensity score is higher than the maximum propensity score of participants (for the distribution of propensity scores see 4). The contribution of each non-participant's outcome depends on the proximity of the propensity scores to that of the participant's. The outcome of a non-participant receives greater weight if the propensity score is close in terms of its distance to the propensity score of the participant. To specify the weights of non-participants' outcomes, we choose an Epanechnikov kernel function with a bandwidth 0.05.²⁴

If the propensity score model is specified correctly, covariates that are relevant for selection are balanced after matching. This means that, after matching each participant to a group of comparable non-participants, observable characteristics X in the matched samples should be balanced on average. Table 3 provides summary statistics on covariate balancing before and after matching. After matching, the mean values of all covariates show no significant differences between the group of participants and the non-participants. The mean standardised bias is reduced by 77 per cent.

Table 3 reveals that even before we match participants and non-participants, a substantial number of covariates are balanced. In this case a linear least square regression (OLS) could be used. Still the matching approach has some advantages. Due to its non-parametric nature we do not have to specify $E(Y^0|X, D = 1)$ avoiding possible misspecification. It also permits the treatment effect to be heterogeneous in arbitrary form. Lastly, we are able to only consider participants which face a non-participant with the same propensity score. This allows us to compare only comparable individuals in an effective way.

4.4 Estimation results

We estimate the difference of dynamic incidence of dropout from apprenticeship between participants and non-participants. We therefore construct the outcome as a binary variable, taking on a value of 1 if the apprentice drops out in t , and 0 otherwise:

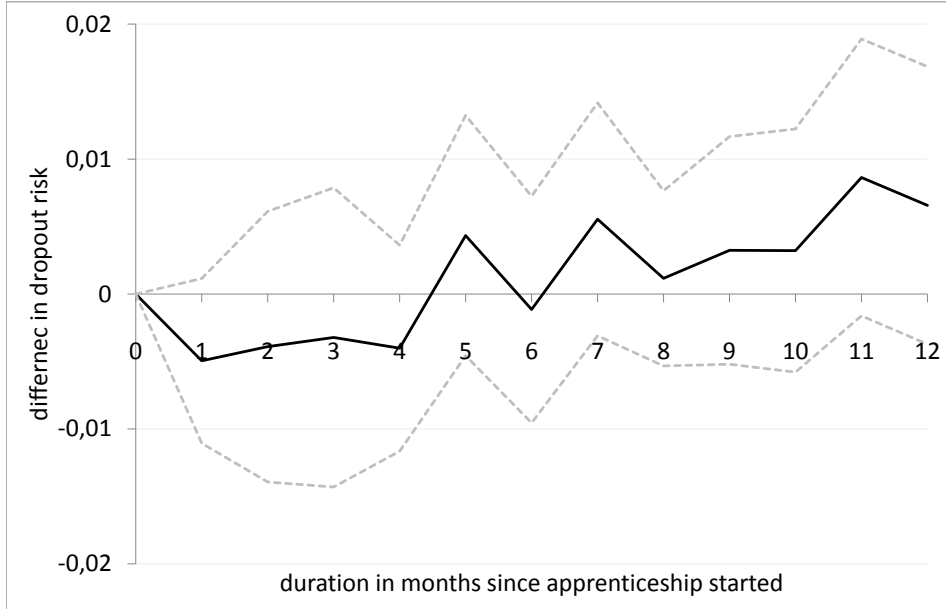
²⁴The Epanechnikov kernel function is optimal with respect to minimizing the asymptotic mean integrated squared error. The bandwidth is chosen by the rule of Härdle (1991). Robustness checks which apply the doubled and quadrupled value of the chosen bandwidth do not show different results.

$$Y_t^d = \begin{cases} 1, & \text{if dropout of apprenticeship in } t \\ 0, & \text{if still in apprenticeship in } t \end{cases} \quad (3)$$

with $d \in (0, 1)$ and $t \in [1, 12]$ months since the start of apprenticeship training. Therefore, a negative average treatment effect on the treated (ATT) indicates a lower monthly dropout rate, i.e. a favourable impact of Apprenticeship Bonus on dropout risk. We separately estimate the ATT on the outcome for each of the first twelve months of apprenticeship as in Equation 1. As stated by Ham and Lalonde (1996) the monthly estimated effects might be influenced by different patterns of dynamic selection among participants and non-participants. To meet this objection we match the group of participants with non-participants on the base of monthly specific propensity scores distribution. We thus take into account that characteristics of apprentices who remain to be at risk to drop out in a specific month might change with the duration of the apprenticeship spell.

Figure 1 presents monthly point estimates of the ATT. All point estimates are insignificant. Thus, Apprenticeship Bonus has no significant effect on early apprenticeship dropout risk. Estimated coefficients are below one percentage point, which is very small from an economic perspective. Estimates are negative in the first four months, and turn positive afterwards. This suggests that during the first four months after start of apprenticeship there is a favourable impact of Apprenticeship Bonus on dropout risk in each month.

Figure 1: Effect of Apprenticeship Bonus on monthly dropout rates (average treatment effect on the treated)



Note: 95% confidence intervals, standard errors are bootstrapped with 500 replications.

One might be concerned that relevant factors on the firm level which might influence both selection into Apprenticeship Bonus and dropout risk are not considered. This would

be the case if firms selected themselves into Apprenticeship Bonus on the base of factors which influence dropout risk at the same time.

From qualitative firm interviews we have a deeper insight into the selection process associated with Apprenticeship Bonus. These interviews suggest that selection into Apprenticeship Bonus is at least partly driven by firms. They decide to offer an apprentice a position. Simultaneously to or before hiring, many firms look out for possible programmes which offer financial or other support in association with an apprenticeship position.²⁵ It could be the case that firms who are more inclined to seek external support – and thus have a higher probability to be supported – share similar characteristics opposed to other firms. One relevant factor could be firm size. Larger firms could have more capacities to screen support facilities and to manage the application process. Moreover, certain industries may be more attached to external support facilities.

In the empirical literature, firm size is not reported as a determinant for dropout. From representative firm interviews, we know that larger firms are less likely to apply for Apprenticeship Bonus. However, according to the literature, this is not a relevant factor for dropout. Furthermore, as we have seen in Section 3, there are no differences in the chosen occupations between subsidised and unsubsidised apprentices. This indicates that occupational and therefore sectoral aspects are not relevant for selection into Apprenticeship Bonus.

We argue that if there is remaining unobserved selection on the firm level, then this is likely to be positive selection of firms with respect to dropout risk. As stated above, firms that participate in the Apprenticeship Bonus have to meet an *additionality criterion*. The position of the subsidised apprentice has to be additional, so that the current sum of offered apprenticeship position has to be more than the average amount of apprenticeship positions offered during the last three years. The fact that the number of apprenticeship positions in firms has been increasing over the last three years is likely to reflect an increasing economic development of the firm. Such firms are presumably more able to invest in training and to provide a stable apprenticeship position. Following our assumption on positive selection, our results can be seen as an upper bound of the effect of Apprenticeship Bonus on dropout risk, and we can conclude that Apprenticeship Bonus at best has no effects on early dropout risk.

To check the robustness of this argument, we simulate an unobserved factor of positive selection (as suggested by Rosenbaum, 2002) and test whether and how this unobserved factor influences our estimated effects.²⁶ With the simulated unobserved factor turning positive, the test statistics attest that it is unlikely for the effects to become positive for months 5 to 12. For months 1 to 4, the likelihood is higher: the test statistics indicate that by more than doubling the odds ratios, the effects tend to turn negative. Thus, our robustness check under the assumption of positive selection supports our main finding

²⁵ As the provision of an apprenticeship position is in public interest, support is often provided by public facilities.

²⁶ This robustness check is explained in detail in Becker and Caliendo (2007). For binary outcomes, the procedure builds on the Mantel and Haenszel (1959) statistic.

that the Apprenticeship Bonus does not have a positive effect on early dropout risk.

Despite the strong incentives for employers provided by Apprenticeship Bonus, we do not find significant effects on the dropout risk. The reason why the firm subsidy has no effect could be that, in almost half of the cases, it is the apprentice's initiative to dropout of apprenticeship training (Table 8). The reasoning of this result could be either that firms have little influence on the individual decision to dropout. Furthermore, it could be that the subsidy is a pure windfall gain for firms which do not react to the incentive as predicted by theory. In that case the Apprenticeship Bonus causes an inefficient allocation due to deadweight loss.

5 Conclusion

In this study we analyse the effect of the Apprenticeship Bonus on dropout of apprenticeship training. One aim of the programme is to support disadvantaged apprentices to complete apprenticeship training. The programme provides a subsidy to the employer if the eligible apprentices do not dropout during a specific period. The subsidy is split into two equal parts. The first part is paid after completing the probationary period and the second part is paid after apprentice's registration for final examination. Only young people who searched for apprenticeship positions unsuccessfully directly after leaving school are eligible for the Apprenticeship Bonus. We describe the characteristics of apprentices who have unsuccessfully searched for an apprenticeship position directly after leaving school. Subsidised apprentices differ from unsubsidised apprentices, but a stereotypical characterisation is not given. In the next step, we calculate the effect of the Apprenticeship Bonus on early apprenticeship dropout.

The subsidy provided by the Apprenticeship Bonus should enter the cost-benefit considerations of employers for entitled apprentices. As the Apprenticeship Bonus is split into two payments over the course of apprenticeship training, firms *ceteris paribus* have an incentive to prevent subsidised apprentices from dropping out during their apprenticeship. Even though apprenticeship wages are quasi fixed through collective bargaining agreements and the subsidy is paid directly to the firm, we argue that incentives from the subsidy are passed to the subsidized apprentices. Rational, profit maximising employers should share the rent and provide monetary or non-monetary transfers to the subsidised apprentices in terms of commitment, patience, concession, encouragement, or better working conditions. Subsidised apprentices should consequently be less likely to dropout than comparable unsubsidised apprentices.

We use data from the evaluation of the Apprenticeship Bonus conducted for the German Federal Ministry of Labor and Social Affairs. The data contain information on apprentices who are subsidised by Apprenticeship Bonus and apprentices who are eligible but not subsidised. The data comprise comprehensive information on the apprentices' characteristics, education, socio-economic and family background. It covers also biographical information on activities and decisions concerning education and labour market between

leaving school and the start of apprenticeship training. We observe variables which are closely related to characteristics that are normally not available for researchers such as motivation and effort. For the estimation of the effects of Apprenticeship Bonus we build on our data and apply a selection-on-observables approach.

We estimate the effect of the Apprenticeship Bonus on dropout risk for the first twelve months after the start of apprenticeship training. The pattern of the monthly treatment effects is in line with the incentive structure of the subsidy. During the probationary period, the effect on dropout is negative which means the subsidy points to a prevention of dropout in this period. Afterwards, the effect turns positive. However, none of the point estimates is significant. Therefore, we conclude that Apprenticeship Bonus has no effect on early dropout of apprenticeship.

References

- Acemoglu, D. and Pischke, J.-S. (1998). Why do firms train? Theory and evidence. *Quarterly Journal of Economics*, 113(1):78–118.
- Acemoglu, D. and Pischke, J.-S. (1999). Beyond Becker: Training in imperfect labour markets. *Economic Journal*, 109(452):112–142.
- Becker, G. S. (1962). Investment in human capital: a theoretical analysis. *Journal of Political Economy*, 70(5):9–49.
- Becker, G. S. (1964). *Human capital: a theoretical and empirical analysis with special reference to education*. Columbia University Press, New York.
- Becker, S. O. and Caliendo, M. (2007). Sensitivity analysis for average treatment effects. *Stata Journal*, 7(1):71–83.
- Bell, B., Blundell, R., and van Reenen, J. (1999). Getting the unemployed back to work: The role of targeted wage subsidies. *International Tax and Public Finance*, 6:339–360.
- Bessey, D. and Backes-Gellner, U. (2008). Dropping out and revising educational decisions: Evidence from vocational education. Leading House Working Paper No. 40, Zürich.
- Bilginsoy, C. (2007). Delivering skills: apprenticeship program sponsorship and transition from training. *Industrial Relations*, 46(4):738–765.
- BMAS (2010). *Bericht der Bundesregierung 2010 über die Auswirkungen des Ausbildungsbonus auf den Ausbildungsmarkt und die öffentlichen Haushalte*. Bundesministerium für Arbeit und Soziales, Bonn, Berlin.
- BMBF (2010). *Berufsbildungsbericht 2010*. Bundesministerium für Bildung und Forschung, Bonn, Berlin.
- Bradley, S. and Lenton, P. (2007). Dropping out of post-compulsory education in the UK. *Journal of Population Economics*, 20:299–328.
- Card, D. and Lemieux, T. (2001). Dropout and enrollment trends in the postwar period: What went wrong in the 1970s? In Gruber, J., editor, *Risky Behavior among Youths: An Economic Analysis*, pages 439–482. University of Chicago Press.
- Dearden, L., Emmerson, C., Frayne, C., and Meghir, C. (2009). Conditional cash transfers and school dropout rates. *Journal of Human Resources*, 44(4):827–857.
- Dettmann, E. and Günther, J. (2009). Subsidized vocational training: Stepping stone or trap? An evaluation study for East Germany. IWH Discussion Paper, Halle.
- Dorsett, R. P. (2006). The New Deal for Young People: Effect of the options on the labour market status of young men. *Labour Economics*, 13(3):405–422.

- Dynarski, S. M. (2003). Does aid matter? Measuring the effect of student aid on college attendance and completion. *American Economic Review*, 93(1):279–288.
- Franz, W. and Soskice, D. (1995). The German apprenticeship system. In Buttler, F., Franz, W., Schettkat, R., and Soskice, D., editors, *Institutional Frameworks and Labor Market Performance*, pages 208–234, London, New York. Routledge.
- Göbel, C. (2006). The effect of temporary employment subsidies on employment duration. Discussion Paper 2006-35, Université Catholique de Louvain.
- Göbel, C. (2008). The effect of participation in subsidised employment on labour market transitions. Mimeo, ZEW Mannheim.
- Gerfin, M., Lechner, M., and Steiger, H. (2005). Does subsidised temporary employment get the unemployed back to work? An econometric analysis of two different schemes. *Labour Economics*, 12(6):807–835.
- Ham, J. C. and Lalonde, R. J. (1996). The effect of sample selection and initial conditions in duration models: Evidence from experimental data on training. *Econometrica*, 64(1):175–205.
- Harhoff, D. and Kane, T. J. (1997). Is the German apprenticeship system a panacea for the U.S. labor market? *Journal of Population Economics*, 10:171–196.
- Heckman, J. J., Ichimura, H., and Todd, P. E. (1997). Matching as an econometric evaluation estimator: Evidence from evaluating a job training programme. *Review of Economic Studies*, 64(4):605–654.
- Heckman, J. J., Ichimura, H., and Todd, P. E. (1998). Matching as an econometric evaluation estimator. *Review of Economic Studies*, 65:261–294.
- Heckman, J. J., Stixrud, J., and Urzua, S. (2006). The effects of cognitive and noncognitive abilities on labor market outcomes and social behavior. *Journal of Labor Economics*, 24(3):411–482.
- Härdle, W. (1991). *Smoothing techniques. With implementation in S*. New York: Springer-Verlag.
- IAB (2011). Jeder fünfte Geringqualifizierte ist arbeitslos. *IAB-aktuell*, 10.02.2011.
- Jaenichen, U. and Stephan, G. (2011). The effectiveness of targeted wage subsidies for hard-to-place workers. *Applied Economics*, 43(10):1209–1225.
- Jovanovic, B. (1979). Job matching and the theory of turnover. *Journal of Political Economy*, 87(5):972–990.

- Katz, L. F. (1998). Wage subsidies for the disadvantaged. In Freeman, R. and Gottschalk, P., editors, *Generating Jobs: How to Increase Demand for Less-Skilled Workers*, pages 21–53. Russell Sage.
- Lüdemann, E., Wilke, R., and Zhang, X. (2006). Censored quantile regressions and the length of unemployment periods in west germany. *Empirical Economics*, 31(4):1003–1024.
- Mangan, J. and Trendle, B. (2008). Surviving apprenticeship training: a duration analysis of apprenticeship contracts in Australia. *The Journal of Interdisciplinary Economics*, 19:379–398.
- Mantel, N. and Haenszel, W. (1959). Statistical aspects of the analysis of data from retrospective studies of disease. *Journal of the National Cancer Institute*, 22(4):719–748.
- Mohrenweiser, J. and Zwick, T. (2009). Why do firms train apprentices? The net cost puzzle reconsidered. *Labour Economics*, 16:631–637.
- Mohrenweiser, J., Zwick, T., and Backes-Gellner, U. (2011). Poaching and firm sponsored training: First clean evidence. Leading House Working Paper No. 51.
- Muehleemann, S., Ryan, P., and Wolter, S. C. (2013). Monopsony power, pay structure and training. *Industrial and Labor Relations Review*, forthcoming.
- Oreopoulos, P. (2007). Do dropouts drop out too soon? Wealth, health and happiness from compulsory schooling. *Journal of Public Economics*, 91:2213–2229.
- Oulton, N. and Steedman, H. (1994). The british system of youth training: A comparison with germany. In Lynch, L. M., editor, *Training and the Private Sector*. University of Chicago Press.
- Rosenbaum, P. R., editor (2002). *Observational Studies*. Springer series in statistics, New York, 2nd edition.
- Rosenbaum, P. R. and Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1):41–50.
- Rosenbaum, P. R. and Rubin, D. B. (1985). Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *The American Statistician*, 39(1):33–38.
- Rubin, D. B. (1974). Estimating causal effects to treatments in randomised and nonrandomised studies. *Journal of Educational Psychology*, 66:688–701.
- Ryan, P. (2001). The school-to-work transition: A cross-national perspective. *Journal of Economic Literature*, 39(1):34–92.

- Ryan, P., Backes-Gellner, U., Teuber, S., and Wagner, K. (2013). Apprentice pay in Britain, Germany and Switzerland: Institutions, market forces, market power. *European Journal of Industrial Relations*, forthcoming.
- Schönfeld, G., Wenzelmann, F., Dionisius, R., Pfeifer, H., and Walden, G. (2010). *Kosten und Nutzen der dualen Ausbildung aus Sicht der Betriebe*. Bundesinstitut für Berufsbildung.
- Schöngen, K. (2003). Lösung von Ausbildungsverträgen - schon Ausbildungsabbruch? *ibv*, Nr. 25.
- Steedman, H. (2001). Benchmarking apprenticeships: Uk and continental europe compared. CEP Discussion Papers No. 513.
- Wenzelmann, F., Schönfeld, G., Pfeifer, H., and Dionisius, R. (2009). Betriebliche Berufsausbildung: Eine lohnende Investition für die Betriebe. BiBB Report 8|09, Bonn.
- Winkelmann, R. (1996). Employment prospects and skill acquisition of apprenticeship-trained workers in Germany. *Industrial and Labor Relations Review*, 49(4):658–672.
- Wolter, S. C. and Ryan, P. (2011). Apprenticeship. In Hanushek, E. A., Machin, S. J., and Woessmann, L., editors, *Handbook of the Economics of Education*, volume III B, pages 521–576. Elsevier Science, Amsterdam.
- Wolter, S. C. and Schweri, J. (2002). The cost and benefit of apprenticeship training: The Swiss case. *Konjunkturpolitik*, 48:347–367.

Figures and tables

Table 4: Most frequent occupations chosen among participants and non-participants

rank	occupations among participants	percentage share	occupations among non-participants	percentage share
1	office clerk	7.8%	merchant	7.3%
2	merchant	7.6%	office clerk	6.5%
3	hairdresser	5.8%	salesperson	5.5%
4	salesperson	4.9%	motor car technician	3.5%
5	motor car technician	4.5%	hairdresser	3.3%

Note: Columns two and four show the ranked occupations among participants and non-participants. Columns three and five show the respective shares of these occupations within the group of participants or non-participants. Data is weighted

Table 5: Differences in mean between participants and non-participants

	mean value parti- cipants	mean value non- particip- ants	t-values
educational, social, and economic background			
secondary education			
lower secondary degree	0.53	0.34	9.95
intermediate secondary degree	0.37	0.42	-2.43
higher secondary degree	0.07	0.21	-12.82
German grade	3.03	2.90	3.68
Maths grade	3.03	3.05	-0.55
socio-economic and family background differences			
disability	0.01	0.03	-4.03
migration background	0.12	0.09	2.25
financial problems or debts	0.14	0.10	2.70
psychological or addiction problems	0.05	0.06	-2.10
recipients of social benefits	0.17	0.15	1.12
having a boy-/girlfriend	0.33	0.32	0.50
living with parents	0.74	0.74	0.15
search strategy			
number of applications	35.56	42.05	-2.88
number of job interviews	5.90	6.70	-2.18
applications were not succesful	0.48	0.46	0.94
another applicant was favoured	0.31	0.36	-1.37
grades were not good enough	0.38	0.33	1.61
sent applications too late	0.10	0.10	0.01
job search channels			
newspaper advertisement/internet	0.770	0.810	-2.64
contact to former employer	0.550	0.480	3.62
inquiry at the employment agency	0.790	0.870	-4.90
job fairs	0.340	0.390	-2.76
employer offered position	0.450	0.340	5.84
labour market status after three months			
in initial apprenticeship	0.980	0.960	2.43
jobbing/new apprenticeship/internship	0.000	0.000	-0.37
jobless, seeking work	0.010	0.020	-0.96
further training, military/alternative service	0.000	0.010	-1.65
exit from labour market	0.000	0.010	-2.45
labour market status after six months			
in initial apprenticeship	0.940	0.920	2.09
jobbing/new apprenticeship/internship	0.000	0.010	-2.60
jobless, seeking work	0.040	0.040	-0.76
further training, military/alternative service	0.020	0.020	-0.83
exit from labour market	0.010	0.010	-1.20

Differences (continued)

	mean value parti- cipants	mean value non- participants	t-values
labour market status after twelve months			
in initial apprenticeship	0.880	0.870	0.27
jobbing/apprentice/internship	0.030	0.030	-0.54
jobless, seeking work	0.070	0.050	1.59
further training, military/alternative	0.020	0.020	-1.50
service			
exit from labour market	0.010	0.020	-1.59
biography since leaving school			
time between school and	32.05	27.61	4.16
apprenticeship (months)			
further schooling/evening classes	0.090	0.060	2.73
vocational school	0.400	0.340	2.80
basic vocational education year (BGJ)	0.220	0.120	5.85
job preparing year (BVJ)	0.210	0.200	0.50
basic training (EQ/EQJ)	0.170	0.160	0.87
job preparing training (BvB)	0.250	0.290	-2.38
job application training	0.330	0.290	2.17
occupational orientation course	0.110	0.120	-0.75
language course	0.010	0.030	-3.96
temporary extra job (employment	0.060	0.050	0.88
agency)			
other measures provided by	0.030	0.020	0.40
employment agency			
longer internship (several weeks)	0.510	0.490	1.41
shorter internship (several days)	0.400	0.340	3.08
started different apprenticeship	0.230	0.240	-0.43
jobbing	0.490	0.440	2.36
military or compulsory community	0.090	0.100	-1.31
service			
volunteer work	0.040	0.050	-1.43
more than 4 weeks vacation	0.180	0.180	-0.09
more than 4 weeks abroad	0.070	0.060	0.06
done nothing for a while	0.450	0.450	-0.24
searched for	0.770	0.780	-0.45
apprenticeship/employment			

Note: Column one depicts mean values among subsidized apprentices, column two depicts mean values among still eligible but unsubsidised apprentices. We conduct a two-sample mean-comparison test. The third column shows the respective t-values. Data is weighted.

Table 7: Destination of apprentices who dropped out

	percentage of participants	percentage of non- participants	t-value
after three months			
working, another apprenticeship, internship	8.4%	6.4%	0.23
unemployed, searching for work	65.0%	50.6%	1.05
further education, military-/civil service	19.3%	24.4%	-0.45
not related to the labour market	7.4%	18.3%	-1.39
after six months			
working, another apprenticeship, internship	4.0%	10.9%	-1.93
unemployed, searching for work	56.9%	49.3%	0.94
further education, military-/civil service	26.8%	25.3%	0.21
not related to the labour market	12.3%	14.6%	-0.42
after twelve months			
working, another apprenticeship, internship	22.2%	24.3%	-0.46
unemployed, searching for work	54.1%	40.4%	2.43
further education, military-/civil service	13.7%	19.7%	-1.48
not related to the labour market	10.0%	15.6%	-1.56

Note: Column two and column three show the percentage among subsidised and unsubsidised apprentices who dropped out, respectively. The table distinguishes three time points: three months, six months and twelve months after apprenticeship has started. The figures denote the status at three months, six months and twelve months after apprenticeship has started for the group of apprentices who dropped out until three months, until six months, and until twelve months, respectively. We conduct a two-sample mean-comparison test for each category. The third column shows t-values. Data is weighted.

Table 8: Initiative to dropout of apprenticeship

	mean value parti- cipants	mean value non- participants	t-value
Initiation to dropout of apprenticeship by ...			
the apprentice	46%	46%	0.09
the firm	22%	32%	-2.58
both in mutual consent	17%	15%	0.56
firm closure	9%	5%	1.92
The apprenticeship was not aborted, but finished.	1%	1%	0.29
did not answer	5%	1%	
	100%	100%	

Note: Column one depicts mean values among subsidised apprentices, column two depicts mean values among still eligible but unsubsidised apprentices. We conduct a two-sample mean-comparison test. The third column shows the respective t-values.

Table 9: Reasons for dropout of apprenticeship

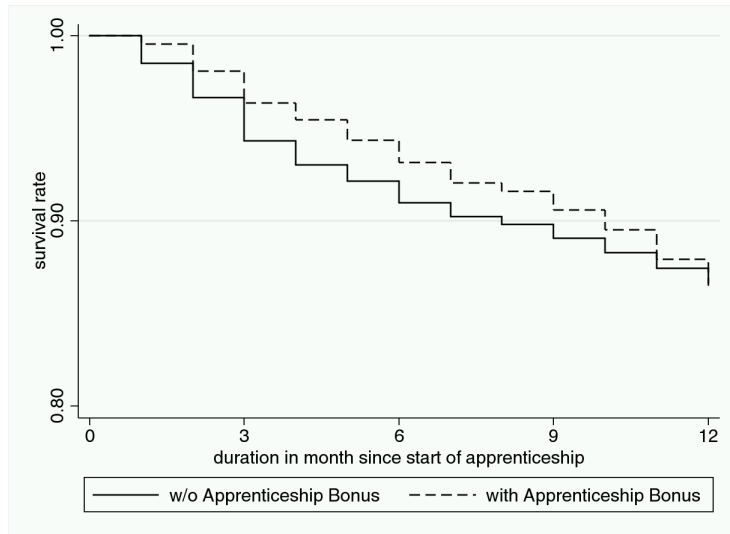
	mean value parti- cipants	mean value non- participants	t-value
general conditions			
unfavourable location of apprenticeship	5%	7%	-0.7
unfavourable working hours	12%	6%	1.4
wage too low	3%	11%	-2.94
lack of support by the firm	9%	6%	0.91
personal preferences			
no interest in apprenticeship	8%	7%	0.14
occupation did not meet expectations	18%	18%	0.11
conflicts with colleagues/supervisor	34%	23%	1.68
found or prospective different			
job/apprenticeship/ treatment	3%	7%	-1.5
other personal reasons	5%	4%	0.44
health			
health problems due to apprenticeship	12%	6%	1.47
health problems unrelated to apprenticeship	1%	8%	-3.41
own accomplishments			
apprenticeship was too easy/difficult	2%	5%	-1.33

Note: Column one depicts mean values among subsidised apprentices, column two depicts mean values among still eligible but unsubsidised apprentices. We conduct a two-sample mean-comparison test. The third column shows the respective t-values. Data is weighted.

Table 10: Cumulative failure and monthly hazard rates among participants and non-participants

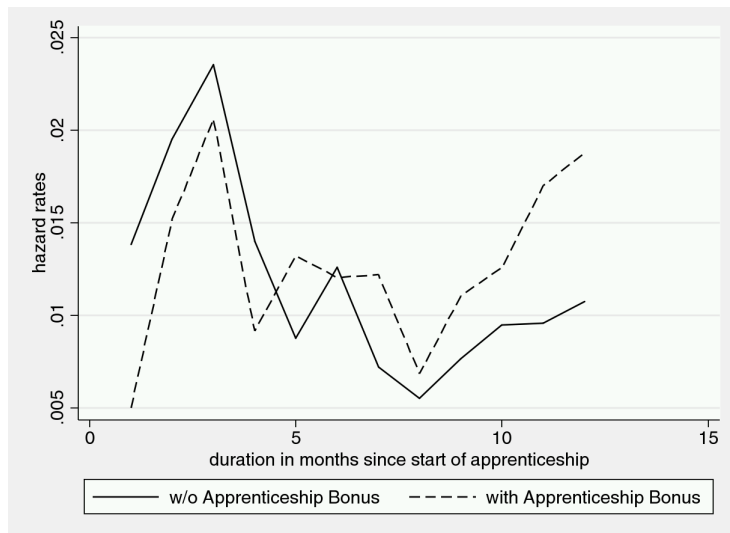
Monthly interval	Number of observations	Cum. Failure	Std. Error	Hazard	Std. Error
w/o Apprenticeship Bonus					
1 2	3200	0.014	0.002	0.014	0.002
2 3	3156	0.033	0.003	0.020	0.003
3 4	3095	0.055	0.004	0.024	0.003
4 5	3023	0.068	0.005	0.014	0.002
5 6	2981	0.077	0.005	0.009	0.002
6 7	2955	0.088	0.005	0.013	0.002
7 8	2918	0.095	0.005	0.007	0.002
8 9	2897	0.100	0.005	0.006	0.001
9 10	2881	0.107	0.006	0.008	0.002
10 11	2859	0.115	0.006	0.010	0.002
11 12	2832	0.123	0.006	0.010	0.002
12 13	2805	0.133	0.006	0.011	0.002
with Apprenticeship Bonus					
1 2	800	0.005	0.003	0.005	0.003
2 3	796	0.020	0.005	0.015	0.004
3 4	784	0.040	0.007	0.021	0.005
4 5	768	0.049	0.008	0.009	0.004
5 6	761	0.061	0.009	0.013	0.004
6 7	751	0.073	0.009	0.012	0.004
7 8	742	0.084	0.010	0.012	0.004
8 9	733	0.090	0.010	0.007	0.003
9 10	728	0.100	0.011	0.011	0.004
10 11	720	0.111	0.011	0.013	0.004
11 12	711	0.126	0.012	0.017	0.005
12 13	699	0.143	0.012	0.019	0.005

Figure 2: Survival rates in apprenticeship for participants and non-participants



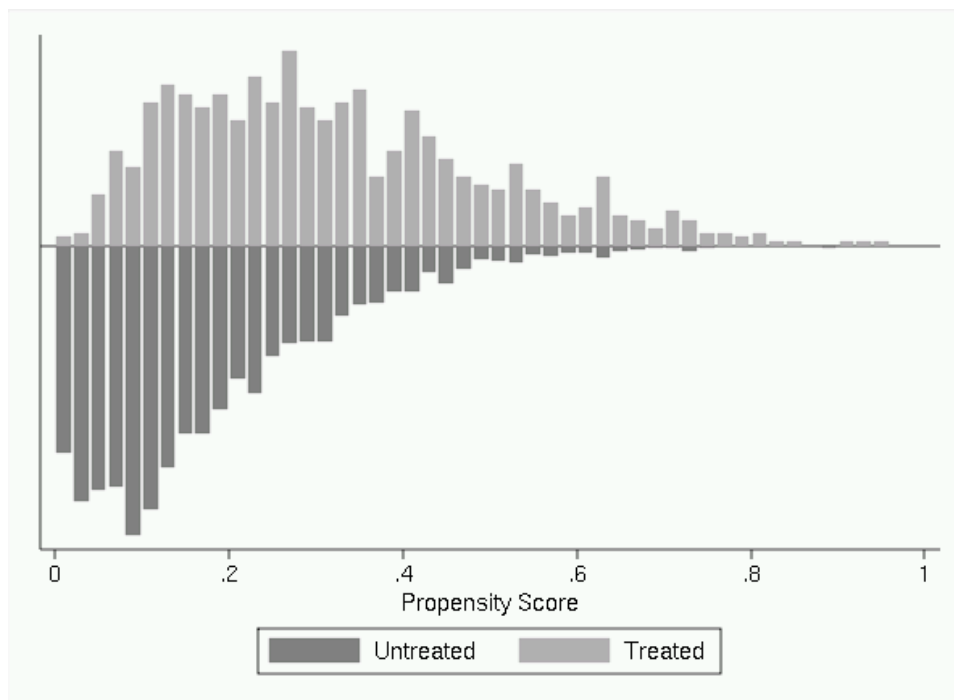
Note: The graph depicts survival rates in apprenticeship for every month since apprenticeship has started. The survival rates are estimated Kaplan-Meier survivor functions. The solid line shows survival rates for apprentices without Apprenticeship Bonus. The dashed line shows survival rates for apprentices with Apprenticeship Bonus.

Figure 3: Hazard rates out of apprenticeship for participants and non-participants



Note: The graph depicts survival rates in apprenticeship for every month since apprenticeship has started. The survival rates are estimated Kaplan-Meier survivor functions. The solid line shows survival rates for apprentices without Apprenticeship Bonus. The dashed line shows survival rates for apprentices with Apprenticeship Bonus.

Figure 4: Different distributions of estimated propensity scores for apprentices with and without Apprenticeship Bonus



Note: The graph depicts from the centre line upwards the histogram of propensity scores for apprentices with Apprentices Bonus. The graph depicts from the centre line downwards the histogram of propensity scores for apprentices without Apprentices Bonus.