

Profil 8:

Netzwerke – Strukturen von Wissen, Akteuren und Prozessen in der beruflichen Bildung

**Digitale Festschrift
für BÄRBEL FÜRSTENAU**



Roland Happ¹, Jasmin Reichert-Schlax², Olga Zlatkin-Troitschanskaia² & Carla Olivier²

(¹ Universität Leipzig & ² Universität Mainz)

The Impact of Pre-University Education on the Development of Students' Economic Knowledge During their University Studies – Results from a Germany-wide Longitudinal Study.

Online unter:

https://www.bwpat.de/profil8_fuerstenaу/happ_etal_profil8.pdf

in

bwp@ Profil 8 | September 2023

Netzwerke – Strukturen von Wissen, Akteuren und Prozessen in der beruflichen Bildung

Teil 1: Ökonomisches Wissen und ökonomische Kompetenzen – fachwissenschaftliche und fachdidaktische Perspektiven

Hrsg. v. **Mandy Hommel, Carmela Aprea & Karin Heinrichs**

www.bwpat.de | ISSN 1618-8543 | bwp@ 2001–2023



www.bwpat.de



Herausgeber von **bwp@** : Karin Büchter, Franz Gramlinger, H.-Hugo Kremer, Nicole Naeve-Stoß, Karl Wilbers & Lars Windelband

Berufs- und Wirtschaftspädagogik - online

The Impact of Pre-University Education on the Development of Students' Economic Knowledge During their University Studies – Results from a Germany-wide Longitudinal Study

Abstract

About one fifth of business and economics (B&E) students in Germany complete a vocational training before starting their university studies. This article analyzes the differences between students with and without vocational training at the beginning, during, and at the end of the first year of bachelor studies. Using 25 items from the German adaptations of the Test of Economic Literacy IV and the Test of Understanding College Economics IV, the students' economic knowledge was assessed at the time of their entry into the study program, during, and after the first year of study. Students with vocational training showed a significantly higher level of economic knowledge at the beginning of their university studies. Over the course of the first year of study, the two groups converged in terms of their economic knowledge, but after the first year of study students with vocational training still had a higher level of economic knowledge. The two groups also differed significantly in study- and learning-related characteristics such as self-regulation and self-efficacy. Highlighting the significant impact of pre-university education such as vocational training for students' knowledge development during university studies, this article provides evidence for didactic implications to effectively support students with different study preconditions (e. g. prior knowledge).

Der Einfluss der voruniversitären Bildung auf die Entwicklung des ökonomischen Wissens von Studierenden im Verlauf ihres Studiums – Ergebnisse einer deutschlandweiten Längsschnittstudie

Etwa ein Fünftel der Studierenden der Wirtschaftswissenschaften in Deutschland hat vor Beginn des Studiums eine Berufsausbildung absolviert. Dieser Artikel analysiert die Unterschiede zwischen Studierenden mit und ohne Berufsausbildung zu Beginn, während und am Ende des ersten Studienjahres im Bachelorstudium. Anhand von 25 Items aus den deutschen Adaptionen des Tests of Economic Literacy IV und des Tests of Understanding College Economics IV wurde das ökonomische Vorwissen der Studierenden zum Zeitpunkt der Aufnahme des Studiums, während und nach dem ersten Studienjahr untersucht. Studierende mit Berufsausbildung wiesen zu Beginn des Studiums ein signifikant höheres ökonomisches Wissen auf. Im Verlauf des ersten Studienjahres glichen sich die beiden Gruppen hinsichtlich ihres ökonomischen Wissens an, aber auch nach dem ersten Studienjahr wiesen die Studierenden mit Berufsausbildung noch ein höheres Wissen auf. Auch weitere studien- und lernprozessbezogene Merkmale wie Selbstregulation und Selbstwirksamkeit unterschieden sich zwischen den beiden Gruppen signifikant. Dieser Artikel hebt den signifikanten Einfluss der voruniversitären Bildung wie einer absolvierten Berufsausbildung auf den Wissenserwerb im Studium hervor und liefert eine evidenz-

basierte Grundlage für didaktische Implikationen, um Studierende mit verschiedenen Studieneingangsdispositionen (wie Vorwissen) adressatengerecht und binnendifferenziert zu unterstützen.

Schlüsselwörter: *Ökonomisches Wissen, Vorwissen zu Studienbeginn, Wissenserwerb, voruniversitäre Bildung, Hochschulbildung*

Keywords: *Economic knowledge, prior knowledge at the beginning of university studies, knowledge development, pre-university education, higher education*

1 Relevance and research questions

Today, the proportion of beginning B&E students in Germany who have completed vocational training prior to entering university is about one fifth of the overall population of B&E students (Commission of Experts for Research and Innovation 2021). Recent studies show that beginning students are heterogeneous in terms of their study preconditions due to, e. g., different educational backgrounds (German Federal Statistical Office 2021). Pelled (1996) and Kuh et al. (2006) differentiate this heterogeneity into various facets (age, ethnicity, cognitive ability, previous knowledge, gender, sociocultural, migration- and language-related background). For instance, beginning students who have completed vocational training (Pilz/Fürstenau 2019) are about 3 years older than students who enter university directly after secondary school (German Federal Ministry of Education and Research 2021). Numerous facets of the performance- and migration-related heterogeneity of students are still underresearched comparing beginning students with and without pre-university education such as vocational training. Hence, the first research goal is to analyze the differences between students with and without vocational training in a B&E course of study.

The majority of studies on beginning B&E students in Germany were conducted directly upon the students' entry into higher education (Beck/Wuttke 2004; Zlatkin-Troitschanskaia et al. 2019). However, little consideration has so far been given to the possible differences between the two groups of students (with and without vocational training) after the first year of study. This may be due to the fact that such an analysis requires a longitudinal research design, which is difficult to implement in higher education (Caruana et al. 2015). The second research goal is thus to analyze the differences between the two groups longitudinally over the first year of study.

Therefore, the overall objective of this article is to analyze the initial conditions at entry into the study program and the development of students with and without vocational training during the first year of study. The objective is examined by addressing the following six research questions (RQ):

1. Are there significant differences in individual sociodemographic (e. g. age, gender), educational (e. g. educational background of the parents as a component of the socioeco-

conomic status of the family) and cognitive (e. g. score in an intelligence test and university entrance qualification) characteristics between B&E students with and without vocational training when they enter higher education?

2. Are there significant differences in prior economic knowledge assessed through items of a knowledge test between B&E students with and without vocational training at the beginning of their studies?
3. What are the differences in prior economic knowledge between students with and without vocational training when other personal characteristics (e. g. gender, age, university entrance qualification and so on) are controlled?
4. Are there significant differences in individual study-related (e. g. stress, learning motivation such as extrinsic and intrinsic motivation) and learning-related (e. g. self-regulation, self-efficacy, the average amount of time per week (in hours) and so on) characteristics between students with and without vocational training over the course of the first year of studies?
5. Are there any significant differences in economic knowledge assessed through items of a knowledge test between students with and without vocational training after the first year of study?
6. What are the differences in economic knowledge after the first year of studies between students with and without vocational training when other personal characteristics (e. g. gender, age, university entrance qualification and so on) are controlled?

For RQ2 and RQ5, the economic knowledge scores of students with and without vocational training were compared. In RQ3 and RQ6, other student characteristics such as gender and migration background were included in the analyses to investigate the effect of completing a vocational training under control of these personal characteristics (see Sections 4.2 and 4.4).

2 State of research

2.1 Sociodemographic and educational and cognitive characteristics (RQ1)

The immigrant-optimism theory points out that migrants consider higher education an important instrument for social advancement (Kao/Tienda 1995). Accordingly, the proportion of migrants who have completed vocational training before entering higher education may likely be lower than the proportion of migrants who move directly into higher education. In addition, differences in sociodemographic and educational characteristics can be expected between beginning students with and without vocational training (German Federal Ministry of Education and Research 2015). For instance, in Germany young adults with a lower socioeconomic and educational background of their parental home tend to take up vocational training (Bornkessel 2015).

2.2 Prior economic knowledge at the beginning of the study program (RQ2 & RQ3)

Completing a commercial administrative vocational training leads to the acquisition of study-relevant knowledge (for Germany, see Rosendahl/Straka 2011; for Switzerland, Holtsch/Eberle 2016). This finding is supported by (i) curriculum analyses indicating that completing vocational training leads to the acquisition of a wide range of general economic knowledge (see for more details on the theoretical background on this correlation, Happ 2017; Beck/Wuttke 2004; Pilz/Fürstenau 2019). Prior studies demonstrated the higher level of economic knowledge among students with vocational training independent of the field of occupation compared to their peers without vocational training (Schmidt 2018). Therefore, it can be assumed that beginning students with vocational training may demonstrate a higher level of economic knowledge than students without vocational training (for the role of prior knowledge see Fürstenau/Oldenbürger/Trojahner 2014).

2.3 Study- and learning-related characteristics (RQ4)

The offer-and-use model by Helmke (2014; for a description in English, see Hascher/Hagenauer 2016) provides guidance when it comes to study- and learning-related factors that can influence the acquisition of knowledge. With regard to learning activities, active learning time at the university and extramural learning time, for instance self-study, can be distinguished. As little is known so far about the extent to which study- and learning-related characteristics differ between students with and without vocational training over the course of their first year of study in higher education, study- and learning-related characteristics and their influence on knowledge acquisition among the two groups are considered in our study.

2.4 Differences in economic knowledge after the first study year (RQ5 & RQ6)

Prior knowledge represents a significant influencing factor of knowledge acquisition (Renkl 2006; Shapiro 2004). From the perspective of the theory of mental models, the positive effect of prior knowledge can be described as follows: An individual is confronted with an economic problem. This evokes the construction of a mental model, which is contingent on the existing prior knowledge (Seel 2003). It is favorable if the knowledge acquisition takes place in the appropriate context. The construction of the mental model can include declarative, procedural but also conditional knowledge components (Wuttke 2005, 40). Consequently, mental models can be characterized as executable process models that support the importance of prior knowledge in the learning process.

Students who have completed vocational training have usually acquired basic economic knowledge in educational and/or practical, in-company contexts. Students with vocational training can be expected to integrate new knowledge from university courses into existing prior knowledge networks and build up new knowledge. Therefore, it can be assumed that even after the first year of study students with vocational training still have a higher level of knowledge than students without vocational training.

3 Methods

3.1 Study design

To compare students with and without vocational training, data from the WiWiKom II project was used. This study was a longitudinally designed field survey of students all over Germany (for the project description, see Zlatkin-Troitschanskaia et al. 2019). With regard to entry diagnostics (t1), this study is based on the data of 7,679 B&E students assessed at 49 German universities and universities of applied sciences in the winter term 2016/17. In a second measurement at the end of the summer term 2017 (t2), the students from t1 were asked to participate in an online survey on study- and learning-related characteristics. A total of 722 B&E students were assessed in this online survey. At the beginning of the third semester, 1,867 students from 22 universities and universities of applied sciences were assessed at the third measurement (t3) in the winter term 2017/18. At t1 and t3 the students were assessed using a paper-pencil test, whereby participation was voluntary and advertised with a monetary incentive (for more details, see Zlatkin-Troitschanskaia et al. 2019). Since t1 and t3 assessed the intellectual ability and students' knowledge, a survey in paper-pencil format was necessary to ensure controlled test conditions. At t2, to assess the study process and learning characteristics of the students, an online survey was used for cost efficiency and as it provided the easiest access to the students.

Since international students who came to Germany for the purpose of studying did not have access to the German education system including the vocational training system before beginning their university studies, the sample from the winter semester 16/17 was adjusted for the group of international students. In addition, only first-year students at t1 were included in the analyses. Accordingly, the subsample from t1 used here consists of $N=6,870$ participants. At t2 and t3, the sample was again adjusted for the international students and limited to the second (t2) or third semesters (t3) respectively, so that a total of 718 test participants from t2 were available for the analyses and 1.646 test participants participated at t3. The study design is summarized in Figure 1.

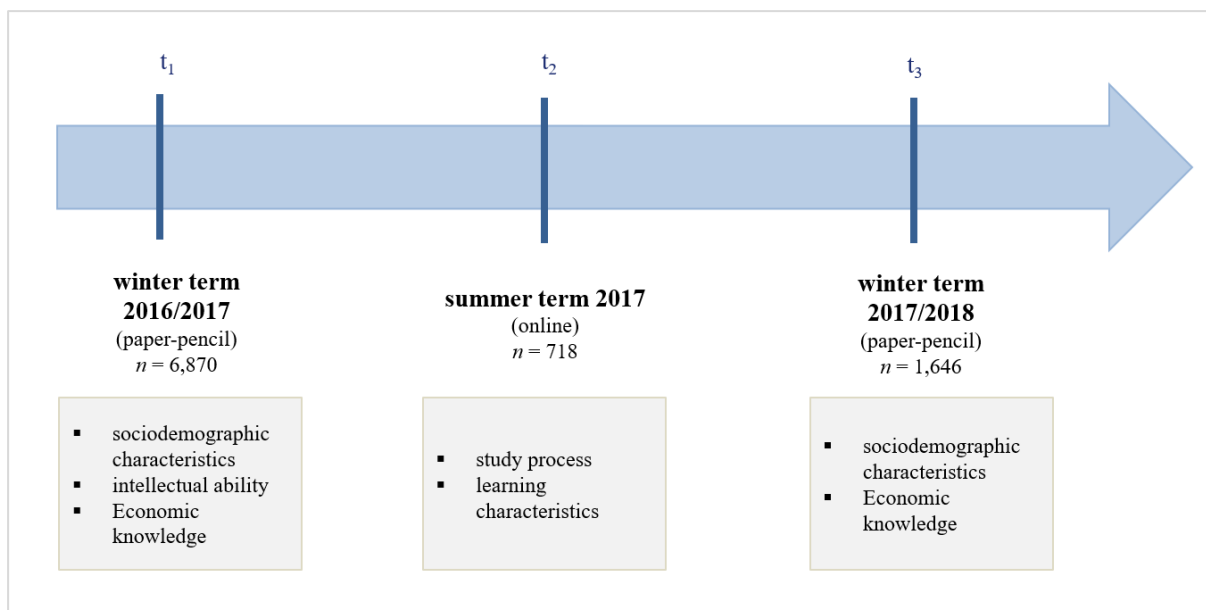


Figure 1: Study Design

3.2 Test instruments

At t_1 and t_3 , paper-pencil questionnaires that comprise a survey of sociodemographic data and an economic knowledge test were used. In the sociodemographic part, the participants gave a self-reported indication of whether they had completed vocational training. If they had completed a vocational training, they could indicate whether it was commercial, technical or health-related. The exact occupation was not assessed. In addition, a short form of an intelligence test was used at t_1 (“Berliner Test zur Erfassung fluider und kristalliner Intelligenz” BEFKI; Schipolowski/Wilhelm/Schroeders 2017). For t_2 , data on study- and learning-related learning characteristics was collected. The test time was about 45 minutes for t_1 , about 15 minutes for t_2 and about 30 minutes for t_3 .

3.2.1 Economic Knowledge at t_1 and t_3

At t_1 and t_3 , the study participants answered a total of 25 items for the assessment of economic knowledge. These items were taken from two internationally established tests developed by the US-American Council for Economic Education (CEE). To measure basic economic knowledge, 15 items from the fourth edition of the Test of Economic Literacy (TEL IV) (Walstad/Rebeck/Butters 2013) were used. The TEL IV was designed by the CEE for high school students before graduation, although the test developers consider it also suitable for university students. To include more in-depth economics contents in the assessment, 10 items from the fourth edition of the Test of Understanding College Economics (TUCE IV) (Walstad/Watts/Rebeck 2007) were used: 5 of these items assessed microeconomic knowledge; the other 5 items assessed macroeconomic knowledge (for details, see Zlatkin-Troitschanskaia et al. 2019).

Both US-American tests were adapted for German-speaking countries (for the adaptation of the TUCE IV, see Zlatkin-Troitschanskaia et al. 2014; for the adaptation of the TEL IV, see Happ et al. 2016). Findings from validation studies show that the two tests allow for a valid assess-

ment of prior basic economic knowledge (TEL IV) as well as of knowledge of micro- and macroeconomics (TUCE IV) in German higher education (Zlatkin-Troitschanskaia et al. 2019).

One point was given for each correct response, with missing responses considered an indicator of lack of knowledge and thus coded as incorrect responses (for details, see Schlax et al. 2020). The total test score therefore ranged from 0 to 25. If more than 50% of the test values were missing, a low level of test motivation was assumed, and the score was not included in the analyses. While two orders of item presentation were used at both measurements, no significant differences were determined in terms of the participants' results ($t(6817)=-0.221$, $p=0.825$; $t(1641)=-0.369$, $p=0.712$). Reliability analyses showed a Cronbach's α of 0.734 at $t1$ and of 0.803 at $t3$.

3.2.2 Sociodemographic characteristics at $t1$ and $t3$

Sociodemographic data (e. g., age, gender) including indicators for migration background were collected at $t1$. Relevant research shows various indicators but no agreement as to which indicators should be used. From an educational perspective, the parents' migration background, which conveys values, norms and role attributions (Huddleston/Niessen/Tjaden 2013), may prove important with regard to economic knowledge. The literature points out that a conflicting relationship between the parents' migration background and educational background can be expected among beginning students (Global Education Monitoring Report 2019). The parents' educational background is an indicator of the socioeconomic status of the parental home (Duong et al. 2016). In this study, the educational background of the parental home was defined as the highest level of education attained by the students' parents. In addition, the students' main communication language was also assessed to identify students' preferred language when reading economic content (Čapková/Kroupová 2017; Richardson 2004). All of the sociodemographic characteristics were collected from the participating students on a self-report basis.

3.2.3 General cognitive ability at $t1$

Due to the assumption of the stability of the personal state (Spinath/Steinmayr 2008), the students' general cognitive ability was assessed only at $t1$. Two indicators were used: the students' university entrance qualification (UEQ) grade and a short form from the BEFKI. The UEQ grade represents a reliable indicator of general intellectual ability and reflects academic achievement, which is important for study success (e. g., willingness to learn; Camara/Echternacht 2000). In addition, a short matrix test was taken from BEFKI, which focuses on the assessment of the fluid facets of intelligence. The short form consisted of 16 items with two sub-items each, in which one out of three possible response alternatives had to be selected. Only if both sub-items were solved correctly the participants received a point so that the total score ranged from 0 to 16. Cronbach's α was 0.655.

3.2.4 Study- and learning-related characteristics at $t2$

Study and learning-related characteristics in the course of first year of B&E studies were assessed at $t2$. Stress was assessed using four items of the Perceived Stress Scale (PSS)

(Cohen/Kamarck/Mermelstein 1983), which were to be answered on a 6-level scale ranging from "does not apply at all" to "fully applies". A mean value was calculated out of all four items. Learning motivation was assessed using the two subscales extrinsic and intrinsic motivation (adapted from Wild et al. 1995), each of which comprised four items, which were to be answered on a 6-level scale ranging from "absolutely correct" to "not correct at all".

Based on the current findings from motivation research (Ryan/Deci, 2017), two constructs are assessed: extrinsic (here vocationally-related) motivation and intrinsic (here study-related) motivation (Schiefele/ Köller, 2010). The items assess the motivational reasons why students engage with the business and economics degree program. A high extrinsic motivation for choosing the subject was, for example, expectations of secure employment and good earning opportunities. Students with a high intrinsic motivation chose the business and economics degree program because the content is important to them, and they enjoy dealing with the topics.

A mean value was calculated for each subscale. Furthermore, a separate scale was used for assessing self-regulation (Schwarzer/Jerusalem 1999). The analyses, based on a mean value out of five items, each of which was again to be answered on a 6-level scale ranging from "absolutely correct" to "not correct at all". Self-efficacy (Beierlein et al. 2012) was assessed using three items, which were to be answered on a 6-level scale ranging from "does not apply at all" to "fully applies". Students were also asked about the average amount of time per week (in hours) they spent on attending lectures, course preparation, and exam preparation.

3.3 Sample description

For a detailed description of the sample see Table 1. The high proportion of other study subjects in t2 and t3 is possibly due to the fact that courses were surveyed in which – in contrast to the introductory courses in t1 – there were many students who are studying B&E (and other related subjects) as minor subject in addition to their major subject.

Table 2: Sample Description

Variables	t1 (n=6,870)	t2 (n=718)	t3 (n=1,646)
Gender, male, %	54.63	54.87	55.77
Age, $x (\pm SD)$	20.37 (± 2.65)	20.35 (± 2.67)	21.06 (± 2.19)
Migration background, no (both parents born in Germany), %	72.98	75.58	72.54
Preferred language of study, German, %	98.34	99.19	98.91
Study domain, %			
Business Administration	39.69	33.13	38.21
B&E	38.28	35.56	28.31
Economics	10.45	9.83	12.64
Other B&E-related subjects	11.58	21.48	20.84

3.4 Method

RQ1 and RQ4 were analyzed descriptively and tested for significance by t-tests and chi²-tests (Field 2009; Tabachnick/Fidell 2014). The differences in RQ2 und RQ5 were also examined by means of a t-test. To test the predictability of the knowledge score under control of influencing factors, multilevel analysis were calculated for RQ3 and RQ6. Universities were distinguished from universities of applied sciences (Lehmann/Starnecker 2012). The data set was hierarchically structured as students were clustered within the respective universities. To take this nesting into account, multilevel models were calculated (Hox 2010). In the so-called zero model, the intra-class coefficient (ICC) was calculated for each measurement point (t1: ICC=0.096; t3: ICC=0.179), indicating that multilevel models were appropriate due to the hierarchical structure (Rabe-Hesketh/Skrondal 2012).

For the further procedure, we tested whether the economic knowledge was to be modelled on the basis of a total score (from 25 items and thus 25 points) or on the basis of sub-scores for all 3 content areas (basic economics knowledge, microeconomics and macroeconomics). Confirmatory Factor Analysis (CFA) were calculated to test the factor structure at t1 and t3. Both the one-factorial and the three-factorial model showed a satisfactory model fit (performed by MPlus; Muthén/Muthén 2016; for CFA models on B&E knowledge, see Zlatkin-Troitschanskaia et al. 2019). Accordingly, the modelling of both the overall scores and the three sub-scores are reported in this paper. The following analyses were performed using Stata Version 15 (Stata Corp. 2017).

4 Results

4.1 Sociodemographic, educational and cognitive characteristics at university entry (t1, RQ1)

Table 2 provides an overview of the sociodemographic and educational characteristics of the students who participated at t1; 16.75% of whom have completed a vocational training. The average age of students who have completed vocational training was, as expected, higher than of students without vocational training (German Federal Ministry of Education and Research 2021). German is the preferred language of instruction for both student groups (>95%). The highest average level of educational achievement among the parents of students with vocational training was middle secondary education. In contrast, the highest average level of educational achievement among the parents of students without vocational training was a university degree.

Table 2: Socio- and-Educational Demographic Characteristics of Students

Variables	Vocational training		<i>p</i>
	yes (<i>n</i> =1,151)*	no (<i>n</i> =5,708)*	
Gender, male, %	56.56	54.31	0.163
Age, <i>x</i> (\pm <i>SD</i>)	22.98 (\pm 3.19)	19.84 (\pm 2.18)	< 0.001
Migration background, no (both parents born in Germany), %	82.10	71.27	< 0.001
Preferred language of study, German, %	98.95	98.91	0.020
Highest educational achievement of parents, %			< 0.001
Primary education			
Lower secondary school	0.70	1.58	
Middle secondary school	10.55	5.67	
Upper secondary school	35.18	23.97	
University degree	22.25	20.19	
Doctoral degree	28.67	41.52	
	2.64	7.07	

Note. * Differences in the sample size were due to missing values. If there were missing values in the variables gender, age, migration background, preferred language and educational achievement of parents, these test participants were not included. The proportion of missing values was clearly below 5%.

Table 3 illustrates the cognitive entry characteristics of beginning students with and without vocational training. The UEQ grade was slightly lower for students with vocational training than for students without vocational training. Also, the mathematics grade was on average lower among students with vocational training. In the BEFKI score, where a maximum of 16 points could be achieved, students with vocational training performed slightly worse. The effect sizes were classified according to Cohen (1988) who differentiates between the following effect sizes: $d < 0.2$ = no effect, $d = 0.2 - 0.5$ = small effect, $d = 0.5 - 0.8$ = medium effect, $d > 0.8$ = large effect. While there was a small effect size according to Cohen's d for the UEQ grade and the math grade, there was a negligible effect size for the BEFKI score.

Table 3: Comparison of the Cognitive Entry Prerequisites of the Two Groups

Variable	Vocational training		Difference test	
	yes (<i>n</i> =1,151)	no (<i>n</i> =5,708)	<i>p</i>	Cohen's <i>d</i>
	<i>x</i> (\pm <i>SD</i>)	<i>x</i> (\pm <i>SD</i>)		
UEQ Grade *	2.55 (\pm 0.56)	2.35 (\pm 0.56)	<0.001	0.36
Maths Grade *	2.73 (\pm 0.93)	2.51 (\pm 0.96)	<0.001	0.23
Sum score BEFKI	7.91 (\pm 2.62)	8.36 (\pm 2.71)	<0.001	0.02

Note: * According to the German grading system (from 1=very good to 6= unsatisfactory) a numerically smaller number expresses a better UEQ grade.

4.2 Prior economic knowledge (t1, RQ2 & RQ3)

Table 4 illustrates the participants' performance in the economic knowledge test at t1. Students with vocational training scored higher in the economic knowledge test than students without vocational training (RQ2). In the test parts on basic economic knowledge as well as on macroeconomics, students with vocational training answered more questions correctly than students without vocational training. The effect strength according to Cohen's d indicates a

small effect size. However, prior knowledge in the microeconomics test part was about the same for both groups. Overall, beginning students with vocational training showed a higher level of prior economic knowledge.

Table 4: Prior Knowledge at the Beginning of Studies (RQ2)

Testscore	Vocational training		Difference test	
	yes (<i>n</i> =1,151)	no (<i>n</i> =5,708)	<i>p</i>	Cohen`s <i>d</i>
	<i>x</i> (\pm SD)	<i>x</i> (\pm SD)		
Full test	14.45 (\pm 4.08)	13.16 (\pm 4.36)	< 0.001	0.30
Basic economic knowledge	9.94 (\pm 2.74)	9.07 (\pm 3.04)	< 0.001	0.29
Microeconomics	2.31 (\pm 1.18)	2.29 (\pm 1.22)	0.637	0.02 ¹
Macroeconomics	2.17 (\pm 1.291)	1.72 (\pm 1.24)	< 0.001	0.36

To answer RQ3, a multilevel model (higher education institutions as a level-2-variable without explaining variables on level 2, see Section 3.4) was calculated that estimated the effect of vocational training under control of the assessed students' personal characteristics, including gender, age and UEQ grade, the BEFKI score, the parents' migration background and the preferred language of study (all variables on level 1). The control variables were chosen as they are reportedly related to (prior) knowledge in theoretical and empirical research (see Section 2). Even when these variables were included in the analysis, beginning students with vocational training showed a higher level of economic knowledge than those without vocational training (RQ3). In addition, the university type (university vs. university of applied sciences) was controlled as a structural characteristic (Table 5). With the exception of age, economics knowledge was significantly influenced by all these included personal and institutional characteristics. The negative sign at the UEQ grade indicates a positive effect on economic knowledge.

Table 5: Economic Knowledge at the Beginning of Studies Under Control of Personal and Structural Characteristics (t1) (RQ3)

Variable	<i>Model: Wald chi² = 2013.34, <i>p</i> < 0.001*</i>			
	<i>b</i>	<i>SE</i>	<i>z</i>	<i>p</i>
Constant	11.37	0.745	15.27	< 0.001*
Vocational training, no	-1.67	0.139	-12.02	< 0.001*
Gender, male	2.29	0.093	24.56	< 0.001*
Age	0.02	0.020	1.01	0.313
UEQ grade	-1.81	0.092	-19.68	< 0.001*
BEFKI sum score	0.30	0.018	16.87	< 0.001*
Migration background, no (both parents born in Germany)	1.52	0.107	14.22	< 0.001*
Preferred language of study, German	1.84	0.500	3.68	< 0.001*
Institution type, University	1.13	0.229	4.95	< 0.001*

Note. UEQ = University entrance qualification, *N* = 6,625 (48 groups) (due to missing values), * indicates significance on a 5%-level.

¹ The effect size (e.g. Cohen`s *d*; Cohen, 1988) can also be calculated for non-significant mean differences. This has the advantage that despite non-significant mean differences in small or unequal samples and lower test strength, indications of possible effects can still be found.

4.3 Study- and learning-related characteristics (t2, RQ 4)

Significant differences in two study- and learning-related characteristics were found between students with and without vocational training (Table 6). Since the sample size for the online survey was small, attention was paid not only to the significance level but also to the effect size according to Cohen's *d*. There was no significant difference between both groups and a negligible effect size regarding self-efficacy, the average amount of time per week for attending courses and the time required for preparing and following up on courses ($d < 0.2$). For all other study- and learning-related characteristics in the course of the B&E study, low and medium effects size were observed, with learning motivation having the strongest effects out of all included variables. However, it must be emphasized that only the difference in perceived stress and time spent on exam preparation became significant.

Table 6: Study and Learning-Related Characteristics in the Course of Studies (RQ4)

Variables	Vocational training		<i>p</i>	Cohen's <i>d</i>
	yes (<i>n</i> =120)	no (<i>n</i> =598)		
Stress (PSS-scale*), <i>x</i> (\pm <i>SD</i>)	4.00 (\pm 0.95)	3.78 (\pm 0.89)	0.015	0.25
Extrinsic motivation**, <i>x</i> (\pm <i>SD</i>)	1.36 (\pm 0.41)	2.13 (\pm 1.08)	0.066	0.75
Intrinsic motivation**, <i>x</i> (\pm <i>SD</i>)	2.14 (\pm 0.79)	2.84 (\pm 0.95)	0.067	0.75
Self-regulation***, <i>x</i> (\pm <i>SD</i>)	2.66 (\pm 1.00)	2.91 (\pm 0.48)	0.259	0.45
Self-efficacy ****, <i>x</i> (\pm <i>SD</i>)	4.58 (\pm 0.72)	4.48 (\pm 0.76)	0.211	0.13
Average amount of time per week spent attending courses, in h, <i>x</i> (\pm <i>SD</i>)	17.69 (\pm 6.78)	17.47 (\pm 6.09)	0.721	0.04
Average amount of time per week for preparation and follow-up, in h, <i>x</i> (\pm <i>SD</i>)	8.16 (\pm 6.87)	8.33 (\pm 6.32)	0.802	0.03
Average amount of time per week for exam preparation, in h, <i>x</i> (\pm <i>SD</i>)	13.31 (\pm 8.42)	11.56 (\pm 8.09)	0.038	0.22

Note. * Mean value out of 4 items assessed on a 6-level scale from “does not apply at all” to “fully applies”.
 ** Mean value out of 4 items assessed on a 6-level scale from “applies fully” to “does not apply at all”.
 *** Mean value out of 5 items assessed on a 6-level scale from “applies fully” to “does not apply at all”.
 **** Mean value out of 3 items assessed on a 6-level scale from “not applicable at all” to “fully applicable”.

4.4 Economic knowledge after one academic year (t3, RQ5 & RQ6)

The economic knowledge levels of students with and without vocational training converged after one academic year (Table 7). Nevertheless, students with vocational training still showed a significantly higher level of economic knowledge in the full test and the macroeconomics part than their fellow students after the first year of study (RQ5). Again, there was no significant effect regarding knowledge in microeconomics. Regarding basic knowledge, there was no significant difference between both groups after one academic year. The effect size regarding the difference can be classified as small and the significant difference seems to be largely related to macroeconomic content.

Table 7: Economic Knowledge After the First Year of Study (RQ5)

Testscore t3	Vocational training		Difference test	
	yes (n=272)	no (n=1,374)	<i>p</i>	Cohen`s <i>d</i>
	<i>x</i> (± SD)	<i>x</i> (± SD)		
Full test	14.41 (± 4.71)	13.69 (± 5.06)	0.031	0.14
Basic knowledge	9.65 (± 2.96)	9.29 (± 2.14)	0.087	0.16
Microeconomics	2.37 (± 1.28)	2.32 (± 1.29)	0.551	0.04
Macroeconomics	2.36 (± 1.45)	2.07 (± 1.38)	0.002	0.21

When investigating RQ6, these findings persisted even under control of the assessed personal and structural characteristics in the multilevel model (Table 8). Apart from age, preferred language and university type, economic knowledge at the end of the first study year was still significantly influenced by all other included personal characteristics.

Table 8: Economic Knowledge After the First Year of Study Under Control of Personal and Structural Characteristics (t3) (RQ6)

Variable	<i>Model: Wald chi² = 327.10, p < 0.001*</i>			
	<i>b</i>	<i>SE</i>	<i>z</i>	<i>p</i>
Constant	16.90	1.837	9.20	< 0.001*
Vocational training, no	-1.32	0.333	-3.97	< 0.001*
Gender, male	2.17	0.213	10.18	< 0.001*
Age	-0.00	0.057	-0.08	0.937
UEQ Grade	-2.38	0.213	-11.20	< 0.001*
Migration background, no (both parents born in Germany)	1.73	0.240	7.22	< 0.001*
Preferred language of study, German	0.94	0.989	0.95	0.344
Institution type, University	0.99	0.690	1.43	0.153

Note. UEQ= University entrance qualification, *N* = 1,610 (22 groups) (due to missing values), * indicates significance on a 5%-level.

5 Discussion

5.1 Summary of findings

With regard to RQ1 (see Table 2 and 3), the parents of the group of beginning students with vocational training have a lower educational background than those of the group of students without vocational training. This group of students is also characterized by lower cognitive entry prerequisites than the group without vocational training. Despite the lower prerequisites, students with vocational training show significantly higher levels of prior knowledge than students without vocational training: When asked to complete an economic test at the beginning of their studies (see Table 4), students with vocational training achieved significantly higher test scores than the students without vocational training, especially on the sections regarding the basics of economics and macroeconomics (RQ2). This difference (see Table 5) also persists when controlling for the assessed personal and institutional influencing factors (RQ3).

With regard to study and learning-related characteristics (see Table 6) in the course of B&E studies (RQ4), students with vocational training showed higher perceived stress levels and, on average, required more time to prepare for exams than students without vocational training. This indicated that students with vocational training invest more time in their B&E studies despite their higher level of prior knowledge. At the same time, students with vocational training were also found to have higher levels of learning motivation. Even if the intrinsic and extrinsic motivation became not significant at the 5% significance level (however, at least $p < 0.1$), the effect size was large, with a Cohen's d of nearly 0.8.

With regard to RQ5 (see Table 7), even after one academic year (t_3), students who had previously completed vocational training still show a significantly higher level of knowledge than their fellow students without vocational training, especially regarding knowledge of macroeconomics. This remains significant (see Table 8) even when including the assessed personal and institutional influencing factors in the analysis (RQ6). However, the differences or effect sizes (Cohen's d) are smaller compared to t_1 .

5.2 Limitations

These findings should be evaluated critically, taking into account the limitations of the study. There is a risk of bias in self-reported data (e. g., perceived stress levels, the UEQ grade). Furthermore, this article focuses only on economic knowledge. Business knowledge, which is also relevant to students of B&E, is excluded. Since business knowledge is a focal point in many commercial administrative training programs, the area of business knowledge should also be included in follow-up studies. Moreover, only selected personal and institutional characteristics (e. g., cognitive and motivational characteristics, type of university) were considered. Here, too, it would be conceivable to include additional characteristics (e. g., attended B&E courses) in follow-up analyses (e. g., Shavelson/Zlatkin-Troitschanskaia/Marino 2018). Furthermore, the study- and learning-related characteristics were retrospectively assessed in this study, that can result in bias. More current and more extensive learning motivation instruments may also be used in follow-up studies to further investigate possible associations with pre-university education. In addition, the conducted assessments can be characterized as low-stakes tests; i.e., test participants did not have to fear any direct consequences when completing the items. Studies have shown that low-stakes tests often result in lower test motivation (Wise/DeMars 2005), which in turn may lead to a poorer performance. Furthermore, the survey at t_3 took place at the beginning of the third semester, so that a break of about 3-4 months from active teaching during the lecture-free period preceded the survey.

The models presented here were based on a quasi-longitudinal survey (Kahiya/Dean/Heyl 2014); i.e., while there were three measurement points, not all test takers necessarily participated on all three occasions. Accordingly, in addition to the group of test participants who were assessed three times (real panel) we included the test participants who were assessed only once or twice. This design was chosen due to the problematic field access at universities and the high panel mortality in higher education. The sample numbers at the three measurements clearly show a high panel mortality; i.e., a positive selection in the sampling cannot be ruled out, which

may cause a bias in the findings. Further analyses should therefore focus on the analysis of the real panel to better deal with such unbalanced data set (Hox 2010). For a more in-depth longitudinal study of the correlations of pre-university education with study success criteria such as professional knowledge over the course of studies, see e.g., Reichert-Schlax (accepted for publication).

5.3 Implications and outlook

The question of impact of pre-university education such as vocational training on study achievements in higher education is fiercely debated (Vulperhorst et al. 2017). Our study provides an evidence-based foundation for such a discussion. The proportionally lower level of economic knowledge in the group with vocational training may indicate a lack of targeted support in higher education in Germany, where the potential of beginning students is not fostered as much as it should be over the course of their studies. For example, thanks to the opportunities offered by digital teaching, it should be possible to offer additional individualized learning materials to support students who evidently exhibit a higher level of prior knowledge at the beginning of their studies in a way that is optimal for their target group (Falk/Marshall 2021). Our study highlights the need to prioritize the study entry phase in higher education research as this can help teachers to better assess students' preconditions and provide better support to specific groups (Fokkens-Bruinsma et al. 2020).

The overall sample comprising all students (regardless of whether or not the test participants completed vocational training) showed comparatively low levels of economic knowledge. This also indicates that understanding of economics is not promoted as effectively as it could be in economics programs in higher education. In connection with a relatively low level of knowledge acquisition, the keyword "bulimic learning" is often mentioned in modularized B&E study programs (Klaus et al. 2016). As a result, didactic optimization is required to ensure sustainable knowledge acquisition.

Individual support is especially difficult in fields of study that attract large numbers of students. Consequently, an initial objective identification of students' learning potentials and deficits is essential to ensure access to needs-based preparatory courses. Looking at both general and domain-specific learning outcomes, it is very likely that only few competence facets are specifically promoted in higher education, even though knowledge thereof is expected in, for instance, economics programs. Many studies show that at the beginning of a study program, the skills and knowledge of young people vary greatly (Coertjens et al. 2017; Dammann/Lang 2019). Consequently, valid entry diagnostics before the beginning of higher education are of major importance, in particular to improve the transition phase from secondary to higher education (Zlatkin-Troitschanskaia/Schlax 2020).

Acknowledgments

This research was supported by the German Federal Ministry of Education and Research under Grant 01PK15001A.

References

- Beck, K./Wuttke, E. (2004): Eingangsbedingungen von Studienanfängern: Die prognostische Validität wirtschaftskundlichen Wissens für das Vordiplom bei Studierenden der Wirtschaftswissenschaften [Input conditions of university entrants – prognostic validity of economic knowledge for the intermediate diploma of economic students]. In: Zeitschrift für Berufs- und Wirtschaftspädagogik, 100, H. 1, 116-124.
- Beierlein, C./Kovaleva, A./Kemper, C. J./Rammstedt, B. (2012): Ein Messinstrument zur Erfassung subjektiver Kompetenzerwartungen: Allgemeine Selbstwirksamkeit Kurzsкала (ASKU) [A measuring instrument for assessing subjective competency assumptions: General self-efficacy short scale]. GESIS- Leibniz-Institut für Sozialwissenschaften.
- Bornkessel, P. (2015): Studium oder Berufsausbildung? Zur Bedeutung leistungs(un)abhängiger Herkunftseffekte für die Bildungsentscheidung von Abiturientinnen und Abiturienten [Studying or vocational training? On the significance of performance- (in)dependent effects of origin for the educational decision of high school graduates]. Münster.
- Camara, W. J./Echternacht, G. (2000): The SAT I and high school grades: Utility in predicting success. The College Board.
- Caruana, E. J./Roman, M./Hernández-Sánchez, J./Solli, P. (2015): Longitudinal studies. In: Journal of Thoracic Disease, 7, H. 11, 537-540. <https://doi.org/10.3978%2Fj.issn.2072-1439.2015.10.63>.
- Čapková, H./Kroupová, J. (2017): Language Needs Analysis of Students of Economics. In: Journal of Efficiency & Responsibility in Education & Science, 10, H. 1, 1-6. <https://doi.org/10.7160/eriesj.2017.100101>.
- Coertjens, L./Brahm, T./Trautwein, C./Lindblom-Ylänne, S. (2017): Students' transition into higher education from an international perspective. In: Higher Education, 73, H. 3, 357-369. <https://doi.org/10.1007/s10734-016-0092-y>.
- Cohen, J. (1988): Statistical power analysis for the behavioral sciences. 2nd ed. Lawrence Erlbaum. Online: <https://www.utstat.toronto.edu/~brunner/oldclass/378f16/readings/CohenPower.pdf> (29.06.2023).
- Cohen, S./Kamarck, T./Mermelstein, R. (1983): A global measure of perceived stress. In: Journal of Health and Social Behavior, 24, H. 4, 385-396. <https://doi.org/10.2307/2136404>.
- Commission of Experts for Research and Innovation (EFI) (2021): Research, innovation and technological performance in Germany – EFI Report 2021. EFI.
- Dammann, E./Lang, M. (2019): Unterschiede des mathematischen Wissens bei Studierenden des Bauingenieurwesens zu Studienbeginn [Differences in mathematical knowledge among civil engineering students at the beginning of their studies]. In: Journal of Technical Education (JOTED), 7, H. 1. <https://doi.org/10.48513/joted.v7i1.170>.

Duong, M. T./Badaly, D./Liu, F./Schartz, D./McCarty, C. A. (2016): Generational differences in academic achievement among immigrant youths: A meta-analytic review. In: *Review of Educational Research*, 86, H. 1, 3-41. <https://doi.org/10.3102/0034654315577680>.

Field, A. (2009): *Discovering statistics using SPSS*. (3. ed., reprinted 2009 (twice)). Sage.

Falk, S./Marschall, M. (2021): Abbruch des Erststudiums bei MINT-Studierenden: Welche Rolle spielen Informations- und Unterstützungsangebote bei Studienbeginn? [First degree dropout among STEM students: What is the role of information and support services at entry?.] In: Neugebauer, M./Daniel, H.-D./Wolter, A. (Hrsg.). *Studienerfolg und Studienabbruch [study success and study dropout]* Wiesbaden, 345-368.

Fokkens-Bruinsma, M./Vermue, C./Deinum, J. F./van Rooij, E. (2021): First-year academic achievement: the role of academic self-efficacy, self-regulated learning and beyond classroom engagement. In: *Assessment & Evaluation in Higher Education*, 46, H. 7, 1115-1126. <https://doi.org/10.1080/02602938.2020.1845606>.

Fürstenau, B./Oldenbürger, H./Trojahnner, I. (2014): Prior Knowledge of Potential Entrepreneurs. In: *Becoming an Entrepreneur*. Rotterdam, 77-89.

German Federal Ministry of Education and Research [BMBF] (2021): *Berufsbildungsbericht 2021 [Report on Vocational Education and Training 2021]*. BMBF. Online: https://www.bmbf.de/SharedDocs/Publikationen/de/bmbf/3/31684_Berufsbildungsbericht_2021.pdf?__blob=publicationFile&v= (29.06.2023).

German Federal Statistical Office [Statistisches Bundesamt] (2021): *Bildung und Kultur Studierende an Hochschulen [Education and culture, students at higher education institutions]*. Statistisches Bundesamt.

Global Education Monitoring Report (2019): *Consultation on Migration*. UNESCO. Online: <https://unesdoc.unesco.org/ark:/48223/pf0000265866> (29.06.2023).

Happ, R./Förster, M./Zlatkin-Troitschanskaia, O./Carstensen, V. (2016): Assessing the previous economic knowledge of beginning students in Germany – implications for teaching economics in basic courses. *Citizenship, Social and Economics Education*, 15, H. 1, 45-57. <https://doi.org/10.1177/2047173416646597>.

Hascher, T./Hagenauer, G. (2016): Openness to theory and its importance for pre-service teachers' self-efficacy, emotions, and classroom behaviour in the teaching practicum. In: *International Journal of Educational Research*, 77, 15-25. <https://doi.org/10.1016/j.ijer.2016.02.003>.

Helmke, A. (2014): *Forschung zur Lernwirksamkeit des Lehrerhandelns [Research on the learning effectiveness of teacher action]*. In: Terhart, E./Bennewitz, H./Rothland, M. (Eds.). *Handbuch der Forschung zum Lehrerberuf*. Münster, New York, 807-821.

Holtsch, D./Eberle, F. (2016): Learners' economic competence in Switzerland – Conceptual foundations and considerations for measurement. In: Wuttke, E./Seifried, J./Schumann, S. (Eds.): *Economic competence and financial literacy of young adults: Status and challenges*. Opladen, Berlin, Toronto, 101-119.

- Hox, J. J. (2010): *Multilevel Analysis – Techniques and Applications* (2nd ed.). Routledge.
- Huddleston, T./Niessen, J./Tjaden, J. D. (2013): *Using EU indicators of immigrant integration. Final Report for Directorate-General for Home Affairs. European Commission.* Online: https://ec.europa.eu/migrant-integration/library-document/using-eu-indicators-immigrant-integration_en (29.06.2023).
- Kahiya, E. T./Dean, D. L./Heyl, J. (2014): *Export barriers in a changing institutional environment: A quasi-longitudinal study of New Zealand’s manufacturing exporters.* In: *Journal of International Entrepreneurship*, 12, H. 4, 331-364.: <https://doi.org/10.1007/s10843-014-0131-7>.
- Kao, G./Tienda, M. (1995): *Optimism and achievement: The educational performance of immigrant youth.* In: *Social Science Quarterly*, 76, 1-19.
- Klaus, H./Rauch, W./Winkler, J./Zlatkin-Troitschanskaia, O. (2016): *Wer studiert Wirtschaftswissenschaften? [Who studies economics?].* In: *Hochschulrektorenkonferenz (Ed.): Die Studieneingangsphase in den Wirtschaftswissenschaften – Spezifische Herausforderungen und studierendenzentrierte Lösungsansätze.* Bonn, 9-16.
- Kuh, G. D./Kinzie, J. L./Buckley, J. A./Bridges, B. K./Hayek, J. C. (2006): *What matters to student success: A review of the literature.* National Postsecondary Education Cooperative. Online: https://nces.ed.gov/npec/pdf/kuh_team_report.pdf (29.06.2023).
- Lehmann, E. E./Starnecker, A. (2012): *Introducing the University of Applied Science in the technology transfer process.* In: *Technology Transfer in a Global Economy.* Boston, 99-115.
- Muthén, L. K./Muthén, B. O. (2016): *Mplus. The comprehensive modelling program for applied researchers: User’s guide.* Muthén & Muthén.
- Pelled, L. H. (1996): *Demographic diversity, conflict, and work group outcomes: An intervening process theory.* In: *Organization science*, 7, H. 6, 615-631. <https://doi.org/10.1287/orsc.7.6.615>.
- Pilz, M./Fürstenau, B. (2019): *Duality and Learning Fields in Vocational Education and Training: Pedagogy, Curriculum, and Assessment.* In: *The Wiley Handbook of Vocational Education and Training.* Wiley, 311-327.
- Rabe-Hesketh, S./Skrondal, A. (2012): *Multilevel and Longitudinal Modeling using Stata- Volume II: Categorical Responses, Counts, and Survival.* Stata Press.
- Reichert-Schlag, J. (accepted for publication): *Studienerfolgstypen in den Wirtschafts- und Sozialwissenschaften: Eine Analyse personenbezogener Bedingungsfaktoren von Studienerfolg über den Verlauf des Bachelorstudiums [Types of academic success in economics and social sciences: An analysis of personal determinants of academic success over the course of bachelor studies].* Springer.
- Renkl, A. (2006). *Wissenserwerb [Knowledge acquisition].* In: Wild, E./Möller, J. (Eds.): *Pädagogische Psychologie.* Berlin, Heidelberg, 3-26.

Richardson, P. W. (2004): Reading and writing from textbooks in higher education: a case study from Economics. In: *Studies in Higher Education*, 29, H. 4, 505-521.
<https://doi.org/10.1080/0307507042000236399>.

Rosendahl, J./Straka, G. (2011): Kompetenzmodellierungen zur wirtschaftlichen Fachkompetenz angehender Bankkaufleute [Competence modelling for the economic professional competence of prospective bankers]. In: *Zeitschrift für Berufs- und Wirtschaftspädagogik*, 107, H. 2, 190-217. <https://doi.org/10.25162/zbw-2011-0011>.

Ryan, R. M./Deci, E. L. (2017): *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. New York.

Schiefele, U./Köller, O. (2010). Intrinsische und extrinsische Motivation [Intrinsic and extrinsic motivation]. In D. H. Rost (Hrsg.): *Handwörterbuch Pädagogische Psychologie*. Weinheim, 336-344.

Schipolowski, S./Wilhelm, O./Schroeders, U. (2017): Berliner Test zur Erfassung fluider und kristalliner Intelligenz ab der 11. Jahrgangsstufe (BEFKI 11+) [Berlin test for the acquisition of fluid and crystalline intelligence from the 11th grade onwards (BEFKI 11+)]. Göttingen.

Schlx, J./Zlatkin-Troitschanskaia, O./Happ, R./Pant, H. A./Jitomirski, J./Kühling-Thees, C./Förster, M./Brückner, S. (2020): Validity and fairness of a new entry diagnostics test in higher education economics. *Studies in Educational Evaluation*, 66, 100900. Online:
<https://doi.org/10.1016/j.stueduc.2020.100900> (29.06.2023).

Schmidt, S. (2018): Veränderungsmessung des fachlichen Wissens von Studierenden – Eine Längsschnittanalyse des Wissenserwerbs in einem latenten Mehrebenenmodell [Measuring change in students' subject knowledge – A longitudinal analysis of knowledge acquisition in a latent multi-level model]. Wiesbaden.

Schwarzer, R./Jerusalem, M. (1999): *Skalen zur Erfassung von Lehrer- und Schülermerkmalen: Dokumentation der psychometrischen Verfahren im Rahmen der Wissenschaftlichen Begleitung des Modellversuchs Selbstwirksame Schulen* [Scales for recording teacher and student characteristics: Documentation of the psychometric procedures within the framework of the scientific monitoring of the pilot project Self-effective schools]. Freie Universität Berlin.

Seel, N. M. (2003): Model-centered learning and instruction. *Technology, Instruction, Cognition and Learning*, 1, H. 1, 59-85.

Shapiro, A. M. (2004): How including Prior Knowledge as a Subject Variable May Change Outcomes of Learning Research. In: *American Educational Research Journal*, 41, H. 1, 159-189. <https://doi.org/10.3102/00028312041001159>.

Shavelson, R.J./Zlatkin-Troitschanskaia, O./Marino, J. (2018): Performance indicators of learning in higher-education institutions: overview of the field. In: Hazelkorn, E./Coates, H./Cormick, A. (eds): *Research Handbook on Quality, Performance and Accountability in Higher Education*. Cheltenham, 249-263.

Spinath, B./Steinmayr, R. (2008): Longitudinal Analysis of Intrinsic Motivation and Competence Beliefs: Is There a Relation Over Time? In: *Child Development*, 79, H. 5, 1555-1569.
<https://doi.org/10.1111/j.1467-8624.2008.01205.x>.

Stata Corp (2017): Stata Statistical Software: Release 15. StataCorp LLC.

Tabachnick, B./Fidell, L. (2014): Using Multivariate Statistics (6th). Pearson Education.

Vulperhorst, J./Lutz, C./de Kleijn, R./van Tartwijk, J. (2018): Disentangling the predictive validity of high school grades for academic success in university. In: *Assessment & Evaluation in Higher Education*, 43, H. 3, 399-414. <https://doi.org/10.1080/02602938.2017.1353586>.

Walstad, W. B./Rebeck, K./Butters, R. B. (2013): Test of economic literacy: Examiner's manual. 4th ed. Council for Economic Education.

Walstad, W. B./Watts, M./Rebeck, K. (2007): Test of understanding in college economics: Examiner's manual (4th ed.). National Council on Economic Education.

Wild, K.-P./Krapp, A./Schiefele, K./Lewalter, K./Schreyer, I. (1995): Dokumentation und Analyse der Fragebogenverfahren und Tests [Documentation and analysis of questionnaire procedures and tests]. Universität der Bundeswehr, Institut für Erziehungswissenschaft und Pädagogische Psychologie.

Wise, S. L./DeMars, C. E. (2005): Low examinee effort in low-stakes assessment: Problems and potential solutions. In: *Educational assessment*, 10, H. 1, 1-17. https://doi.org/10.1207/s15326977ea1001_1.

Wuttke, E. (2005): Unterrichtskommunikation und Wissenserwerb: Zum Einfluss von Kommunikation auf den Prozess der Wissensgenerierung [Instructional communication and knowledge acquisition: On the influence of communication on the process of knowledge generation]. Frankfurt a. M.

Zlatkin-Troitschanskaia, O./Förster, M./Brückner, S./Happ, R. (2014): Insights from a German assessment of business and economics competence. In: Coates, H. (Ed.), *Higher Education Learning Outcomes Assessment – International Perspectives*. Frankfurt a. M., 175-197.

Zlatkin-Troitschanskaia, O./Jitomirski, J./Happ, R./Molerov, D./Schlax, J./Kühling-Thees, C./Pant, H. A./Förster, M./Brückner, S. (2019). Validating a Test for Measuring Knowledge and Understanding of Economics Among University Students. *Zeitschrift Pädagogische Psychologie*, 32, H. 2, 1-14. <https://doi.org/10.1024/1010-0652/a000239>.

Zlatkin-Troitschanskaia, O./Schlax, J. (2020): Entry assessment of student learning preconditions in higher education: Implications for the transition from secondary to tertiary education in Germany. *European Review*, 28, H. S1, 67-84. <https://doi.org/10.1017/S1062798720000915>.

Zitieren dieses Beitrags

Happ, R./Reichert-Schlax, J./Zlatkin-Troitschanskaia, O./Olivier, C. (2023): Der Einfluss der voruniversitären Bildung auf die Entwicklung des ökonomischen Wissens von Studierenden im Verlauf ihres Studiums – Ergebnisse einer deutschlandweiten Längsschnittstudie. In: *bwp@Profil 8: Netzwerke – Strukturen von Wissen, Akteuren und Prozessen in der beruflichen Bildung*. Digitale Festschrift für Bärbel Fürstenau zum 60. Geburtstag, hrsg. v. Hommel, M./Aprea, C./Heinrichs, K., 1-21. Online: https://www.bwpat.de/profil8_fuerstenau/happ_etal_profil8.pdf (14.09.2023).

Die Autor:innen



Univ.-Prof. Dr. ROLAND HAPP

Universität Leipzig, Institut für Wirtschaftspädagogik

Grimmaische Straße 12, 04109 Leipzig

happ@wifa.uni-leipzig.de

<https://www.wifa.uni-leipzig.de/institut-fuer-wirtschaftspaedagogik>



Dr. JASMIN REICHERT-SCHLAX

Johannes Gutenberg-Universität Mainz, Fachbereich Rechts- und
Wirtschaftswissenschaften, Lehrstuhl für Wirtschaftspädagogik

Jakob-Welder-Weg 9, 55009 Mainz

jasmin.schlax@uni-mainz.de

<https://www.wipaed.uni-mainz.de/lehrstuhlteam/wissenschaftliche-mitarbeiter-innen-der-lehrstuehle/jasmin-schlax-m-sc/>



Univ.-Prof. Dr. OLGA ZLATKIN-TROITSCHANSKAIA

Johannes Gutenberg-Universität Mainz, Fachbereich Rechts- und
Wirtschaftswissenschaften, Lehrstuhl für Wirtschaftspädagogik

Jakob-Welder-Weg 9, 55009 Mainz

troitschanskaia@uni-mainz.de

<https://www.wipaed.uni-mainz.de/lehrstuhlteam/prof-dr-olga-zlatkin-troitschanskaia/>



Dr. CARLA OLIVIER

Johannes Gutenberg-Universität Mainz, Fachbereich Rechts- und
Wirtschaftswissenschaften, Lehrstuhl für Wirtschaftspädagogik

Jakob-Welder-Weg 9, 55009 Mainz

ca.kuehlingthees@gmail.com

<https://www.wipaed.uni-mainz.de/>