

Improving Formal Qualifications or Firm Linkages- What Supports Successful School-to-Work Transitions among Low-Achieving School Leavers in Germany?

Holtmann, Anne Christine; Ehlert, Martin; Menze, Laura; Solga, Heike

Postprint / Postprint

Zeitschriftenartikel / journal article

Zur Verfügung gestellt in Kooperation mit / provided in cooperation with:

Wissenschaftszentrum Berlin für Sozialforschung (WZB)

Empfohlene Zitierung / Suggested Citation:

Holtmann, A. C., Ehlert, M., Menze, L., & Solga, H. (2021). Improving Formal Qualifications or Firm Linkages-What Supports Successful School-to-Work Transitions among Low-Achieving School Leavers in Germany? *European Sociological Review*, 37(2), 218-237. <https://doi.org/10.1093/esr/jcaa047>

Nutzungsbedingungen:

Dieser Text wird unter einer Deposit-Lizenz (Keine Weiterverbreitung - keine Bearbeitung) zur Verfügung gestellt. Gewährt wird ein nicht exklusives, nicht übertragbares, persönliches und beschränktes Recht auf Nutzung dieses Dokuments. Dieses Dokument ist ausschließlich für den persönlichen, nicht-kommerziellen Gebrauch bestimmt. Auf sämtlichen Kopien dieses Dokuments müssen alle Urheberrechtshinweise und sonstigen Hinweise auf gesetzlichen Schutz beibehalten werden. Sie dürfen dieses Dokument nicht in irgendeiner Weise abändern, noch dürfen Sie dieses Dokument für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, aufführen, vertreiben oder anderweitig nutzen.

Mit der Verwendung dieses Dokuments erkennen Sie die Nutzungsbedingungen an.

Terms of use:

This document is made available under Deposit Licence (No Redistribution - no modifications). We grant a non-exclusive, non-transferable, individual and limited right to using this document. This document is solely intended for your personal, non-commercial use. All of the copies of this documents must retain all copyright information and other information regarding legal protection. You are not allowed to alter this document in any way, to copy it for public or commercial purposes, to exhibit the document in public, to perform, distribute or otherwise use the document in public.

By using this particular document, you accept the above-stated conditions of use.

Holtmann, Anne Christine; Ehlert, Martin; Menze, Laura; Solga, Heike

Article — Accepted Manuscript (Postprint)

Improving Formal Qualifications or Firm Linkages- What Supports Successful School-to-Work Transitions among Low-Achieving School Leavers in Germany?

European Sociological Review

Provided in Cooperation with:

WZB Berlin Social Science Center

Suggested Citation: Holtmann, Anne Christine; Ehlert, Martin; Menze, Laura; Solga, Heike (2021) : Improving Formal Qualifications or Firm Linkages-What Supports Successful School-to-Work Transitions among Low-Achieving School Leavers in Germany?, European Sociological Review, ISSN 1468-2672, Oxford University Press, Oxford, Vol. 37, Iss. 2, pp. 218–237, <http://dx.doi.org/10.1093/esr/jcaa047>

This Version is available at:

<http://hdl.handle.net/10419/248116>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Improving Formal Qualifications or Firm Linkages-What Supports Successful School-to-Work Transitions among Low-Achieving School Leavers in Germany?

Anne Christine Holtmann*, Martin Ehlert, Laura Menze and Heike Solga

*Corresponding author. Email: anne.holtmann@wzb.eu

Abstract

Many countries have implemented youth (un)employment programmes for low-achieving young people to improve their employment prospects. In Germany, these youths are often channelled into prevocational programmes to prevent them from long-term 'scars' by providing a 'second chance' to enter apprenticeships (serving as entry into the labour market in Germany). However, the usefulness of these programmes is contested. It remains unclear whether it is (more) useful for young people to invest in education and improve formal qualifications (to send a positive 'signal') or to spend more time in firms (e.g. to counteract possible discrimination processes or to generate new network ties). It is also unclear who benefits most depending on previous school-leaving certificates. We address these questions by using rich data from the German National Educational Panel Study and apply entropy balancing as a matching approach to control for selection. We find that both attaining a higher school certificate and spending time in firms improve low-achieving youth's chances to enter apprenticeships. However, only those who attained a higher-level school certificate are able to enter higher-status training occupations afterwards. Moreover, prevocational programmes are most beneficial for the most disadvantaged.

Introduction

All affluent countries are struggling to improve the employment prospects of young people who leave school with low levels of skills and education. These 'lowachievers' are particularly vulnerable given the need for skills and qualifications in modern labour markets. They are at high risk of never completing postsecondary education and of performing poorly on the labour market as adults. Hence, countries have implemented various youth employment programmes to improve these young people's school-to-work transitions and employment opportunities. Not only but especially in times of economic recessions, like after the

financial crisis in 2007, stakeholders at the national and supranational level consider participation in educational programmes as an important means to combat youth unemployment and to prevent long-term 'scars' (e.g. Commission of the European Communities, 2009; OECD, 2012). Given the foreseeable economic repercussions of the current COVID-19 pandemic, such debates about what can be done for youth labour market entrants in general and those with a low qualification in particular will certainly reignite. However, to assess the potential of education, it is important to understand whether, and which,

Originally published in:

European Sociological Review, Vol. 37 (2021), Iss. 2, p. 218

educational youth programmes can improve the labour market integration of low-skilled or poorly qualified youth.

From a life-course perspective, we know that disadvantages at an early stage have strong impacts on later life outcomes (DiPrete and Eirich, 2006; Mayer, 2009). Accordingly, we observe that youth unemployment or, more broadly, NEET (not in employment, education or training) episodes in early careers increase the risk of long-term ‘scars’, for example, in terms of long-term socioeconomic marginalization, unwanted pregnancies, or health problems (e.g. Coles *et al.*, 2002; Bell and Blanchflower, 2009; OECD, 2010). The question is, however, whether educational programmes for school leavers are capable of improving the labour market and training opportunities of low-skilled youth, given that they already had difficulties in learning at school. Perhaps programmes that establish a direct connection with firms and less emphasize further training are therefore more suitable. However, the problem with this strategy is that it requires a sufficient number of firms to take on these young people. Thus, youth employment programmes for low-achievers are theoretically salient for understanding how states can facilitate school-to-work transitions and reduce inequality at labour market entry.

The existing literature is divided concerning the impact of youth employment programmes on the labour market outcomes of low-achieving youth: some studies find no or even negative effects on labour market outcomes, while some studies report positive effects (see reviews by Heckman, Lalonde and Smith, 1999; Crépon and van den Berg, 2016; Kluve *et al.*, 2017). Existing research lacks, first, systematic comparisons between different programme strategies, that is, targeting on education and improving the school certificates or generating firm linkages for participants. Second, it ignores heterogeneity within the low-achieving group and does not examine effect heterogeneity, that is, who benefits most from such programmes: the most disadvantaged participants or the more advantaged participants among the low achievers? Third, it does not examine the job quality achieved after programme participation. These are the subjects of our study. We investigate the impact of participation in Germany’s prevocational programmes (the country’s major youth unemployment intervention) on low-achievers’ chances to enter apprenticeship positions. With regard to generalizability, it should be emphasized that the German training serves as an entry into the labour market and accordingly functions like a labour market (Protsch and Solga, 2016).

The German data allow us to study not only whether low-achieving school leavers’ participation in prevocational programmes improves their chances to enter apprenticeship positions, but also the under-researched question whether it is (more) beneficial for them to upgrade their school certificate in mostly school-based programmes or to generate firm linkages by participating in firm-based training programmes. Related to this, we also examine whether prevocational programmes improve participants’ chances of entering higher-status training occupations—an aspect that has far-reaching consequences for young people’s future careers, especially in occupational labour markets like in Germany (DiPrete *et al.*, 1997; Hillmert, 2002). Thus, beyond the German case, our study contributes new insights on the more general theoretical question of whether potential discrimination processes owing to employers’ uncertainty about the trainability of low-achieving school leavers can be (more) successfully counteracted by more education, that is, helping these young people to acquire new educational certificates as positive ‘signals’, or by allowing employers to get to know and to screen those young adults.

In our study, we analyse rich longitudinal data from the German National Educational Panel Study (NEPS) for a cohort of young people who attended grade 9 in 2010. This data set includes extensive information that is often unobserved in other studies, such as data on competencies, social skills, and aspirations. Moreover, unlike most existing studies, we account for the large regional variation in the apprenticeship and youth labour market by linking regional information to our data. We apply entropy balancing (Hainmüller, 2012) as a matching approach to account for a large number of observables influencing selection into prevocational programmes.

Low Achievers and Prevocational Programmes in Germany

We provide a short overview of the different options that low-achieving youth in Germany have after leaving general schooling depending on their school certificates. In Germany, students who do not continue general schooling until the end of upper secondary education and who do not obtain a university entrance qualification (*Abitur*) can leave school at the end of lower secondary education (usually after grade 10) with various certificates: a lower secondary certificate, an extended lower secondary certificate, and an intermediate certificate. They may also drop out without any school certificate. In our article, we focus on low-achieving school

leavers. In the German context, this group can be defined as students who leave the general school system without an intermediate school certificate (Solga, 2004, 2017). This group somewhat resembles the group of 'early school leavers' in other countries. According to this definition, about 25 per cent of school leavers were low achievers in 2012¹ (Autorengruppe Bildungsbericht-erstattung, 2014: p. 273).

For young people who do not move on to university, participation in three-year apprenticeship programmes that train students for a wide variety of skilled blue- and white-collar occupations is a typical phase in the school-to-work transition.² Importantly, it also structures subsequent employment opportunities and career prospects: more than 60 per cent of apprenticeship graduates remain employed by the company that trained them (Autorengruppe Bildungsberichterstattung, 2014: p. 290). Although most apprenticeship programmes do not have formal entry requirements, the apprenticeship market is competitive: young people apply for apprenticeship positions, and employers select their apprentices from the pool of applicants. Low-achieving school leavers often lose out in this competition. Unsuccessful applicants can reapply for the next apprenticeship year (i.e. 1 year later).

For those who are unable to enter an apprenticeship, Germany has introduced prevocational programmes. Because participation in some form of education is compulsory until at least age 18, these young people usually cannot directly enter the labour market. Therefore, nearly all low-achieving school leavers who do not enter an apprenticeship have to participate in prevocational programmes—regardless of their own motivation to do so. Moreover, the type of programme they participate in is not so much a matter of 'choice'; rather they are assigned by the employment agency office. Over the last decades, about 50 per cent of low-achieving school leavers entered such prevocational programmes (at least once) after leaving school (Protsch and Solga, 2016).

What the various prevocational programmes have in common is they do not lead to a recognized occupation-specific qualification (as apprenticeships do) or to a university entrance qualification (*Abitur*). Instead, they are meant as bridges into apprenticeship positions (Ulrich, 2008). They usually last 1 year and can include a wide range of components such as skills training, career guidance, and application writing support. In our paper, we focus on two main strategies that prevocational programmes use to improve participants' access to apprenticeship positions. The first focuses on education. It gives participants the opportunity to obtain a first or higher school-leaving

certificate³. The second strategy is to provide placements in firms; in these programmes attending vocational schools is often limited to one or two days per week. Such firm-based programmes improve participants' occupational orientation (without upgrading their school certificates) and serve as an extended screening period for the employers who provide apprenticeship positions.

Previous Research

Research on the impact of prevocational programmes on future entry into apprenticeship positions in Germany is both scarce and inconclusive: Kübler, Schmid and Stüber (2019) found positive effects, whereas others found no effects (see Ulrich, 2006, 2011; Rahn, Fuhrmann and Hartkopf, 2017). International research, too, is inconclusive about the effects of youth training and employment programmes: For the US, most studies draw negative conclusions about such programmes (e.g. Greenberg, Michalopoulos and Robins, 2003; Heckman *et al.*, 1999), but some are positive or mixed (e.g. Fein and Hamadyk, 2018). Studies on European and other countries often report that such programmes have modest to major positive effects on subsequent employment prospects (e.g. Blundell *et al.*, 2004; De Giorgio, 2005; Dorsett, 2006; Ehlert, Kluge and Schaffner, 2012; Crépon and van den Berg, 2016; Attanasio *et al.*, 2017).

Evidence regarding the question of what is (more) beneficial for improving participants' labour market prospects—increasing their educational attainment or providing direct linkages to firms—is also inconclusive and difficult to systematize because of the enormous diversity of programmes in terms of structure, content, duration, and governing actors across and within countries. For Germany, some studies show that programme participants who attained a higher school-leaving certificate have higher chances of subsequently entering an apprenticeship position than those participants who did not attain a higher-level school certificate (e.g. Beicht, 2009; Skrobánek, Reissig and Müller, 2011; Beicht and Eberhard, 2013; Geier und Braun, 2014; Méliani, Mokhonko and Nikolaus, 2019; Menze and Holtmann, 2019). At the same time, German studies that examined firm-based prevocational programmes or long-term internships for low-achieving students indicate that such firm linkages can increase the likelihood of subsequently entering apprenticeship positions (Ulrich, 2011; Baas *et al.*, 2012; Solga and Kohlrausch, 2013). However, comparisons of these different programme philosophies within a single study are very rare, and the existing studies only compare among participants but not with a

control group of non-participants (e.g. Méliani *et al.*, 2019; Menze and Holtmann, 2019).

Similarly, research on which group of participants benefits most from such programmes is scarce: For employment programmes in the US, experimental evidence suggests that the most disadvantaged low-skilled participants benefit *least* (Heckman *et al.*, 1999: p. 2060; for a European study, see Hämäläinen, Hämäläinen and Tuomala, 2014). In contrast, for Germany, Beicht (2009) and Buhr and Müller (2008) report that the more disadvantaged participants benefit *most*.

Finally, previous research has primarily focused on programme effects on *access* to employment per se; few empirical studies look at programme effects on *job quality* (Caliendo and Schmidt, 2016). While Heckman, Lalonde and Smith (1999: p. 2053) find that active labour market programmes seem to increase young people's chances of transitioning into the labour market but not into higher-income jobs, Kluve *et al.* (2017) report that some programme types seem to improve participants' chances of gaining access to higher-quality jobs.

Theoretical Considerations and Hypotheses

Like regular labour markets, apprenticeship markets are competitive matching markets—they match applicants to vacant apprenticeship positions. According to signalling theories (Spence, 1974) and job competition theories (Thurow, 1979; Sørensen and Kalleberg, 1981), individuals with lower school attainment or skills are ranked lower in the applicant queue and are thus less likely to be selected for vacant apprenticeship positions.

This is also true for the highly stratified German apprenticeship market (see Protsch, 2014; Protsch and Solga, 2016). Training occupations range from occupations that would be classified as low-skilled or semi-skilled jobs in other countries (e.g. shop assistants or cleaners) up to occupations that would be taught at higher (tertiary) education institutions (e.g. bank and insurance clerks or IT specialists). For the latter, firms usually only hire applicants with a university-entrance qualification (*Abitur*). But even in the lower-skilled training occupation segment, low-achieving school leavers are competing with school leavers with intermediate school certificates (the typical school certificate for apprentices in Germany). Moreover, less-educated applicants might be ranked lower or screened out entirely from the applicant pool (e.g. Solga, 2004; Holtmann, Menze and Solga, 2017). Employers may not regard them as trainable (yet), especially when training programmes include a demanding school-based part with subjects like math and

German as it is the case in the German dual system. Studies show that employers would rather leave training positions vacant than hire low-achieving adolescents—even if there is a shortage of higher-achieving applicants (Gericke, Krupp and Troltsch, 2009). Those who left school without any certificate should be especially affected by such sorting-out processes, while those who at least obtained a lower secondary school certificate might still be considered as potential candidates but lose out in the competition against school leavers with intermediate school certificates.

Based on these considerations, we envisage two opposing effects of prevocational programmes: prevocational programmes may *improve* low-achieving school leavers' chances of being selected into the pool of 'potential' applicants and may help students to improve their rank in the queue by equipping them with a better school-leaving certificate or with general and vocational skills that act as signals of trainability (Lehmann *et al.*, 2005; Weißeno *et al.*, 2016; Behrendt, Nickolaus and Seeber, 2017). In contrast, employers may perceive participation in prevocational programmes as a signal of low skills and motivation because it indicates that participants did not manage to enter an apprenticeship directly but needed remedial education and support (Heckman, Hsueh and Rubinstein, 2000). If this is true, programme participation may actually *decrease* participants' chances of accessing apprenticeship positions.

A combined view of these two competing arguments suggests that the effects of prevocational programmes may not be the same for all educational groups, even within the group of low achievers. Prevocational programmes may signal some improvement in trainability for all low-achieving school leavers but may especially offset the widespread perception among employers that the least qualified do not meet the demands of an apprenticeship (e.g. Solga, 2004). We therefore hypothesize the following:

Hypothesis 1: Prevocational programmes improve the chances of entering an apprenticeship position.

Hypothesis 2: Prevocational programmes are more beneficial for school leavers without a certificate than for those with a lower secondary school certificate.

Next, we turn to differences between types of prevocational programmes. One way to improve apprenticeship prospects is to give participants the opportunity to attain a higher school certificate. Research on Germany has repeatedly demonstrated that school leavers' chances of accessing apprenticeship positions are highly dependent on their school-leaving certificate, even within the low-achieving group (Ulrich, 2006, 2011; Kleinert

and Jacob, 2013; Protsch, 2014; Holtmann *et al.*, 2017). As those who leave school without a certificate are especially disadvantaged in this respect, attaining a certificate during prevocational programmes should be more beneficial for these school leavers than for those who had a certificate prior to the programme.

Another way to improve apprenticeship opportunities is to create strong firm linkages: Spending time in firms gives low-achieving youth the opportunity to show their skills to employers (Solga and Kohlrausch, 2013; Pallais, 2014). This extended screening period for employers may counteract negative signalling and discrimination processes due to low school certificates or poor grades. Additionally, spending time in firms may also enhance participants' motivation and vocational skills and/or improve youths' application and search behaviour for apprenticeship positions. Long-term workplace immersion gives participants insights into certain jobs or occupations and young people will develop new ties to employers and employees. These screening, motivation and network mechanisms might therefore improve low-achieving youth's training opportunities when participating in firm-based programmes.⁴

Based on these considerations, we hypothesize for both types of programmes:

Hypothesis 3: Participants who attained a higher school-leaving certificate via prevocational programmes improve their chances of entering an apprenticeship position, especially those who left school without a school certificate.

Hypothesis 4: Prevocational programmes with a strong firm linkage improve low-achieving school leavers' chances of entering an apprenticeship position, especially for those with no or the lowest school certificates.

In contrast, participants who spend little time in firms and do not attain a higher school-leaving certificate during prevocational programmes may not improve their chances or may have lower chances of entering apprenticeship positions afterwards than those with firm linkage or certificates.

Finally, in addition to raising the chances of entering apprenticeship positions, prevocational programmes may help participants enter apprenticeships of higher quality. This would ultimately improve their employment and career prospects. In this respect, the various prevocational programme strategies might be beneficial in different ways. Those who upgrade their level of school attainment during prevocational programmes may gain new opportunities to access more attractive training occupations compared to those who enter the apprenticeship market without a

(higher) certificate for two reasons: first, participants with an upgraded certificate might apply for apprenticeships in 'better' occupations than they would have done with their lower school attainment directly after leaving school. Second, even if their occupational aspirations do not change, they might achieve better ranks in the applicant queue. These two mechanisms should apply to participants with upgraded school certificates, regardless of their initial school leaving certificate.

By contrast, participants in prevocational programmes with a strong firm linkage may experience a substantial improvement in their chances of accessing apprenticeship positions but at the price of being channelled into low-skilled training occupations. This is because the firm-based part is usually spent in small companies such as shops, restaurants, hairdressers, repair businesses or manufacturing (GIB/IAB, 2011), because, among other things, here low-skilled work tasks can also be performed by youth without training. The other side of the coin is, however, that these firms often only offer apprenticeship positions located rather in the lower occupational segment of the apprenticeship market.

We also do not expect access to higher-status occupations for those who neither spent a considerable amount of time in firms nor attained a higher certificate. Taken together, we hypothesize:

Hypothesis 5: Only participants who attained a higher school-leaving certificate via prevocational programmes improve their chances of accessing higher-status training occupations. We expect this irrespective of participants' school-leaving certificate when entering the prevocational programme.

To conclude, if our hypotheses are supported, this would suggest that both formal qualifications and firm linkages are a means of reducing employers' uncertainty about the trainability of these low-achieving youths. Both do so through different mechanisms, namely via signalling (trust in educational certificates) and on-the-job screening (facilitating observation of actual behaviour, motivation enhancement, or improved networks), respectively. Moreover, if hypothesis 5 is supported, they have different consequences for the placements in the occupational stratification system.

Data and Methods

Data and Sample

We use data from the German National Educational Panel Study (NEPS) on a cohort of students who attended grade 9 in German secondary schools in fall

2010 and have been surveyed once or twice each year since then (Blossfeld, Roßbach and von Maurice, 2011; Leuze, Ludwig-Mayerhofer and Solga, 2011). We restrict our sample to low-achieving youth who left the general school system at the end of lower secondary education after grade 9 or 10—that is, to respondents who obtained no more than an extended lower secondary certificate (see section *Low Achievers and Prevocational Programmes in Germany*).

The NEPS data are particularly suitable for our study because they provide the unique opportunity to undertake within-group comparisons, owing to a quite large sample of low-achieving school leavers. The NEPS data oversampled students from lower secondary schools and from special-needs schools for students with learning disabilities, making it one of the very few (German and international) data sets to include a large group of students with learning disabilities. This is particularly important for our study, as these students make up a substantial proportion of low-achieving school leavers, especially of those without a school-leaving certificate (see Powell, 2006). We include 1,316 low-achieving school leavers who participated in prevocational programmes in the fall directly after leaving general schooling in our analyses and compare them to a control group of recent low-achieving school leavers (see below). The total sample includes 3,367 low-achieving school leavers. The reported descriptive information in the *Results* section accounts for the NEPS sampling design and panel attrition by using weights (for details see Steinhauer and Zinn, 2016).

Dependent Variables

To test our hypotheses, we analyse two dependent variables: (i) entry into an apprenticeship position⁵ and (ii) the occupational status of the training occupation entered for those participants who do enter an apprenticeship. We use this second outcome variable as an indicator of the attractiveness or skill level of training occupations, which we measure using the International Socio-Economic Index of Occupational Status (ISEI, coding scheme of 2008) with a theoretical range from 10 to 90 (Ganzeboom, 2010: p. 13). Compared to alternative measures (e.g. occupation-specific wages or unemployment risk), the ISEI has the advantage of measuring the relative position of occupations in a relatively time-independent manner, meaning it is less contingent on economic conditions.

Independent Variables

We differentiate low-achieving youth by their school-leaving certificates: no certificate, lower secondary certificate, or

extended lower secondary school certificate. For participation in prevocational programmes⁶, we distinguish between three groups: (i) participants who attained a first or a higher certificate during their prevocational programme, (ii) participants who did not attain a first or higher certificate but spent a considerable amount of time in firms during their prevocational programme, and (iii) participants who neither attained a higher certificate nor experienced a strong firm linkage. This last group also includes participants who attended a prevocational programme that offered the opportunity to obtain a higher certificate but failed to complete this certificate.⁷ To identify firm linkages, we use self-reported information on how much time participants spent in firms during the whole programme. If respondents report having spent at least half of their time in a firm, we define this as a strong firm linkage.

Analytical Strategy

We are interested in the effect of attending a prevocational programme on the chances of entering an apprenticeship position and on the ISEI of the training occupation. However, estimating this effect is challenging: those who enter prevocational programmes are usually those who did not manage to enter an apprenticeship. They have poorer application behaviour and career orientation, lower school-leaving certificates, lower grades, and fewer parental resources (Holtmann *et al.*, 2017). Given this selectivity of participation, simple comparisons between participants and non-participants are not very informative.

We therefore understand participation in prevocational programmes as a ‘treatment’ (in a broader sense, as ‘intent-to-treat’) and aim to estimate a somewhat more credible causal effect of this treatment on the two dependent variables. We focus on the ‘average treatment effect on the treated’ (ATT), because we are interested in the effect of the programmes on those who typically enter them. To identify this effect, we need a ‘control group’ that approximates the counterfactual situation, namely what would have happened to participants had they not pursued the programmes. We use school leavers directly after leaving school (hereafter called recent school leavers) as the comparison group, because at that time, none of the school leavers has yet entered a prevocational programme. To account for selectivity, we apply entropy balancing that weights the control group such that it becomes comparable to the programme participants on a wide range of observables such as career aspirations, skills, school certificates, parental background and regional youth labour market conditions.

Although there might still be unobserved factors, our approach leads to an underestimation of the effects because programme participants have weaker skills and certificates and are more disadvantaged than those who enter an apprenticeship directly after leaving school. In the following, we discuss our analytical strategy and possible alternatives in more depth.

Designing an appropriate comparison group is not easy. Comparing prevocational participants to youths who did something other than a prevocational programme after leaving school, such as being unemployed or working, is not an appropriate strategy because most of them are under 18, an age at which some form of education is still compulsory in Germany (see section *Low Achievers and Prevocational Programmes in Germany*). Existing studies for Germany therefore use prevocational programme dropouts or other rather negative comparison groups, which probably inflates the positive impact of prevocational programmes (e.g. Beicht and Ulrich, 2008; Plicht, 2016). Moreover, some studies only use the characteristics of participants *after* prevocational programmes to design the control group (i.e. post-treatment measures), and thus do not identify the total programme effect (e.g. Ulrich, 2006, 2011).

To credibly and realistically approximate the ATT, we compare our treatment group to young people right after leaving school. This is a meaningful comparison group because both programme participants and school leavers aim to enter apprenticeships. They thus face similar decisions. Ideally, we would like to observe apprenticeship market entry for the school leavers at the same time as for the prevocational participants. This is not possible with the NEPS data because we only have one cohort of school leavers. Yet, we adjust for differences in labour market circumstances (see below). We therefore use the whole initial school leaving cohort, including those who enter the prevocational programmes, as a control group. Figure 1 illustrates our approach. We compare the training chances of prevocational participants after leaving the programmes—that is, about 1 year after leaving school (t_1 in Figure 1)—to the chances in the initial school-leaving cohort at the time of leaving school (t_0 in Figure 1), that is, before the prevocational programme. By design, participants in prevocational programmes are also part of the control group (at t_0), as the entire cohort consists of non-participants at that time point. The consideration of the same person at different points in time is not uncommon in statistical models; all panel regression models rely on this strategy. Moreover, this comparison is the most meaningful and realistic counterfactual situation (namely, what would have happened without participation in prevocational

programmes). As a robustness check, we also split the sample randomly so that the treatment cases are not in the control group at t_0 (for details see *Results* section).

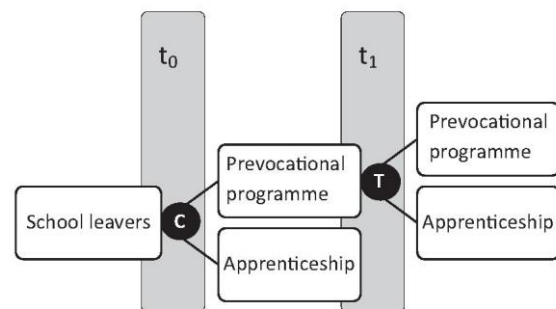


Figure 1. Empirical strategy of defining treatment group (T) and control group (C).

Notes: t_0 = directly after leaving general schooling, t_1 = directly after prevocational programme participation.

To account for selectivity into (different) prevocational programmes, we apply entropy balancing (Hainmüller, 2012). This method calibrates weights that balance the treatment and the control group on included covariates. When applying these weights, the differences between the groups in the included variables disappear, rendering the groups conditionally independent for these covariates. Since we are interested in the ATT, we reweight the control group so that it becomes similar to the respective treatment group. In our design, we compare the outcomes of programme participants at t_1 to matched non-participants at t_0 .

One may think of seemingly more obvious analytical strategies, such as fixed-effects or difference-in-difference (DiD) estimations. However, due to our data structure, methods to control for unobserved time-constant individual-specific heterogeneity would not lead to meaningful results: fixed-effects estimation would lead to an estimate that is equal to the percentage of programme participants entering apprenticeships at t_1 . This is because the percentage entering apprenticeships is zero at t_0 for the treatment group, because they all enter a prevocational programme and not an apprenticeship. Moreover, since the control group is likely to be positively selected, modelling the counterfactual apprenticeship probabilities (i.e. the probability of entering an apprenticeship without programme participation) by using the initial school leaving cohort as described above is much more conservative than fixed-effects estimation. Furthermore, DiD is not feasible because the control group (of the ‘untreated’) would not experience any

Table 1. Variables used to balance the control group.

Variable	Operationalization	Time of measurement
<i>School attainment</i>		
School-leaving certificate	Certificate at time of leaving general schooling: extended lower secondary certificate, lower secondary certificate, no certificate (incl. 'certificate' from special-needs schools)	At time of leaving general schooling
GPA school-leaving certificate	Average grade on school-leaving report (if no certificate attained: average grade point in Mathematics and German from the latest semester report), scaled from 1 (worst) to 6 (best grade)	At time of leaving general schooling
Special-needs school	Attended special-needs school for learning disabilities, 1 = yes, 0 = no (mainstream school)	At time of leaving general schooling
<i>Cognitive basic skills</i>		
Reasoning skills (z-standardised)	Matrices test assessing reasoning (NEPS-MAT; Lang <i>et al.</i> , 2014)	9th grade
Perceptual speed (z-standardised) ^a	Picture Symbol Test assessing perceptual speed (NEPS-BZT; Lang <i>et al.</i> , 2014)	9th grade
<i>Social skills</i>		
Prosocial behaviour (z-standardized)	Strength and Difficulties Questionnaire, subscale (SDQ; Bayer, Ditton and Wohlkinger, 2012)	9th grade
Conscientiousness ^b (z-standardised)	The two items of the 10-item short version (called BFI-10) of the well-known Big Five inventory (NEO-FFI; Rammstedt and John, 2007)	9th grade
Global self-esteem ^b (z-standardised)	German adaptation of Rosenberg's self-esteem scale (von Collani and Herzberg, 2003)	9th grade
<i>Vocational aspirations and application behaviour</i>		
Applied for apprenticeship position(s) ^a	Item: 'Have you ever applied for an apprenticeship position?' (retrospectively), 1 = yes, 0 = no	In fall after leaving general schooling
Originally planned starting an apprenticeship ^a	Item: 'Now we'd like to know what you wanted to do after school: did you want to start an apprenticeship right after school?', 1 = yes, 0 = no	In fall after leaving general schooling
<i>Social background</i>		
Parents' highest vocational degree ^a	Highest degree among parents; 0 = no vocational degree, 1 = vocational degree, 2 = tertiary degree	Parents' surveys, if missing, information from the target person ^c
Parental employment ^a	0 = no parent employed, 1 = one parent employed, 2 = both parents employed	(See parents' highest vocational degree)
Parents' highest, most recent occupational status	International Socio-Economic Index of Occupational Status (ISEI-08)	(See parents' highest vocational degree)
<i>Local context</i>		
Local youth unemployment rate	Youth unemployment rate (16 to <20 years) at municipality level (<i>Gemeinde</i>)	Year of leaving general schooling (after grade 9: 2011, after grade 10: 2012) or after prevocational programme

(continued)

Table 1 (Continued)

Variable	Operationalization	Time of measurement
<i>Socio-demographics</i>		
Gender	1 = girl, 0 = boy (reported by the school)	9th grade
Migration background	Target or both parents born abroad; 1 = yes, 0 = no	(See parents' highest vocational degree)
Age ^a	Age when leaving general schooling	At time of leaving general schooling

^az-standardized: mean = 0, SD = 1.

^bVariables only used in matching for the analyses of the probability of entering an apprenticeship, not for the analyses of the occupational status (ISEI) of the training occupation entered.

^cVariables only used for robustness checks because they are unavailable for special-needs schools (see *Results* section).

^dParents' response rate was too low for using their information as only source for social background.

change: For them, the event of interest (entry into apprenticeship training) already happened at t_0 .

The NEPS data provide us with an exceptionally wide range of covariates for entropy balancing. We include information on school attainment, social background, and socio-demographics but also information that is often unobserved in other studies, such as data on cognitive and social skills, vocational aspirations, and application behaviour (see Table 1). We can therefore address more possible confounders than previous studies. The distribution of the covariates for our sample of programme participants and the control group is shown in Table A1 in the Appendix. To enable comparisons between different school-leaving certificates, we further include interactions between the covariates and school-leaving certificates in our entropy balancing. To control for potential variations in labour market conditions at the time of leaving general schooling (t_0) and of completing prevocational programmes (t_1), we also include fine-grained regional information about youth unemployment at the local municipality level in the matching.

Our analytical strategy aims to capture the total ATT of prevocational programmes. Thus, the effects comprise all developments that occur during programme participation (such as attaining a higher school-leaving certificate). To do so, we balance the covariates in the treatment and control groups at t_0 . Thus, we use information in the treatment group (prevocational participation) at the time of leaving general schooling *before* the programme starts (t_0) and weight the control group accordingly.

When we investigate the effect of prevocational programmes on the ISEI of the training occupation, we can only include those who entered an apprenticeship. Because this reduces the number of cases, we encounter convergence issues in the entropy-balancing algorithm in this second analysis. To solve this problem, we balance the control group on a reduced set of covariates, as indicated in

Table 1, but we continue to include all major dimensions (school attainment, cognitive and social skills, social background, socio-demographics, and local context). These results therefore have to be treated with somewhat more caution.

To estimate the effect of the different prevocational programmes, we compare the weighted means of the dependent variables in the treated group and in the control group. We test for significant differences using t-tests with clustered standard errors, because we use information from the same individuals at different points in time. Assuming that the conditional independence assumption holds after balancing, we can interpret the differences as approximations of causal effects of prevocational programme participation.

Finally, to deal with item non-response, we use multiple imputations to fill in the missing values. We generate 20 imputations for each missing value using the iterated chained equations algorithm in Stata 15.⁸ The prediction equations include the dependent variable, all variables used for entropy balancing (see Table 1) and some further variables.⁹ To avoid bias, we drop the cases with imputed dependent variables from our analyses (von Hippel, 2007). We apply entropy balancing separately for each of the 20 imputations, mirroring the separate estimations for each imputed data set. We then estimate the test statistics for each imputation separately and combine the results applying Rubin's rules (Rubin, 1987). We also conduct several robustness checks, which we will explain in more detail at the end of the *Results* section to avoid redundancy.

Results

The share of low achievers who are able to enter apprenticeship positions directly after leaving school varies substantially by school-leaving certificate: 9 per cent of school leavers without a certificate, 40 per cent of those

Table 2. Effect of prevocational programme participation on the probability of entering an apprenticeship position, by school-leaving certificate at time of leaving general schooling (t_0).

	M1 All	M2 No certificate	M3 Lower secondary certificate	M4 Extended lower secondary certificate
Prevocational participation	0.179*** (0.016)	0.321*** (0.029)	0.147*** (0.022)	0.082* (0.034)
Constant	0.313*** (0.008)	0.090*** (0.012)	0.358*** (0.012)	0.480*** (0.017)
N individuals	3,367	585	1,713	1,069
N total	4,683	931	2,402	1,350

N total includes prevocational participants twice (see section Analytical Strategy). Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Source: NEPS SC4, SUF 9.0.0, own calculations.

with a lower secondary certificate, and 53 per cent of those with an extended lower secondary certificate. Instead, the majority of school leavers without a certificate enrol in prevocational programmes in the fall after leaving school (76 per cent); the same is true of a substantial number of school leavers holding a lower secondary certificate (48 per cent) or an extended lower secondary certificate (31 per cent).¹⁰

To find out how prevocational programme participation influences transitions into apprenticeship positions, we start by testing our hypotheses 1 to 4 on access to training and then turn to hypothesis 5 concerning the differences in the occupational status of the training occupations entered.

Access to Apprenticeship Positions

Table 2 shows the estimated average treatment effect on the treated (ATT) of prevocational programmes on access to apprenticeships. Model 1 shows that programme participants have a higher probability of entering an apprenticeship position than the control group of recent school leavers. Assuming that our entropy balancing rendered the two groups comparable, we estimate an ATT of almost 18 percentage points. This is a substantial difference compared to the baseline probability of about 31 per cent in the control group (as indicated by the constant term in Model 1, Table 2). Apparently, participation in prevocational programmes moves low-achieving school leavers into the applicant pool considered by firms or moves them forward in the applicant queue compared to recent school leavers. This is support for hypothesis 1.

To test hypothesis 2, we differentiate within the low-achieving group by school-leaving certificate at the time

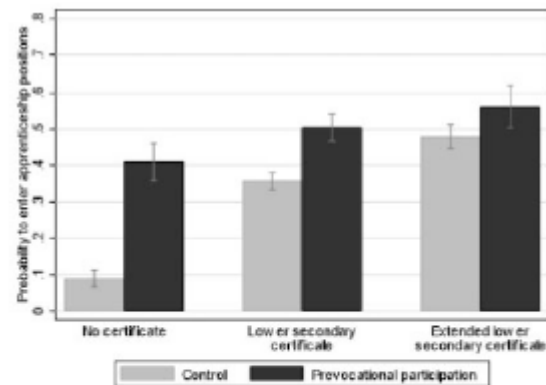


Figure 2. Predicted probabilities to enter an apprenticeship position, by school-leaving certificate at time of leaving general schooling (t_0) and prevocational programme participation.

Notes: Calculations based on Models 2 to 4 in Table 2. Source: NEPS SC4, SUF 9.0.0, own calculations.

of leaving general schooling (t_0). Models 2 to 4 in Table 2 suggest that a large part of this total effect is due to improvements in apprenticeship chances for school leavers without a certificate. Prevocational programmes improve the chances in this sub-group enormously (by 32 percentage points). Participants who left school with an (extended) lower certificate, by contrast, benefit less from the programmes, as Models 3 and 4 reveal (Table 2). Additional analyses show that the difference between those with and without a certificate is statistically highly significant ($p < 0.001$). This is in line with hypothesis 2.

Figure 2 shows that the differences in effect sizes between the certificate groups are mainly due to large differences in the adjusted control groups. In the control

Table 3. Effect of prevocational programme participation on the probability of entering an apprenticeship position, by school-leaving certificate at time of leaving general schooling (t_0) and group of participants.

	Improved certificate			Firm linkage			Neither		
	M1 No	M2 Low	M3 Ext	M4 No	M5 Low	M6 Ext	M7 No	M8 Low	M9 Ext
Prevocational participation	0.405*** (0.061)	0.188*** (0.041)	0.104 (0.059)	0.370*** (0.044)	0.211*** (0.038)	0.103 (0.057)	0.218*** (0.042)	0.104*** (0.030)	0.066 (0.049)
Constant	0.102*** (0.015)	0.344*** (0.015)	0.446*** (0.021)	0.096*** (0.013)	0.362*** (0.013)	0.534*** (0.019)	0.078*** (0.011)	0.353*** (0.012)	0.463*** (0.018)
N individuals	585	1,713	1,069	585	1,713	1,069	585	1,713	1,069
N total	656	1,886	1,149	729	1,905	1,149	710	2,030	1,188

No – no certificate; Low – lower secondary certificate; Ext – extended lower secondary certificate.

N total includes prevocational participants twice (see section *Analytical Strategy*). Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: NEPS SC4, SUF 9.0.0, own calculations.

group, only 9 per cent of school leavers without a certificate enter an apprenticeship position. Those who have a lower secondary or an extended lower secondary certificate have much higher chances (36 per cent and 48 per cent, respectively).¹¹ The predicted probabilities of entering an apprenticeship position after participation in prevocational programmes, in contrast, are between about 40 per cent and 56 per cent. Thus, to some extent, the programmes equalize the chances of entering apprenticeship positions for the group of low-achieving school leavers by raising the chances of the most disadvantaged individuals, that is, of those who leave school without a certificate. Note, however, that even though prevocational programmes do improve low achievers' chances, about half of the participants still fail to enter an apprenticeship position.¹²

Next, we discuss the different types of prevocational programme participants: 26 per cent of all participants attained a first or a higher certificate during their prevocational programme, whereas 32 per cent did not attain a higher certificate during their prevocational programme but experienced a strong firm linkage. The largest group, however, are those who did neither—they did not attain a higher certificate or experience a strong firm linkage (42 per cent). Our analyses show that both attaining a higher certificate and experiencing a strong firm linkage benefits low-achieving school leavers (see Table 3). As demonstrated in Models 1 to 3, participants who attain a higher school-leaving certificate improve their chances compared to the counterfactual situation of non-participation in prevocational programmes (i.e. without upgrading their school-leaving certificate). Those with an extended lower secondary certificate are an exception; here, the effect is not significant. Again, we find the largest

benefits of these programmes for those who leave school without a certificate. These findings support our hypothesis 3. It is important to note, however, that the majority of participants who had the opportunity to attain a higher-level school certificate in their prevocational programme failed to complete such a certificate (66 per cent).

Models 4 to 6 (Table 3) show that the effects of spending a lot of time in firms during a prevocational programme on the probability to enter an apprenticeship position are similar to those of attaining a higher-level school certificate; again, the effect for those with an extended lower secondary certificate is not significant. This evidence supports hypothesis 4, yet again only for those who left school without a school certificate or only attained a lower one. Apparently, contacts with firms help some low achievers bypass the certificate-driven screening process by allowing them to demonstrate their cognitive and social skills directly to employers and/or by improving firm-based network resources.

Finally, Models 7 to 9 in Table 3 reveal that participants who did not improve their certificates or participate in programmes with a strong firm linkage (classified as 'neither') still benefit from prevocational programmes, albeit at a substantially lower level. We find significant effects for those who left school without a certificate (Model 7) or with a lower secondary certificate (Model 8) but, as in Models 3 and 6, not for those with an extended lower secondary certificate. For the latter group, it is possible that participating in a prevocational programme has no positive effect at all, but major negative effects are unlikely to occur either, given the standard error. Thus, prevocational programmes

might put this group on hold rather than improve their opportunities. In contrast, the positive effects of participation in prevocational programmes that we found for low-achieving school leavers who left school without any qualifications or with only a lower secondary certificate suggests that for them, these programmes presumably provide vocational orientation and ‘time to grow’ (Kübler *et al.*, 2019: p. 1466), which seem to be positively valued by firms.

Finally, to find out whether certificates and firm contacts significantly improve low achievers’ chances on the apprenticeship market compared to those participants who had neither, we conducted further analyses, adopting a strategy proposed by Lechner (2002). We only report the results here but do not present them in detail. We find significant differences between programmes with strong firm linkages and the ‘neither’ group but not compared to those who improved their certificate, although the size of the differences is also substantial here. Moreover, we only find this significant advantage of strong firm linkages among those who left school without a certificate or a lower secondary certificate but, again, not among those with an extended lower secondary certificate.

Occupational Status of the Training Occupation Entered

We now analyse whether participation in prevocational programmes also improves the occupational status of the training occupations entered. First of all, these analyses again reveal that participation in prevocational programmes generally does not have negative effects. Instead, Models 1 to 4 in Table 4 show that attaining a higher certificate during a prevocational programme helps low-achieving school leavers enter higher-status training occupations than those they would have entered directly after leaving school. Although the effect is not significant for those who left school without a certificate (probably because of low statistical power), the four-point increase is quite substantial, given that the mean ISEI for the control group is about 28. For the other two groups, we find a statistically significant increase of about five and six points (compared to a mean ISEI of about 31 and 33, respectively, in the control group). As expected in Hypothesis 5, none of the differences between the school-leaving certificates is statistically significant, as the small differences in the size of the coefficients and significance tests reveal. Accordingly, Figure 3 shows that the ISEI distributions of programme participants who attained a higher certificate generally shift to the right.

Table 4. Effect of prevocational programmes participation on ISEI of the entered training occupation, by school-leaving certificate at time of leaving general schooling (t_0) and group of participants.

	All	No	Low	Ext
Improved certificates	M1	M2	M3	M4
Prevocational participation	5.317***	4.287	5.968***	4.939*
	(1.138)	(2.749)	(1.522)	(1.996)
Constant	31.03***	28.02***	31.47***	32.73***
	(0.564)	(1.954)	(0.620)	(0.499)
N total	1,317	73	682	562
Firm linkage	M5	M6	M7	M8
Prevocational participation	0.168	-0.290	0.481	0.076
	(0.795)	(1.722)	(0.910)	(1.659)
Constant	29.17***	26.87***	28.78***	33.12***
	(0.533)	(1.538)	(0.389)	(0.645)
N total	1,377	101	708	568
Neither	M9	M10	M11	M12
Prevocational participation	0.204	-2.251	0.454	1.062
	(0.810)	(2.962)	(0.785)	(1.715)
Constant	30.05***	27.28***	29.66***	32.61***
	(0.535)	(2.878)	(0.403)	(0.554)
N total	1,392	72	741	579

No – no certificate; Low – lower secondary certificate, Ext – extended lower secondary certificate.

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: NEPS SC4, SUF 9.0.0, own calculations.

In contrast, we find no significant effects of programmes with a strong firm linkage (Models 5 to 8 in Table 4): These programmes do not improve the chances to enter higher-status training occupations but instead channel participants into the same low-skilled occupations they can enter directly after leaving school. This applies irrespective of the school-leaving certificate. Together with the results presented in Table 3, this result suggests that these firm experiences serve as a so-called stepping stone to low-status training occupations but not to higher-status occupations. The results reported in Table 4 are in line with hypothesis 5, which states that only obtaining a new certificate, but not a strong firm linkage, enables participants to enter higher-status training occupations.

The results for participants who neither improved their certificates nor spent much time in firms are somewhat inconclusive (Models 9 to 12 in Table 4). There are slightly negative coefficients for those without a certificate and slightly positive coefficients for those with

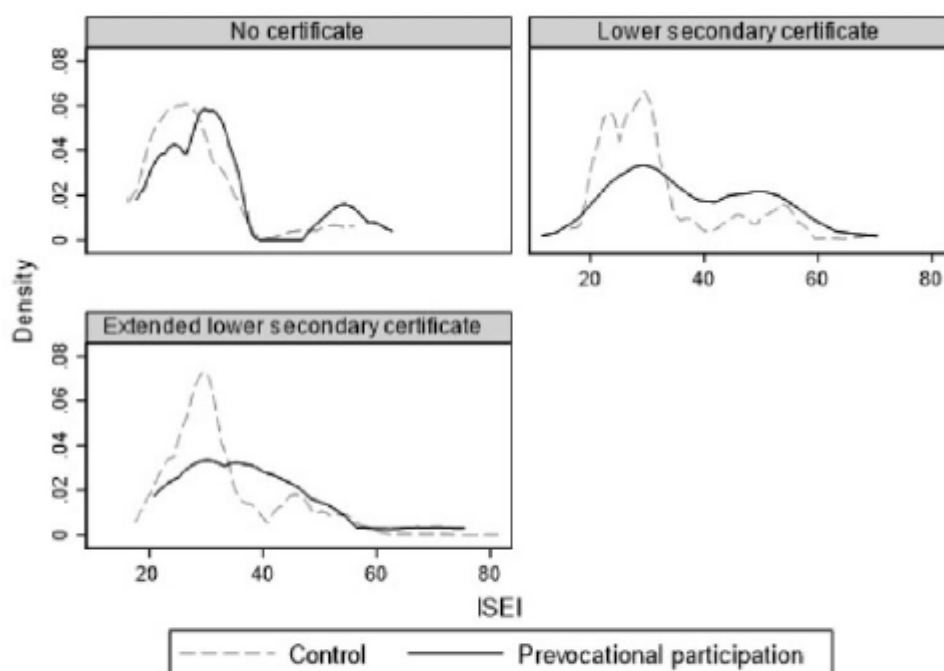


Figure 3. Kernel density estimates of ISEI scores of the entered training occupations for prevocational programme participants who improved their certificates and the control group, by school-leaving certificate at time of leaving general schooling (t_1).
 Source: NEPS SC4, SUF 9.0.0, own calculations.

an extended lower secondary certificate. Yet none of this is statistically significant. Together with the findings presented in Table 3, they suggest that such programmes only improve the chances of accessing lower-status training occupations but not higher-status occupations.

Robustness Checks

We conduct several robustness checks to test the validity of our results. First, we test whether our results depend on including programme participants twice. We therefore randomly split our entire sample into two subsamples and then draw the treatment group from one of the two samples and the control group from the other sample. The substantive results are similar to the ones presented in the paper, yet statistical power is reduced due to the smaller sample size (see Supplementary Table S1).

Next, we assess the influence of unobserved characteristics on our results (see also discussion in section *Analytical Strategy*). To estimate the influence of unobserved variables on our results, we apply a method developed by Oster (2019). The method provides a formalization of a common practice for robustness checks which is adding additional control variables and comparing the estimates of interest across models. Under the assumption that the added

variables are related to the unobserved factors, researchers can infer the severity of omitted variable bias from the coefficient movements. If coefficients remain largely unchanged after adding control variables, this is usually taken as evidence that unobserved factors related to the additional control variables do not matter. Oster (2019) argues that such statements can only be made if the coefficient movements are scaled by the change in explained variance. The method scales up coefficient changes if the added variables contribute little to the explained variance. The intuition behind this is that confounders that explain little variance also have a smaller impact on the coefficients of interest.

Based on these considerations, we estimate the potential impact of two unobserved factors that may be theoretically important confounders: (i) problems in the household (stress, inconsistent parenting) and (ii) students' psychological and behavioural problems (Kaiser, Li and Pollmann-Schult, 2019). Following Oster's considerations, we use our family background variables (parents' employment status and education) as proxies for household problems and our personality trait variables (prosocial behaviour, conscientiousness, and self-esteem) as proxies for youth's behaviour. These latter two factors were not included in the surveys in special-

needs schools; therefore, we exclude these students from our sample for this robustness check. We estimate our models without and with these variables (reduced and full model) and then use the coefficients and the explained variance to estimate the ratio of observed and unobserved factors δ that would be needed to reduce the observed treatment effect to zero. A δ of 1 would mean that observed and unobserved factors would have to be equally important to achieve this. Oster considers $|\delta|$ of larger than 1 as an indication that unobserved factors do not play a large role because they would have to be more important than the observed factors.¹³

Supplementary Table S2 presents the results using Oster's method and suggests that neither unobserved problems in the household nor unobserved behavioural problems are likely to bias our results concerning the training chances.¹⁴ For both analyses, the results show that the treatment effect is even larger in the full model than in the reduced model. This indicates that the treatment group is negatively selected. This is reflected in the negative values of the estimated δ . Accordingly, the unobserved factors would need to be negatively associated with the added variables, which is quite unlikely. The estimated δ furthermore show that the two sets of unobserved factors would need to be about three times and 1.7 times, respectively, more important than the observed factors to move the estimate of the treatment effect to zero.

Nevertheless, there might be other unobserved characteristics that we did not consider. First, we use regional variation in youth unemployment and assume that the treatment group is more positively selected in regions with high unemployment because some students may have to enter the programmes even though they are otherwise 'good' students (beyond the factors that we measure) due to lack of training opportunities. In contrast, in regions with low youth unemployment as a proxy for good training opportunities, school leavers who participate in prevocational programmes may have unmeasured unfavourable individual characteristics. Hence, the treatment effect should be larger in regions with high youth unemployment. However, we find that the treatment effect is even larger in regions with low youth unemployment (results in Supplementary Table S3). This is an indication that selection on unobserved traits does not change our results. Rather, the results seem to be driven by better opportunity structures for programme participants in regions with low youth unemployment once they have improved their trainability.

Another source of unobserved characteristics could be that not all programme participants considered entering

apprenticeships directly after leaving school and this may bias our results upwards. Some of them may have chosen to participate in prevocational programmes before entering apprenticeships in order to improve their training chances, and our control variables are unable to capture the processes behind this selection. We therefore recalculate the models including only those school leavers who actually applied for apprenticeships at t_0 and for whom entering prevocational programmes is thus involuntary. The results of this analysis are similar to the results in the main analyses (see Panel A, Supplementary Table S4). This indicates that our control variables capture the factors driving self-selection.

Finally, we assess a number of issues related to sample selection and measurement. Our observed positive effects may simply be because our programme participants are 1 year older than the control group. Accordingly, participation in prevocational programmes may only be beneficial because employers (and vocational schools) prefer older, and hence more mature, applicants. This could especially drive the positive results for those participants who neither improved their certificates nor spent much time in firms. In the analyses presented so far, we did not condition on age after prevocational programmes because of a possible bias: Older school leavers in the control group may have repeated a grade and may therefore be negatively selected on variables that we cannot control for. However, the results do not change after further adjusting the control group to match age after leaving prevocational programmes (see Panel B, Supplementary Table SA4). We also address this issue by including only respondents who dropped out of an apprenticeship position, and who were consequently older, as a control group. We then compare the situation of prevocational programme participants with the situation of the control group in the fall after they dropped out (i.e. at t_1). The results are similar to those presented above (see Panel C, Supplementary Table S4). However, it is unclear whether this is a good control group, since dropping out of an apprenticeship position results from various reasons, ranging from being dismissed because of low performance to leaving voluntarily in order to transfer to a different (better) training occupation.

Furthermore, school leavers from special-need schools for students with learning disabilities have very low chances of entering apprenticeships directly after leaving school. This is, among other things, because they are labelled as 'learning disabled' and often leave school without a school-leaving certificate (KMK, 2016). Thus, their very low chances in the control group might be a major reason for the positive effects of programme participation. Even though we already condition on school

type (mainstream vs. special-needs school) in the entropy balancing, we re-estimate the models by excluding school leavers from special-needs schools from the analysis (see Panel D, Supplementary Table S4). As expected, this decreases the effect size slightly among participants with no or only a lower secondary certificate (here, we are referring only to students from mainstream schools). Yet the effects remain substantively positive, indicating that our general conclusions are not driven by school leavers from special-needs schools.

Additionally, it is possible that the effects in our main analyses are only due to selection into the programmes and not due to the programmes' content. To address this, we exclude the participants who dropped out of the programme prematurely. The results without the drop-outs show even larger effects of participation than the results for the full sample, especially among youths with no certificates (see Panel E, Supplementary Table S4). This suggests that the effect we found in our main analysis is rather due to compliance with the treatment, that is, with staying in the programme, than because of possible positive selection into the programme.

Finally, we test for differences between those programme participants who had the possibility to upgrade their school-leaving certificate and actually did so and those who did not. The NEPS data provides self-reported information about the possibility of attaining a certificate at the beginning of the programme. When adding this information to the analysis, we find that those who were unable to upgrade their school-leaving certificate have slightly lower chances of entering an apprenticeship than those who did attain a (higher) certificate (except for those who left school without a certificate; see Supplementary Table S5). However, the differences between the coefficients are not significantly different from zero, as further analyses revealed. Still, when looking at the ISEI of the training occupation, we find that attaining a higher certificate in a programme significantly increases the socio-economic status of the training occupation (see Supplementary Table S6). These findings support our interpretation that attaining a higher certificate is only one way of improving low-achieving school leavers' chances of entering apprenticeship positions. But, among those who enter an apprenticeship, certificates largely govern the quality of the transition in terms of socio-economic position.

As a final note: We might not have ruled out all concerns about selectivity. However, Heckman, Lalonde and Smith (1999) and Card, Kluve and Weber (2010) show that the findings from non-experimental evaluations of active labour market programmes that use matching designs are

consistent with findings from experimental evaluations. Moreover, as shown above, our approach tends to underestimate the effect of prevocational programmes because participants in prevocational programmes are a negatively selected group.

Conclusions

Integrating youth with low education and skills into the labour market is a common challenge in affluent countries. It is still highly debated among policy makers and researchers whether youth employment programmes in general and which type of programmes in particular are able to improve low-achievers' labour market integration or whether such programmes mainly put young people on hold and hide youth unemployment. Especially in times of economic crises, the German apprenticeship system is praised for smoothing out school-to-work transitions and reducing youth unemployment (e.g. Scarpetta, Sonnet and Manfredi, 2010: p. 24). However, this system is competitive and serves as labour market entry; thus like in other countries, low-achieving youth face severe problems after leaving school. Instead of entering apprenticeship positions, they are often channelled into prevocational programmes—Germany's major youth unemployment interventions.

From both a policy and a theory point of view, a crucial question is: What is the better programme philosophy—improving low-achieving youths' formal qualification (education-focused programmes) or giving them the opportunity to spend time in firms (firm-based programmes)? We contribute to the existing literature by (i) comparing these different programme philosophies; (ii) studying effect heterogeneity within the low-achieving group, and (iii) applying entropy balancing as a matching approach to control for selectivity issues that could also be of interest for other countries.

Our analyses of Germany reveal that many low-achieving school leavers do benefit from participation in prevocational programmes, especially the most disadvantaged among them. From the life-course perspective, this is an interesting finding. Even in Germany's highly stratified education system, prevocational programmes *after* leaving school help reduce disadvantage at earlier stages and, thus, inequalities generated by the general school system. Moreover, programmes in which young people attain a higher school certificate allow participants to enter training occupations with a higher status. These findings suggest that the certificates, skills, and firm contacts acquired during prevocational programmes are recognized and valued by employers.

The positive impact of the school-leaving certificate attained during the programmes might not be unexpected, given their high importance on the German apprenticeship market. Yet we show that even in the credentialized German context, programmes that offer a strong firm linkage also help improve low achievers' school-to-work transitions. This likely occurs by reducing employers' uncertainties about these young people's actual skills. Employers can screen participants during the programmes and participants can improve their network resources. Yet the two programme philosophies differ with respect to job quality: only programmes that enable low-achieving youth to successfully upgrade their educational attainment improve both their general training chances and their chances to enter higher-skilled occupations. Beyond the German case, our findings suggest that employers' uncertainty about the trainability of school leavers with low formal qualifications can be reduced by different means: by educational programmes enabling low-achievers to attain a higher school certificate (serving educational signalling) or by firm-based programmes (serving as on-the-job screening).

In terms of policy implications, we also should note, however, that about half of the prevocational programme participants do not enter apprenticeship programmes afterwards. The vast majority of them enter a second prevocational programme, a low-skilled job, or unemployment. Nonetheless, even though the programmes do not help everyone, our analyses suggest that many low-achieving youth are better off afterwards than they would have been without the programmes.

Supplementary Data

Supplementary data are available at *ESR* online.

Notes

- 1 2012 is the year in which the 10th graders in our study left school.
- 2 Throughout the article, we use the term apprenticeship for training programmes both in the dual (firm-based) system and in the smaller school-based sector (for details see Protsch and Solga, 2016). The latter mainly trains candidates for white-collar occupations (e.g. nurses or kindergarten teachers). As admission often requires an intermediate school-leaving certificate, the school-based sector is less relevant to low-achieving school leavers.
- 3 It is important to note, however, that most participants fail to complete a certificate in these programmes (Dionisius and Illiger, 2016).
- 4 Moreover, low-achieving youths often have family members and friends who are less educated, non-

employed, or only employed in low-skilled jobs (Gasquet, 2004; Solga, 2008). Thus, another effect of firm-based programmes could be that they help reducing deficits in parental guidance and reputation. In our matching strategy (see *Data and Methods* section), we control for parental background characteristics. We therefore rather capture the screening, motivation and network mechanisms described above in our analysis.

- 5 We include firm- and school-based training programmes. We retrieve this information from the retrospective life-course information reported by respondents. As respondents sometimes had difficulties distinguishing between school, prevocational, and apprenticeship episodes, we edited this information under certain circumstances, using several sources of information on the content of these episodes available in the NEPS.
- 6 We consider all programme participants regardless of whether they completed the programme or dropped out early (21% of participants). We do so because participants may drop out for various reasons: they could have found an apprenticeship before the end of the programme or might not have managed to complete the programme. We address programme drop out in the robustness checks at the end of the *Results* section.
- 7 We address possible issues emerging from this categorization in the robustness checks at the end of the *Results* section.
- 8 This procedure fills in missing values using a set of linked prediction equations, which are run several times until the predicted values remain stable. We conduct the imputations in "wide format" to ensure that correlations within individuals at different points in time are accounted for. Given the large set of covariates, we have reason to believe that the missing values are missing at random (MAR) conditional on these covariates, which is the prerequisite for this imputation technique.
- 9 We additionally include type of school (detailed), math and reading skills (both are not available for special-needs schools and can therefore not be used in the main analyses), a summary measure of problematic social behaviour, realistic aspirations to enter regular vocational education and training (VET), time spent in firms during prevocational programme, possibility to attain a certificate during prevocational programme, drop-out of prevocational programme, and German state.
- 10 The remaining students reported an internship or being on parental leave, working, or unemployment.

- 11 Note that these figures differ from the descriptive statistics presented at the beginning of this section because they represent the estimated (weighted) counterfactual situation for the prevocational programme participants.
- 12 The majority of these participants re-enters a new prevocational programme (37 per cent). Two other large groups enter unemployment (22 per cent) or employment (20 per cent). The remaining participants report a gap (e.g. parental leave, homemaker, or vacation; 10 per cent), vocational school attendance (9 per cent), or voluntary social/military service (2 per cent).
- 13 To estimate this we also need a maximum value of R^2 (R_{max}) indicating how large we believe R^2 to be if we included all relevant variables. R_{max} is unlikely to be 1 because of measurement error and other idiosyncratic differences in the outcome that are unrelated to the treatment. To estimate R_{max} , we follow Oster's suggestion and multiply the R^2 of the full model by 2.2.
- 14 Note that the point estimate from the full model differs from model 1 presented in Table 2 because the Oster method requires covariate adjustment using linear regression while our main results rely on nonparametric matching. The difference between the estimates is likely due to less optimal model fit of the linear model. Furthermore, we only use the first imputation for the calculations because the treatment of multiple imputations is not included in the method so far (and possibly also not crucial because we are not interested in the standard errors here). We conducted the calculations using the Stata ado *psacalc*.

Acknowledgements

The paper was supported by the DFG – German Research Foundation (grant number: SO 430/8-1). This paper uses data from the National Educational Panel Study (NEPS): Starting Cohort 4–9th Grade, <http://dx.doi.org/10.5157/NEPS:SC4:9.0.0>. From 2008 to 2013, NEPS data were collected as part of the Framework Programme for the Promotion of Empirical Educational Research, funded by the German Federal Ministry of Education and Research (BMBF). Since 2014, the NEPS survey has been carried out by the Leibniz Institute for Educational Trajectories (LifBi) at the University of Bamberg in cooperation with a nationwide network.

References

- Attanasio, O. et al. (2017). Vocational training for disadvantaged youth in Colombia. *American Economic Journal: Applied Economics*, 9, 131–143.
- Autorengruppe Bildungsberichterstattung, (2014). *Bildung in Deutschland 2014*. Bielefeld: W. Bertelsmann Verlag.
- Baas, M. et al. (2012). "Kleben Bleiben?" Der Übergang von Hauptschüler/innen in eine berufliche Ausbildung. *Sozialer Fortschritt*, 10, 247–257.
- Bayer, M., Ditton, H. and Wohlkinger, F. (2012). *Konzeption und Messung sozialer Kompetenz im Nationalen Bildungspanel*. NEPS Working Paper No. 8. Bamberg: Otto-Friedrich-Universität.
- Behrendt, S., Nickolaus, and R., Seeber S. (2017). Entwicklung der Basiskompetenzen im Übergangssystem. *Unterrichtswissenschaft*, 45, 51–66.
- Beicht U. (2009). *Verbesserung der Ausbildungschancen oder sinnlose Warteschleife? BIBB Report 3/2011*. Bonn: Bundesinstitut für Berufsbildung.
- Beicht U. and Eberhard V. (2013). Ergebnisse empirischer Analysen zum Übergangssystem auf Basis der BIBB-Übergangsstudie 2011. *DDS - Die Deutsche Schule*, 105, 10–27.
- Beicht, U. and Ulrich, J. G. (2008). Ergebnisse der BIBB-Übergangsstudie. In Beicht, U., Friedrich, M. and Ulrich, J.G. (Eds.), *Ausbildungschancen und Verbleib von Schulabsolventen*. Bonn: Bundesinstitut für Berufsbildung, pp. 101–291.
- Bell, D. N. F. and Blanchflower, D. G. (2009). *What Should Be Done about Rising Unemployment in the OECD? IZA Discussion Paper No. 4455*. Bonn: IZA.
- Blossfeld, H.-P., Roßbach, H.-G. and von Maurice, J. (2011). *Education as a Lifelong Process: The German National Educational Panel Study (NEPS)*. Wiesbaden: Springer VS.
- Blundell, R. et al. (2004). Evaluating the employment impact of a mandatory job search. *Journal of the European Economic Association*, 2, 569–606.
- Buhr, P. and Müller, R. (2008). Wege in die Berufsausbildung. In: Reißig, B., Gaupp, N., Lex, T. (eds.). *Hauptschüler auf dem Weg von der Schule in die Arbeitswelt*. München: Deutsches Jugendinstitut, 118–135.
- Caliendo, M. and Schmidt, R. (2016). Youth unemployment and active labor market policies in Europe. *IZA Journal of Labor Policy*, 5, 1–20.
- Card, D., Kluve, J. and Weber, A. (2010). Active labour market policy evaluations. *The Economic Journal*, 120, 452–477.
- Coles, B. et al. (2002). Literature Review of the Costs of Being "Not in Education, Employment or Training" at Age 16–18. *Research Report 347*. Nottingham: Department for Education and Skills.
- Commission of the European Communities. (2009). *Consultation on the Future "EU 2020" Strategy. Commission Working Document*. Brussels.
- Crépon, B. and van den Berg, G. J. (2016). Active labor market policies. *Annual Review of Economics*, 8, 521–546.
- De Giorgio, G. (2005). The new deal for young people five years on. *Fiscal Studies*, 26, 371–383.

- Dionisius, R. and Illiger, A. (2016). Nachholen von Schulabschlüssen im Übergangsbereich. *BWP – Berufsbildung in Wissenschaft und Praxis*, 45, 4–5.
- DiPrete, T. et al. (1997). Collectivist vs. individualist mobility regimes? *American Journal of Sociology*, 103, 318–359.
- DiPrete, T. and Eirich, G. (2006). Cumulative advantage as a mechanism for inequality: a review of theoretical and empirical developments. *Annual Review of Sociology*, 32, 271–297.
- Dorsett, R. (2006). The newdeal for young people: effect on the labour market status of young men. *Labour Economics*, 13, 405–422.
- Ehlert, C., Kluge, J. and Schaffner, S. (2012). *Temporary Work as an Active Labor Market Policy*. IZA Discussion Paper No. 6670. Bonn: IZA.
- Fein, D. and Hamadyk, J. (2018). *Bridging the Opportunity Divide for Low-Income Youth*. OPRE Report #2018-65. Washington, DC: U.S. Department of Health and Human Services.
- Ganzeboom, H. B. G. (2010). *Occupational Status Measures for the New International Standard Classification of Occupations ISCO-08*. Paper presented at the Annual Conference of International Social Survey Programme, Lisbon.
- Gasquet, C. (2004). Young people with “no qualification”. *Céreq*, 58, 1–4.
- Geier, B. and Braun, F. (2014). Hauptschulabsolventinnen und -absolventen im Übergangssystem. *Zeitschrift für Berufs- und Wirtschaftspädagogik*, 110, 168–187.
- Gericke, N., Krupp, T. and Troeltsch, K. (2009). *Unbesetzte Ausbildungsplätze: warum Betriebe erfolglos bleiben*. BIBB Report 10/2009. Bonn: Bundesinstitut für Berufsbildung.
- GIB/IAB (2011). *Weiterführung der Begleitforschung zur Einstiegsqualifizierung (EQ)*. Berlin: Bundesministerium für Arbeit und Soziales.
- Greenberg, D. H., Michalopoulos, C. and Robins, P. K. (2003). A meta-analysis of government-sponsored training programs. *Industrial and Labor Relations Review*, 57, 31–53.
- Hainmüller, J. (2012). Entropy balancing for causal effects. *Political Analysis*, 20, 25–46.
- Hämäläinen, K., Hämäläinen, U. and Tuomala, J. (2014). *The Labour Market Impacts of a Youth Guarantee: Lessons for Europe? Vatt Working Papers No. 60*. Helsinki: Government Institute for Economic Research.
- Heckman, J. J., Lalonde, R. J. and Smith, J. A. (1999). The economics and econometrics of active labor market programs. In Ashenfelter, O.C. and Card, D. (Eds.), *Handbook of Labor Economics*. Volume 3a. Amsterdam: Elsevier, pp. 1866–2097.
- Heckman, J. J., Hsueh, J. and Rubinstein, Y. (2000). *The GED as a “Mixed Signal”*. Chicago: University of Chicago.
- Hillmert, S. (2002). Labour market integration and institutions: an Anglo-German comparison. *Work, Employment & Society*, 19, 675–701.
- Holtmann, A. C., Menze, L. and Solga, H. (2017). Persistent disadvantages or new opportunities? The role of agency and structural constraints for low-achieving adolescents’ school-to-work transitions. *Journal of Youth and Adolescents*, 46, 2091–2113.
- Kaiser, T., Li, J. and Pollmann-Schult, M. (2019). The reproduction of educational inequalities – do parenting and child behavioural problems matter? *Acta Sociologica*, 62, 420–439.
- Kleinert, C. and Jacob, M. (2013). Demographic changes, labor markets and their consequences on post-school-transitions in West Germany 1975–2005. *Research in Social Stratification and Mobility*, 32, 65–83.
- Kluge, J. et al. (2017). *Interventions to Improve the Labour Market Outcomes of Youth*. London: International Initiative for Impact Evaluation.
- KMK (2016). *Schüler, Klassen, Lehrer und Absolventen der Schulen 2006-2015*. Statistische Veröffentlichungen der Kultusministerkonferenz 211. Berlin: KMK.
- Kübler, D., Schmid, J. and Stüber, R. (2019). Take your time to grow: a field experiment on the hiring of youths. *German Economic Review*, 20, 1465–6485.
- Lang, F. R. et al. (2014). *Erfassung der fluiden kognitiven Leistungsfähigkeit über die Lebensspanne im Rahmen des Nationalen Bildungspanels*. NEPS Working Paper No. 43. Bamberg: Leibniz-Institut für Bildungsverläufe, Nationales Bildungspanel.
- Lechner, M. (2002). Program heterogeneity and propensity score matching. *The Review of Economics and Statistics*, 84, 205–220.
- Lehmann, R. H. et al. (2005). *Ulme I: Untersuchung der Leistungen, Motivation und Einstellungen zu Beginn der beruflichen Ausbildung*. Hamburg: Behörde für Bildung und Sport.
- Leuze, K., Ludwig-Mayerhofer, W. and Solga, H. (2011). The German national educational panel study. *Longitudinal and Life Course Studies*, 2, 346–355.
- Mayer, K. U. (2009). New directions in life course research. *Annual Review of Sociology*, 35, 413–433.
- Méliani, K., Mokhonko, S. and Nickolaus, R. (2019). Duale Maßnahmen und individuelle Förderung im Übergangssystem und ihre Effekte auf die Übergangswahrscheinlichkeit in vollqualifizierende Ausbildung und weiterführende Schulen. *Zeitschrift für Berufs- und Wirtschaftspädagogik*, 115, 218–253.
- Menze, L. and Holtmann, A. C. (2019). Was können Schulabgängerinnen und Schulabgänger ohne Mittleren Schulabschluss aus Übergangsmaßnahmen mitnehmen?. *Zeitschrift für Erziehungswissenschaft*, 22, 509–533.
- OECD (2010). *Off to a Good Start? Jobs for Youth*. Paris: OECD.
- OECD (2012). *Better Skills, Better Jobs, Better Lives. A Strategic Approach to Skills Policies*. Paris: OECD.
- Oster, E. (2019). Unobservable selection and coefficient stability: theory and evidence. *Journal of Business & Economic Statistics*, 37, 187–204.
- Pallais, A. (2014). Inefficient hiring in entry-level labor markets. *American Economic Review*, 104, 3565–3599.
- Plicht, H. (2016). Die ersten fünf Jahre nach einer berufsvorbereitenden Bildungsmaßnahme (BvB). *Sozialer Fortschritt*, 65, 142–151.
- Powell, J. J. W. (2006). Special education and the risk of becoming less educated. *European Societies*, 8, 577–599.
- Protsch, P. (2014). *Segmentierte Ausbildungsmärkte*. Opladen: Budrich UniPress.
- Protsch, P. and Solga, H. (2016). The social stratification of the German VET system. *Journal of Education and Work*, 29, 637–661.

- Rahn, S., Fuhrmann, C. and Hartkopf, E. (2017). Enttäuschte erwartungen? Lohnt sich die Bildungsbeteiligung in Bildungsgängen des Übergangsegments? *Zeitschrift für Berufs- und Wirtschaftspädagogik*, 113, 595–613.
- Rammstedt, B. and John, O. P. (2007). Measuring personality in one minute or less. *Journal of Research in Personality*, 41, 203–212.
- Rubin, D. B. (1987). *Multiple Imputation for Nonresponse in Surveys*. New York: John Wiley & Sons.
- Scarpetta, S., Sonnet, A. and Manfredi, T. (2010). *Rising Youth Unemployment during the Crisis*. Paris: OECD.
- Skrobanek, J., Reissig, B. and Müller, M. (2011). Successful placement or displacement in the transition from school to vocational training. *Journal of Youth Studies*, 14, 811–836.
- Solga, H. (2004). Increasing risks of stigmatization. Changes in school-to-work transitions of less-educated West Germans. *Yale Journal of Sociology*, 4, 99–129.
- Solga, H. (2008). Lack of training – the employment opportunities of low-skilled persons from a sociological and micro-economic perspective. In Mayer, K.U. and Solga, H. (Eds.), *Skill Formation – Interdisciplinary and Cross-National Perspectives*. Cambridge: Cambridge University Press, pp. 173–204.
- Solga, H. (2017). Bildungsarmut und Ausbildungslosigkeit in der Bildungs- und Wissensgesellschaft. In Becker, R. (Ed.), *Lehrbuch für Bildungssoziologie*. Wiesbaden: Springer VS, pp. 443–485.
- Solga, H. and Kohlrausch, B. (2013). How low-achieving German youth beat the odds and gain access to vocational training. *European Sociological Review*, 29, 1068–1082.
- Sørensen, A. B. and Kalleberg, A. L. (1981). An outline of a theory of matching persons to jobs. In Berg, I. (Ed.), *Sociological Perspectives on Labor Markets*. New York: Academic Press, pp. 49–74.
- Spence, M. A. (1974). *Market Signaling*. Cambridge, MA: Harvard University Press.
- Steinhauer, H. W. and Zinn, S. (2016). *NEPS Technical Report for Weighting: Weighting the Sample of Starting Cohort 4 of the National Educational Panel Study (Wave 1 to 6)*. Bamberg: Leibniz Institute for Educational Trajectories.
- Thurow, L. C. (1979). A job competition model. In Piore, M.J. (Ed.), *Unemployment and Inflation*. London: Routledge, pp. 17–32.
- Ulrich, J. G. (2006). Übergänge in das duale System der beruflichen Bildung. In Friedrich-Ebert-Stiftung (Ed.), *Übergänge zwischen Schule und Beruf und darauf bezogene Hilfesysteme in Deutschland*. Bonn: Friedrich-Ebert-Stiftung, pp. 21–36.
- Ulrich, J. G. (2008). Jugendliche im Übergangssystem – Eine Bestandsaufnahme. *Bwp@ Spezial*, 4, available from: <http://www.bwpat.de/ht2008/ws12/ulrich_ws12-ht2008_spezial4.pdf> (accessed 26 April 2018).
- Ulrich, J. G. (2011). *Übergangsverläufe von Jugendlichen aus Risikogruppen*. *bwp@ Spezial*, 5, 26–2018.
- von Collani, G. and Herzberg, P. Y. (2003). Eine revidierte Fassung der deutschsprachigen Skala zum Selbstwertgefühl von Rosenberg. *Zeitschrift für differentielle und diagnostische Psychologie*, 24, 3–7.
- von Hippel, P. T. (2007). Regression with missing ys: an improved strategy for analyzing multiply imputed data. *Sociological Methodology*, 37, 83–117.
- Weißeno, S. et al. (2016). Development of mathematical competency in different German pre-vocational training programmes of the transition system. *Empirical Research in Vocational Education and Training*, 8.

Anne Christine Holtmann is a postdoctoral researcher at the WZB Berlin Social Science Center in the project 'New opportunities or reinforced disadvantages? Variation in returns to low-achieving school leavers' participation in pre-vocational training measures'. Her research interests are focused on social inequalities, education, families, social policy, and the transition into the labour market.

Martin Ehlert is head of the research group 'National Educational Panel Study: Vocational Training and Lifelong Learning' at the WZB Berlin Social Science Center. His research interests include social inequality and mobility, lifelong learning and education, technological change, unemployment, and gender.

Laura Menze is a postdoctoral researcher at the WZB Berlin Social Science Center in the research group 'National Educational Panel Study: Vocational Training and Lifelong Learning'. Her research interests include school-to-work transitions, occupations, and social inequality.

Heike Solga is head of the research unit 'Skill Formation and Labor Markets' at the WZB Berlin Social Science Center and Professor of Sociology at the Freie Universität Berlin. She is principal investigator in the German National Education Panel Study (NEPS), co-heading the NEPS stage 'From Vocational Training to the Labor Market'. Her research focuses on inequality in skills formation and labour markets with a special focus on low-achieving youth and workers.

Appendix

Table A1. Sample characteristics by group of prevocational programme participants and control group at the time of leaving general schooling (t_0) (column percentages or means [standard deviations], not weighted). Parental highest, most recent occupational status (ISEI)

Variable	Improved certificate	Firm linkage	Neither	Control group of recent school leavers
<i>School attainment</i>				
School-leaving certificate				
No certificate	22%	35%	22%	17%
Lower secondary	53%	46%	57%	51%
Extended lower secondary	25%	19%	21%	32%
GPA school-leaving certificate	4.2 [0.04]	4.0 [0.04]	3.9 [0.03]	4.1 [0.01]
From special-needs school for learning disabilities	19%	43%	27%	20%
<i>Cognitive basic skills</i>				
Reasoning skills (z-standardised)	-0.71 [0.07]	-1.1 [0.06]	-0.82 [0.05]	-0.83 [0.02]
Perceptual speed (z-standardised)	-0.22 [0.07]	-0.47 [0.06]	-0.35 [0.05]	-0.28 [0.02]
<i>Social skills</i>				
Prosocial behaviour (z-standardised)	-0.04 [0.06]	-0.16 [0.06]	-0.26 [0.05]	-0.15 [0.02]
<i>Vocational aspirations and application behaviour</i>				
Applied for apprenticeship position(s)	40%	52%	48%	61%
Originally planned starting an apprenticeship	58%	79%	73%	77%
<i>Social background</i>				
Parental highest vocational degree				
No degree	16%	19%	21%	17%
Upper secondary vocational degree	73%	75%	72%	75%
Tertiary degree	11%	6%	7%	8%
Parental employment				
No parent employed	5%	11%	10%	7%
One parent employed	28%	32%	33%	30%
Both parents employed	67%	57%	57%	62%
Parent's highest, most recent occupational status (ISEI)	39.76 [1.06]	35.25 [0.87]	35.91 [0.74]	37.80 [0.32]
<i>Local context</i>				
Local youth unemployment rate t_0	5.20 [0.27]	5.54 [0.23]	5.70 [0.21]	5.23 [0.09]
Local youth unemployment rate t_1	5.14 [0.26]	5.64 [0.23]	5.74 [0.21]	-
<i>Socio-demographics</i>				
Female	49%	42%	44%	42%
Migration background	22%	19%	21%	20%
Age	16.46 [0.04]	16.85 [0.04]	16.66 [0.03]	16.70 [0.01]
N	324	416	576	3367

Source: NEPS SC4, SUF 9.0.0, own calculations.