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Studia paedagogica. 2020, vol. 25, iss. 4, pp. [11]-34

ISSN 1803-7437 (print); ISSN 2336-4521 (online)

Stable URL (DOI): <https://doi.org/10.5817/SP2020-4-1>

Stable URL (handle): <https://hdl.handle.net/11222.digilib/143451>

Access Date: 30. 11. 2024

Version: 20220831

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READY TO STUDY? ACADEMIC READINESS OF TRADITIONAL AND NON-TRADITIONAL STUDENTS IN GERMANY

NICOLE TIEBEN

Abstract

Pathways to German higher education have diversified considerably during recent decades and approximately one quarter of all first year students enter higher education with a qualification for the skilled labour market. This contribution seeks to identify different types of pathways to higher education and examine the differences among these groups regarding five dimensions of self-reported academic readiness. For our analyses, we used data on Starting Cohort 5 of the National Educational Panel Study. Our results suggest that for most of the indicators of academic readiness, students who entered via non-traditional pathways reported lower levels of academic readiness than traditional students did. In particular, students without a formal higher-education entrance certificate reported lower levels of academic readiness than any other group did. These patterns remained largely stable after controlling for socio-demographic characteristics and institutional destination.

Keywords

Germany, NEPS, non-traditional students, vocational training, academic readiness

Introduction

The German system of secondary education is tracked and students are allocated to non-academic and academic tracks after primary school at the age of 10–12. While only the academic track explicitly prepares students for higher education, qualifications and higher-education entrance certificates can also be obtained through alternative pathways. In recent decades, the higher education system in Germany has expanded and part of this expansion strategy has been to increase permeability between the general academic and vocational sectors of the post-obligatory education system (Jacob, 2004; Jacob & Weiss, 2008; Orr & Hovdhaugen, 2014; Schindler, 2014; Schindler & Reimer, 2011). As a result, more than one fifth of all first-year university students hold formal qualifications for the skilled labour market and a growing proportion of these students have gained their entrance qualifications for higher education via vocational pathways (Middendorff et al., 2017; Orr & Hovdhaugen, 2014; Schindler, 2014; Tieben & Knauf, 2019). Despite the increasing relevance of alternative pathways to higher education, the heterogeneity of German students has not received much attention in prior research. Moreover, we know little about the academic readiness of students who have not gone through the prevalent academic track. This contribution therefore aims to address these issues and shed some light on the composition and academic readiness of students from different pathways. In the first step, we give an overview of different pathways to higher education and previous research. In the second step, we examine the socio-demographic composition of students from traditional and alternative pathways and their academic readiness, using a recent large-scale survey of German students who entered higher education in 2010/11 (Starting Cohort 5 of the German National Educational Panel Study [NEPS]).

German educational system

General description

After primary school, German students are allocated to different tracks of lower secondary education. The most selective track, Gymnasium, comprises general upper-secondary education (grades 11–13) and typically leads to a full general higher-education entrance certificate. The other tracks¹ are less

¹ The nominations for and organizational structures of these institutions vary among federal states, and so it is beyond the scope of this contribution to present much detail. The general structure, however, is as described above.

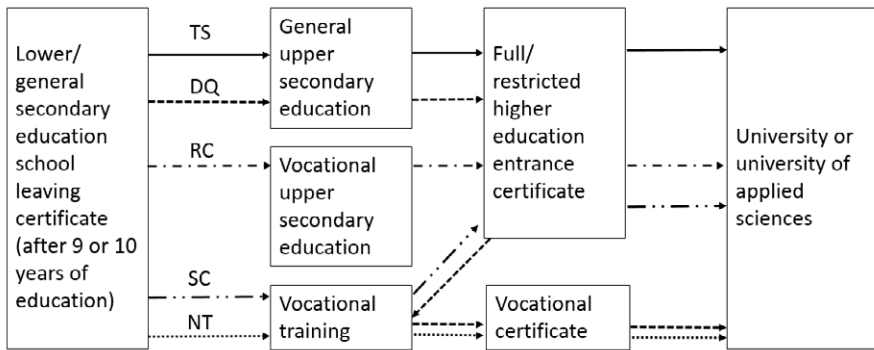
selective and students typically enter vocational training after graduation in grade 9 or 10. Vocational training usually takes three years and consists of a large range of programs, which qualify students for the skilled labour market. The vocational training system is divided into *school-based* and *dual* programs. School-based vocational training takes place as full-time training in vocational schools with practical units in the third year. Dual training mainly takes place on the job at companies with weekly one-day units at vocational schools (Müller et al., 1998; Walden & Troeltsch, 2011). Both types of vocational training are highly standardized and follow curricula which are determined jointly by chambers of industry and commerce, labour unions, and the ministry of education.

The transition sequence *primary education – Gymnasium – higher education* used to be the prevalent academic track, whereas the transition sequence *primary education – lower secondary – vocational training* used to be the prevalent vocational track. However, many students have used the permeability between the vocational and academic tracks in order to gain a higher-education entrance certificate. The following section will therefore give an overview of the most prevalent pathways to higher education.

Pathways to higher education

In international research papers, we frequently find terms such as “non-traditional students”, “mature students”, “adult students”, and “second-chance students.” These terms have been used in Germany as well. In Germany, however, a non-traditional student primarily means a student who has entered higher education without a higher-education entrance certificate (Dahm et al., 2018). This certificate used to be the legitimate admission ticket for higher education. Given comparably low higher-education graduation rates, admission was opened to students without this certificate if they meet certain conditions. These conditions usually comprise full qualification for the skilled labour market and several years of work experience. Nevertheless, only a small percentage of students, approximately 3%, have entered higher education via this route (Dahm & Kerst, 2013). This contribution therefore deviates from the usual binary distinction between traditional and non-traditional students and seeks to tackle the heterogeneity of the student population in a more fine-grained manner. A non-negligible proportion of the student population has gained an entrance certificate before entering higher education via alternative pathways. They nonetheless might not be traditional students in the strict sense because they delayed the transition into higher education for a period in the non-tertiary vocational training sector. We therefore summarized the different typical pathways to higher education in order to identify five categories of pathways. Figure 1 presents a visualization of the pathways.

Figure 1
Pathways to higher education in Germany



Traditional students: This group has obtained a higher-education entrance certificate in general upper-secondary education. They have entered higher education without a detour through the vocational training sector. Delays in this group may occur, but they are usually short and due to periods spent outside the educational system (travelling, voluntary service, military service, parental leave, or jobbing). These students did not obtain full qualification for the skilled labour market before entering higher education.

Students with a restricted entrance certificate: This group has also obtained their entrance certificate during their upper-secondary education. However, their admission to higher education is restricted to certain types (universities of applied sciences) or certain fields of higher education. A restricted entrance certificate can be obtained in several ways. The most common way is graduation from an upper-secondary school with a vocational profile. The curriculum of these schools resembles the curriculum of general upper-secondary schools but also includes a specialized vocational profile in, for example, business administration, care, agriculture, or engineering/natural sciences. Higher-education admission is therefore restricted to fields congruent with the upper-secondary profile. Students can also leave general upper-secondary education a year before their final exam or fail the final exam at a general upper-secondary school. In such cases, the restricted entrance certificate is awarded to those who graduated from the pre-final grade.

Double-qualifiers: This group comprises students who have obtained a full higher-education entrance certificate in general upper-secondary education. Although they were eligible to enter higher education directly, they chose to enter the vocational training sector after their upper-secondary education to gain qualification for the skilled labour market. In some cases, this may be a deliberate strategy; in other cases, the decision to enter higher

education develops later in their life course. This group has been at the focus for education researchers as this strategy was criticized as being inefficient regarding the relationship between time invested and labour market returns. This detour can, however, also be an effective strategy to reduce the risks of a direct transition to higher education (Büchel & Helberger, 1995; Hammen, 2011; Pilz, 2009). Moreover, students who aim to enter highly attractive higher-education programs with high admission requirements may improve their chances of admission after a period of vocational training.

Second-chance education: This group has obtained a higher-education entrance certificate outside general upper-secondary education. The notion of second-chance education used here broadens the common understanding of second-chance education, which takes place in evening schools and colleges for adult education. The German educational system is possibly unique in offering this vocational pathway to a general upper-secondary school-leaving certificate. In many cases, the certificate was therefore gained during vocational training. Students can upgrade their vocational certificate by choosing additional units from the general upper-secondary curriculum and taking extra exams in their final year. Nevertheless, this trajectory often results in a restricted entrance certificate (Schindler, 2014).

Students without a secondary entrance certificate (NT): This group gained their entrance qualification through vocational training and several years of work experience. The main difference between this group and those from the second-chance track is that they did not qualify by gaining credits from the general upper-secondary curriculum. Students in this group nevertheless usually are not underqualified as a typical pathway in this group is via vocational training, work experience, and additional advanced vocational training. This advanced vocational training is equivalent to Level 6 in the European Qualifications Framework.

Previous Research

Non-traditional students in Germany

The higher education system in Germany has undergone two major developments since the 1960s: a massive expansion and also a diversification, which comprised the implementation of universities of applied sciences. Since the mid-1990s, these developments have been flanked by increasing concerns regarding the competition between vocational and academic education. While it remained a priority to increase graduation rates from higher education, representatives of chambers of industry and commerce feared that the quality of the vocational education system might suffer from a drain of capable school-leavers and a devaluation of the vocational system

(Teichler & Wolter, 2004). As a result, actions were taken to improve the permeability between vocational and academic education and open higher education to students from vocational pathways. What might at first seem paradoxical had the aim of eliminating the dead-end character of vocational training and increasing the attractiveness of vocational training. Nevertheless, until today only a small fraction of students have taken the non-traditional route (in the strict sense) to higher education. Currently, the proportion of students without a formal entrance certificate does not exceed 3% of the German student population (Dahm & Kerst, 2013, for a sample drawn in 2011). Admission procedures at higher education institutions still largely rely on formal qualifications and entrance certificates. Nevertheless, the efforts to achieve greater openness and flexibility in the educational system have not remained without effect. The actual permeability between vocational and academic education has been implemented rather through alternative routes to an entrance certificate. These alternative routes to an entrance certificate have been gaining in relevance since the 1970s. Tieben and Rohrbach-Schmidt (2014) showed that the proportion of Germans who made it to a higher education degree after vocational training has approximately doubled between the school-leaver cohorts of 1960 and 1994. Likewise, we can observe an increasing inclination to enter vocational training with a higher-education entrance certificate instead of a direct transition to higher education (Schindler, 2014). As a result, currently 22% of all first-year students enter higher education with full qualifications for the skilled labour market (Middendorff et al., 2017). The situation of students in Germany raises several questions, namely: who they are, whether they are successful in higher education, and whether they are prepared for higher education. In the following sections, these three questions will be addressed by a summary of the current state of research. The remainder of this paper will be dedicated to open questions and an empirical approach to answering them.

Who takes detours to higher education – and why?

The multitude of pathways to higher education highlights the relevance of a clear definition of the concept of non-traditional students, but makes it challenging to determine a bundle of typical characteristics of students who have taken a detour to higher education and their reasons for doing so. We must generally distinguish those who have gained an entrance certificate in general upper-secondary education but first entered vocational training from those who have gained an entrance certificate via vocational training and those who have not gained an entrance certificate. The former group has attracted a great deal of attention from education and labour market researchers since the mid-1990s. Double-qualifiers certainly assume a special role given that they actually had the choice between a direct transition to

higher education and a detour via vocational training. For some, a later transition to higher education may have been a deliberate strategy already during upper-secondary education; for others, the plan to obtain a degree probably arose during or even after vocational training (Büchel & Helberger, 1995; Edeling & Pilz, 2017; Hammen, 2011; Jacob, 2017; Pilz, 2009). For the group that went through second-chance education, vocational training is a prerequisite to gaining access to higher education, but it is unclear to what extent we can assume deliberate action and strategic educational route planning. Especially for this group, we may assume that the development of a career plan and an educational strategy is a continuous, explorative, and sometimes iterative process involving the collection of information and (re-)evaluation of the current plan as well as possible alternatives (Manski, 1989; Super, 1980).

Sociological approaches have examined the socio-demographic composition of students who took detours to higher education as compared to traditional students and reported that students from non-academic family backgrounds were more likely to choose vocational training after obtaining a higher-education entrance certificate (Becker & Hecken, 2009; Hillmert & Jacob, 2003; Jacob, 2004; Müller & Pollak, 2016). Moreover, low grades on the final upper-secondary exam seem to have contributed to a preference for vocational training (Bellmann et al., 2008; Edeling & Pilz, 2017). Several researchers have therefore discussed the role of vocational training in Germany as a “safety net” (Büchel & Helberger, 1995; Scholten & Tieben, 2017; Shavit & Müller, 2000). Vocational training before entering higher education reduces the risk of failure because students can profit from their vocational skills and work experience during higher education. This is particularly the case when they choose a field that is similar to their previous occupation (Hillmert & Jacob, 2003; Jacob, 2004). In addition, a vocational credential also reduces labour market risks in case of dropout because students always can return to their previous occupation. Vocational qualifications thus work as a “paradoxical double-buffer”, which may prevent students from dropping out of higher education, but also comes with labour market opportunities that easily turn into a pull factor and increase the risk of dropping out (Scholten & Tieben, 2017; Tieben, 2020).

Are non-traditional students in Germany successful in higher education? Regarding success in higher education, previous research is ambiguous. This is mainly because there are a multitude of different approaches to measuring success: some use grades, on either final or particular exams; some use timely progression and completion; some use standardized competence tests; and some use graduation. Tieben (2020) noted that it is of some importance to distinguish between performance-related measures and decision-related measures of success in higher education. Most of the

available studies examining performance-related measures have indicated that students from alternative pathways show competence and performance levels that are comparable to those of traditional students, or even slightly better (Burchert & Müller, 2012; Erdel, 2010; Jürgens & Zinn, 2012). Nevertheless, when it comes to graduation rates, results suggest that dropout occurs more often among students with prior vocational training (Dahm & Kerst, 2016; Heublein et al., 2017; Müller & Schneider, 2013). These findings suggest that the decision to quit higher education without a degree might not be primarily driven by performance deficits. It is likely that full qualification for the skilled labour market acts as return ticket to the prior occupation. Dropouts without formal qualifications face higher labour market risks and therefore the incentive to graduate is higher for traditional students (Scholten & Tieben, 2017; Tieben, 2020).

Are non-traditional students in Germany prepared to succeed in higher education?

For all groups of students from alternative pathways, we must assume that a relevant part of their competence package was acquired in vocational education or training rather than in general upper-secondary school. This raises the question of whether these competences match the academic requirements for higher education. On the one hand, we may argue that a vocational profile generates skills and knowledge that are beneficial in higher education; on the other hand, the vocational profile may come at the expense of general skills and academic readiness. The question of academic readiness was especially an issue in the debate around vocational upper-secondary schools. Empirical research repeatedly showed that school-leavers from these schools showed weaker performance on standardized competence tests in language and mathematics as well as scientific reasoning (Asdonk & Sterzik, 2011; Jonkmann et al., 2010; Nagy et al., 2010; Trautwein et al., 2007; Watermann et al., 2004). Nevertheless, it remains unclear if these differences translate into performance deficits after the transition into higher education because a considerable proportion of school-leavers with an entrance certificate do not enter higher education. It is plausible to assume that the probability of making this transition increases with competence level, and so at least part of these differences are compensated for by positive selection (Tieben & Knauf, 2019). Furthermore, it is also plausible to assume that, in higher education, skills and competences other than language and maths are relevant for success, although grades remain powerful predictors (Oepke & Eberle, 2016). Moreover, students with vocational qualifications are likely to choose a field of study that resembles their prior vocation so that they might profit from vocational skills in higher education.

Open questions

The above sections summarize the current state of research regarding students from alternative pathways in Germany. Research in Germany has primarily focused on a narrow definition of non-traditional students, those who have entered higher education without a formal entrance certificate. A further and largely separate strand of research has examined double-qualifiers who have gained their entrance certificates in general upper-secondary education but took a detour to higher education via vocational training. We deviate from earlier approaches and define non-traditional students in a broader sense than the previously used concepts. Students who gained an entrance certificate via non-traditional pathways or who delayed their transition to higher education for vocational training currently constitute more than 25% of the student population. While the academic readiness of students from vocational upper-secondary schools has been an issue in prior research, it has remained unclear how general and vocational competences translate into academic readiness among those students who actually have made a transition to higher education. In the following sections, we present empirical analyses which address the following research questions:

1. Do students from different pathways differ regarding their socio-demographic composition, field of study, and institution type?
2. Do students from different pathways differ regarding their academic readiness?
3. Do students from different pathways differ regarding their academic readiness when socio-demographic characteristics, field of study, and institution type are taken into account?

Data and Methods

Data

For our analyses, we used the German National Educational Panel Study (NEPS), Starting Cohort 5, data release 8-0-0 (Blossfeld et al., 2011). The sample comprises students who entered higher education in autumn 2010. Although the NEPS is a panel study with annual follow-ups, the design rotates regarding the survey method (computer-assisted telephone interviews and computer-assisted web interviews) and instruments. We used the first and second waves of the data. The first wave (telephone interviews, autumn 2010) delivered information about the socio-demographics and prior educational pathways of the students, while the second wave (web interviews, autumn 2011) delivered information about experiences during the first semester. Due to the alternating design and included items, our data set has

a cross-sectional data structure. We excluded students in remote education and extra-occupational students. After data cleaning and case selection, our final dataset contains 10,884 cases. We weighted all analyses to correct for the stratified cluster sampling (Zinn et al., 2017).

Variables

Dependent variables

For our analyses, we rely on self-reports of academic readiness. In the second NEPS wave, academic readiness was measured with the following items:

If you think back to the time when you started university: how would you rate the following statements?

1. General academic methods:
When I started university, I was sufficiently familiar with and comfortable with the work techniques needed for university study (proper citation of sources, taking down a record of a discussion, planning experiments, etc.).
2. Knowledge sufficient for the first semester:
The skills I had when I started university were enough to follow what was being taught in my first semester/trimester without major difficulties.
3. Scientific methods in the field:
When I started university, I was familiar with the fundamental academic methods in my field of study.
4. Lack of important knowledge
I found that I lacked knowledge and skills required for university.
5. Generally well prepared
Overall, I was well prepared for university studies.

Answers originally were recorded on a 4-point scale (does not apply at all [1], hardly applies [2], partly applies [3], applies completely [4]). We dichotomized the dependent variables in order to enable logistic regressions.²

² We are aware that ordered or multinomial logits can be used with ordinal dependent variables. However, we tested whether these methods would result in a relevant information gain, which would justify the increase in complexity and the reduction of statistical power. We excluded ordered logits because of violations of the proportionality assumption. We prefer logistic regression over multinomial logits for reasons of parsimony: juggling a 5×5 group comparison calls for maximal reduction in additional complexity. Sensitivity analyses suggested that the loss of information was negligible.

Pathways

We used the pathways described in the section *Pathways to higher education* as predictors of academic readiness. In order to identify the groups, we used information about the start- and end-dates of general secondary school, the type of certificate obtained in general secondary school, the date of the first transition to higher education, and whether full qualifications for the skilled labour market had been obtained prior to or after obtaining a higher-education entrance certificate.

We therefore distinguished the following groups of students:

Traditional students (TS): full entrance certificate, did not enter vocational training prior to higher education.

Students with a restricted entrance certificate (RC): restricted entrance certificate obtained in general upper secondary education or in vocational upper secondary education; did not enter vocational training prior to higher education.

Double-qualifiers (DQ): full or restricted entrance certificate, obtained full qualifications for the skilled labour market prior to higher education.

Second-chance education (SC): did not obtain an entrance certificate in general secondary education, but obtained a full or restricted entrance certificate after vocational training.

Students without a secondary entrance certificate (NT): obtained full qualifications for the skilled labour market, but never obtained a formal entrance certificate for higher education; eligibility to enter higher education results from vocational skills and work experience.

The bottom rows of Table 1 show the distributions of these groups.

Controls

As control variables, we used gender (male = 0, female = 1), age at higher-education entry (18–19, 20–25, 26–30, 30+), parental education (CASMIN, 3 categories, highest of mother and father: secondary only, secondary plus vocational training, tertiary), field of study (humanities and sports, law, economics and social sciences, maths and natural sciences, medicine and health sciences, agriculture, nutrition sciences and veterinary medicine, engineering), and type of higher education institution (university of applied sciences, university). The last column of Table 1 shows the distributions of all controls.

Analytical approach

In order to answer research question 1, we ran descriptive analyses and compared the distributions of the control variables among the student groups. Research question 2 was answered by mean comparisons of the indicators of academic readiness. In a third step, we ran binary logistic regressions on the

indicators of academic readiness and introduced the pathway as a predictor to answer research question 3. Adding the control variables to the models informed us whether the differences in academic readiness among groups were due to differences in the socio-demographic composition of the student groups or their choice of field of study and institution type. As coefficients of logistic regressions are hard to interpret and can only be evaluated relative to an arbitrary reference category, we calculated average marginal effects. These enabled us to express logit coefficients as changes in the probability to reach 1 (= yes) when the predictor increases by one unit. For ease of interpretation, we calculated predicted probabilities for each student group and present plots of these predicted probabilities.

Results

Socio-demographic composition of student groups

Table 1 shows the socio-demographic composition of the student groups and their choice of field of study and institution type. Compared to the total distribution, women were over-represented in the TS and DQ groups, but under-represented in the RC, SC, and NT groups. Taken together, we can conclude that women were more likely than men to enter higher education with an entrance certificate gained in general upper-secondary education. It is not surprising that the mean age of higher-education entry was higher among the DQ, SC, and NT students. These groups are those who entered after vocational training, which usually takes 2–3 years. Still, a non-negligible share (7%) of the students from SC were in the age group 18–19. This is not unrealistic as, in this track, students can leave lower-secondary education at the age of 16 and enter 3-year vocational training. This illustrates that a detour to higher education does not necessarily result in a loss of time, although it increases the mean entry age by several years.

In all groups, few students had parents with only general secondary education, but we observed that pathways to higher education were socially selective: in all groups, except for NT students, at least 60% of the students were first-generation students. The share of first-generation students was particularly high in the NT group (77%).

Regarding the field of study, we can observe that law, economics, and social sciences were the most popular fields for RC (35%), DQ (39%), and NT (39%) students. Engineering was most popular among RC (33%) and SC (34%) students. This may have been due to the structure of the vocational pathways and the resulting opportunity structures. In the finance and insurance sector and certain technical occupations, it has been common practice to support employees' ambitions to engage in further education

and companies often take efforts to facilitate transitions to higher education and returns to the workplace afterwards.

While universities were the most popular option among the TS group (84%), RC, SC, and NT students were most likely to enter universities of applied sciences. This is not surprising as these groups are also most likely to hold a restricted entrance certificate, which only allows a transition to universities of applied sciences. Furthermore, universities of applied sciences are more oriented towards the labour market and were originally designed to accommodate NT students.

The bottom rows of Table 1 highlight the heterogeneity of the student population and show that more than 30% entered higher education either with a restricted certificate (6.5%) or via a detour through vocational training (DQ: 8%, SC: 14%, NT: 3%). These figures also show that the previously well-examined DQ and NT groups are not the largest groups among the student population.

Academic readiness

Figure 2 shows the means and confidence intervals of our measures of academic readiness. Overlapping confidence intervals indicate that differences in means between groups were not significant. Surprisingly, we did not find a general pattern across the five indicators of academic readiness. For all indicators, except for scientific methods in the field of study, the TS group had the highest values of academic readiness, and in most of the cases the difference in means was significant. Generally, deviations from the total mean of all groups did not exceed ± 2 standard deviations, except for NT students, who showed deviations of around ± 4 standard deviations for readiness in general academic methods, lack of important knowledge, and feeling generally well prepared. Given that NT students were the only group without a formal entrance certificate, this finding suggests that basic techniques of academic work are largely acquired in upper-secondary education, no matter whether the profile is general or vocational. At first glance, this might indicate problematic disadvantages regarding academic readiness. However, our findings also suggest that students may have perceived themselves as lacking in important knowledge and general academic methods but at the same time reported that their knowledge was sufficient for the first semester. Regarding this indicator, the gap between NT students and the other groups was small and non-significant in most of the contrasts.

Multivariate analyses

In the second step, we applied logistic regressions to all five indicators of academic readiness in order to identify whether group differences can be attributed to socio-demographic confounders or the institutional context

(measured as institution type and field of study). Figure 3 presents the predicted probabilities from the models (see Table A1 in the Appendix for coefficients). We started with a set of binary logistic regressions in order to replicate the findings from the mean comparison. We observed largely comparable patterns, except for the fact that the dependent variables in the regressions were not standardized but dichotomized instead.³ The predicted probabilities can therefore be interpreted as the percentage of students that answered “partly applies (3)” or “completely applies (4)” for the respective items. This enabled us to assess the magnitude of the association between the predictors and dependent variables. It is striking that less than half of the traditional students reported being familiar with general academic methods and that this proportion was even lower in all of the other groups. Only approximately one quarter of NT students reported they were familiar with general academic methods. Positive responses were comparably rare for scientific methods in the field. Except for DQ, however, none of the groups scored significantly lower than the TS group on this indicator of academic readiness. This suggests that vocational tracks conveyed field-specific knowledge that was potentially beneficial in higher education. Group differences were more pronounced for the indicator “lack of important knowledge”: while approximately 40% of the TS group reported positive responses, the response was at approximately 60% for the NT group and all groups had significantly higher scores than the TS group did. Nevertheless, the majority within all groups also reported that their knowledge was sufficient for the first semester and that they generally felt well prepared. These findings suggest that for a considerable proportion of the student population, incomplete readiness was not associated with major difficulties in the first semester.

Adding the control variables showed that most of them (age at entry to higher education, parental education, institution type, and field of study) were associated with the outcome variable, but that the associations between pathways and the indicators of academic readiness could not be attributed to the socio-demographic composition of the groups or the institutional setting to a large extent. However, especially regarding scientific methods in the field, the effects of pathway vanished in the full model.

³ The similarity of the results confirmed that the dichotomization did not result in an undue loss of information.

Summary and conclusions

In this paper, we addressed the following research questions:

1. Do students from different pathways differ regarding their socio-demographic composition, field of study, and institution type?
2. Do students from different pathways differ regarding their academic readiness?
3. Do students from different pathways differ regarding their academic readiness when socio-demographic characteristics, field of study, and institution type are taken into account?

To answer these questions, we used Starting Cohort 5 of the German National Educational Panel Study (NEPS) and applied mean comparisons and binary logistic regressions. We distinguished five groups of pathways to higher education and compared the socioeconomic composition of these groups as well as their choice of field and institution type.

Our results showed pronounced differences among pathways regarding the students' gender, age, and family background. The choice of institution type and field of study was also highly associated with the pathway to higher education. Non-traditional pathways to higher education often comprise participation in vocational education and training, which may result in lower exposure to the general upper-secondary curriculum. We therefore examined whether students who entered higher education via alternative pathways reported lower levels of academic readiness than traditional students did. We observed pronounced differences between the traditional students and the students from all alternative pathways when it came to their reports of general academic methods and lack of important knowledge. This suggests that especially vocational pathways may not convey knowledge and competences that correspond to the general upper-secondary curriculum and that vocational skills may not fully compensate for these skills. However, regarding the specific scientific methods of the field, the disadvantage for the students from alternative pathways seemed to be less pronounced – RC and SC students even reported higher levels of readiness on this indicator. A closer examination of the type of schooling seems worthwhile to explain this observation as some of the students in these two groups may have benefited from certain types of vocational upper-secondary education.

It is surprising that controlling for socio-demographics and institutional setting did not alter the general conclusion regarding the association between pathway and academic readiness. The fact that the composition and institutional destination clearly differed among pathways might raise the expectation that they would explain at least some of the association. This finding indicates that academic readiness is quite closely linked to the type of schooling and

that selectivities and path dependences may not have played a decisive role in this association.

Our results do not allow the conclusion that a perceived lack of academic readiness also led students to question their general ability to study. Especially the NT group seemed to have perceived fairly dramatic deficits in academic readiness. At the same time, they were at the same level⁴ as the other students from alternative pathways regarding their assessment of whether their knowledge was sufficient for the first semester. This raises the question of whether a lack of academic readiness contributes to an increased risk of leaving higher education without a degree. Answering this question is beyond the scope of this paper, but we will proceed to discuss some shortcomings of our approach and potential avenues for future research.

First, it seems necessary to include performance and competence measures in order to assess the extent to which different pathways to higher education are associated with lower grades or competences. Grades in upper-secondary education are not a reliable measure of competences in Germany, however, as exams are not consistently standardized across school types and federal states. Despite being a strong predictor of study success, we furthermore assume that grades are a correlate of academic readiness rather than an accurate measurement of the underlying cognitive and non-cognitive skills that are relevant for study success.

Another issue that has to be resolved is the subjective measurement of academic readiness. The NEPS contains comparably detailed information about each student's own perception of their academic readiness, but these are possibly biased through several mechanisms. In the land of blind, the one-eyed man is king, and students assessed their competences relative to their peers or relative to the specific requirements at their institution. Moreover, it lies in the nature of any educational program that the necessary skills and competences are acquired as students progress. Students are therefore expected to assess their competences critically and identify their own shortcomings and close gaps if necessary. For this reason, low levels of academic readiness do not necessarily lead to a higher risk of failure in higher education. Deficits in general academic readiness can be compensated for by higher levels of motivation, dedication, goal orientation, or field-specific competences (Rau, 1999). For students from alternative pathways to higher education, however, it remains unclear how their prior experiences and expectations translate into self-concepts, and also into compensatory assets and strategies.

⁴ Additional analyses revealed that the differences between the NT, RC, SC, and DQ groups were not significant for this indicator.

Acknowledgement

This paper uses data from the National Educational Panel Study (NEPS): Starting Cohort First-Year Students, 10.5157/NEPS:SC5:8.0.0. From 2008 to 2013, NEPS data was collected as part of the Framework Program for the Promotion of Empirical Educational Research funded by the German Federal Ministry of Education and Research. From 2014, NEPS has been carried out by the Leibniz Institute for Educational Trajectories at the University of Bamberg in cooperation with a nationwide network.

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Table 1

Socio-demographic composition of groups, field of study, and institution type.

		TS	RC	DQ	SC	NT	Total
Gender							
Male	<i>n</i>	3,271	396	321	938	175	5,102
	%	43.87	56.5	37.68	61.28	51.05	46.88
Female	<i>n</i>	4,185	305	531	593	168	5,782
	%	56.13	43.5	62.32	38.72	48.95	53.12
Age at entry to higher education							
18–19	<i>n</i>	2,328	236	0	109	4	2,677
	%	31.23	33.65	0.03	7.09	1.17	24.60
20–25	<i>n</i>	5,077	446	705	1,138	168	7,535
	%	68.10	63.58	82.70	74.34	48.98	69.23
26–30	<i>n</i>	34	10	124	214	76	458
	%	0.45	1.44	14.52	13.98	22.19	4.21
30+	<i>n</i>	17	9	23	70	95	214
	%	0.22	1.32	2.75	4.59	27.66	1.97
Mean age		20.1	20.5	23.9	23.4	28.1	21.1
Standard deviation		1.30	2.20	2.90	3.80	7.30	3.1
Parental education							
General secondary	<i>n</i>	293	65	27	81	19	486
	%	3.93	9.28	3.2	5.3	5.56	4.46
General secondary + vocational	<i>n</i>	3,235	423	510	981	244	5393
	%	43.39	60.27	59.86	64.03	71.33	49.55
Tertiary	<i>n</i>	3,927	214	315	470	79	5,005
	%	52.67	30.46	36.94	30.67	23.12	45.98
Field of study							
Humanities & sports	<i>n</i>	2,021	73	162	172	46	2,473
	%	27.10	10.39	18.97	11.25	13.36	22.72
Law, economics, & social sciences	<i>n</i>	1,974	248	334	487	134	3,178
	%	26.47	35.39	39.17	31.82	39.19	29.20
Mathematics & natural sciences	<i>n</i>	1,607	128	121	236	33	2,125
	%	21.55	18.24	14.18	15.39	9.71	19.52
Medical & health sciences	<i>n</i>	358	10	77	63	27	536
	%	4.80	1.45	9.04	4.12	7.96	4.92
Agriculture, nutrition, & vet. med.	<i>n</i>	195	13	34	50	17	309
	%	2.61	1.82	4.04	3.24	4.96	2.84
Engineering	<i>n</i>	1,302	229	124	523	85	2,264
	%	17.46	32.71	14.59	34.18	24.83	20.80
Type of institution							
University of applied sciences	<i>n</i>	1,198	552	313	1,059	222	3,343
	%	16.06	78.67	36.75	69.13	64.71	30.72
University	<i>Nn</i>	6,258	150	539	473	121	7,541
	%	83.94	21.33	63.25	30.87	35.29	69.28
Total	<i>n</i>	7,456	702	852	1,531	343	10,884
	%	100	100	100	100	100	
% of total population		68.5	6.5	7.8	14.1	3.2	

Source: NEPS SC5 release 8-0-0, own calculations, weighted

Figure 2

Academic readiness; means and confidence intervals for five student groups

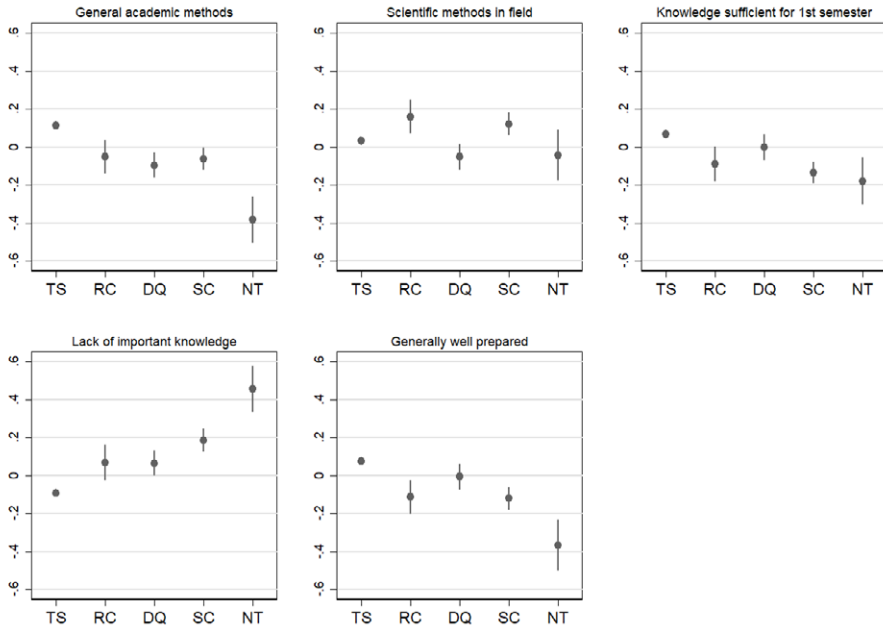


Figure 3

Predicted probabilities from logistic regressions

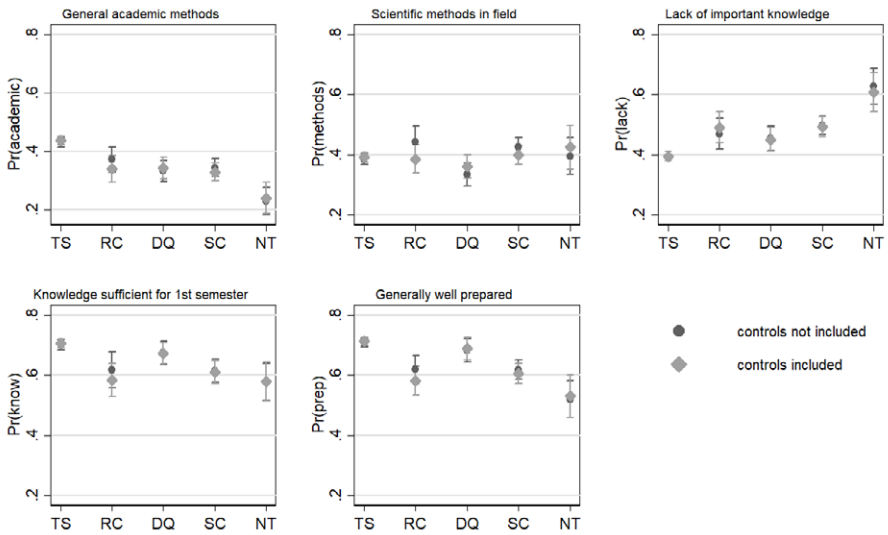


Table A1
Coefficients of logistic regressions (average marginal effects)

Controls included	General academic methods		Scientific methods in field		Lack of important knowledge		Knowledge sufficient for first semester		Generally well-prepared		
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	
Pathway											
TS (ref.)											
RC	-0.060 *	-0.096 ***	0.057 *	-0.006	0.075 **	0.096 ***	-0.084 **	-0.122 ***	-0.090 ***	-0.131 ***	
DQ	-0.099 ***	-0.093 ***	-0.051 *	-0.031	0.060 **	0.055 ***	-0.027	-0.033	-0.027	-0.024	
SC	-0.088 ***	-0.106 ***	0.041 *	0.007	0.103 ***	0.098 ***	-0.086 ***	-0.096 ***	-0.091 ***	-0.107 ***	
NT	-0.202 ***	-0.195 ***	0.010	0.033	0.232 ***	0.213 ***	-0.125 ***	-0.127 ***	-0.189 ***	-0.183 ***	
Sex											
Male (ref.)											
Female		0.000		-0.017		0.002		0.011		-0.007	
Age at entry to higher education											
18-19											
20-25		-0.045 ***		-0.031 **		0.015		0.002		-0.028 *	
26-30		-0.095 **		-0.155 ***		0.119 ***		-0.119 ***		-0.097 **	
30+		-0.118 **		-0.141 ***		0.089		-0.038		-0.087 *	
Parental education											
General secondary (ref.)											
General secondary + vocational		0.067 *		0.033		-0.047		0.070 *		0.114 ***	
Tertiary		0.083 **		0.049		-0.081 **		0.098 ***		0.155 ***	

Institution type																			
University of applied sciences (ref.)																			
University		-0.049	**					0.076	***			-0.128	***					-0.112	***
Field of study																			
Humanities & sports (ref.)																			
Law, economics, & social sciences		0.065	***					0.000				-0.096	***					-0.050	**
Mathematics & natural sciences		0.105	***					0.061	***			-0.207	***					-0.070	***
Medical & health sciences		0.187	***					0.009				-0.129	***					0.007	
Agriculture, nutrition, & vet. med.		0.131	***					0.024				-0.189	***					-0.073	*
Engineering		0.130	***					0.121	***			-0.245	***					-0.106	***
N	10,655	10,655		10,655		10,655		10,655		10,655		10,655		10,655		10,655		10,655	

Source: NEPS SC5 release 8-0-0, own calculations, weighted