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Reference-Group Effects in Vocational Education and Training (VET): An Exploratory Examination of Contrast and Assimilation Effects on VET Success

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Abstract

Context: Reference-group effects are well-established in educational psychology. However, whereas they have been thoroughly researched in primary and secondary education, little is known about their influence in vocational educational and training (VET) contexts. In this exploratory study, we examine whether reference-group effects impact multiple indicators of VET success (i.e. satisfaction, motivation, and dropout) – over and above the influence of secondary school learning contexts.

Approach: To test our assumptions, we worked with a sample of VET students from the National Educational Panel Study. We clustered VET students into VET occupational groups as well as former secondary schools; hence, we calculated cross-sectional multilevel models. **Findings:** Results show a complex pattern of VET reference-group effects. VET occupational status positively affects VET satisfaction, whereas it negatively influences competition-oriented motivation. We also found negative contrast effects of VET achievement on VET school satisfaction, but not on any of the other outcomes. Lastly, findings reveal that VET students who went to low track secondary schools are disadvantaged regarding multiple measures of career success.

Conclusions: These findings reveal the necessity to acknowledge VET contexts as relevant frames of reference and to invest more research into understanding their complex influence. Secondly, they hint at the importance of offering extra support to VET students from low track schools in order to counterbalance the long-term disadvantages of secondary school reference-groups on their occupational success.

Keywords

reference-group effects, big-fish-little-pond-effect, dropout from VET, satisfaction, motivation

1 Introduction

Adolescents spend much of their time in educational contexts, such as secondary schools, universities, vocational training firms or vocational schools. These learning environments constitute an important stepping stone to adolescents' further occupational pathways and hence can be considered relevant influences on career success (Achatz et al., 2022; Göllner et al., 2018; Leuze, 2007; van den Broeck et al., 2023).



Amongst other aspects of the learning environment, the peer group has been identified as a highly impactful influence on individual success (Hattie, 2002; Trautwein et al., 2009; Nikolov & Dumont, 2020; Ryan, 2000). In particular, *reference-group theory* states that social groups provide points of reference to individuals, thereby shaping their self-perception and subsequent behaviour. Specifically, two types of reference-group effects can be distinguished: positive *assimilation* and negative *contrast* effects (Kelley, 1952; Marsh, 1984, 1987; Sherif, 1937). Strong empirical evidence for both has been found in educational environments: whereas school status positively affects academic self-concept and other educational or occupational outcomes (i.e. assimilation effect), school achievement has a negative impact (i.e. contrast effect; Göllner et al., 2018; Marsh, 1991; Marsh et al., 2023). Hence, educational reference-groups can be considered highly relevant to adolescents' career success.

The majority of reference-group research focuses on the impact of compulsory educational contexts, such as primary and secondary schools and classrooms. Post-compulsory reference-groups, i.e. higher or vocational education contexts, remain largely unexamined (Warwas et al., 2016; Zhang, 2021). However, evidence from one learning context cannot be generalised to another, as each environment displays unique characteristics (Tynjälä, 2013). Therefore, the aim of our study is to test the exact nature of reference-group effects on career success in non-compulsory educational contexts.

To achieve this goal, we will make use of the German educational system. In Germany, non-compulsory education is not only highly prevalent but also institutionalised, which makes it possible to cluster individuals into VET reference-groups (BIBB, 2023; Cedefop, 2020). We will focus on vocational education and training (VET) as for most German adolescents VET constitutes the first step towards an occupational qualification (BIBB, 2023) and hence can be considered a highly relevant point of reference.

We will examine VET reference-group effects on multiple indicators of VET success. To account for both contrast and assimilation effects, we will analyse how a) the achievement composition of VET occupations and b) VET status impact VET success. As little knowledge exists regarding reference-group effects in VET, we will take an exploratory perspective by examining the impact on various outcomes that we do not only deem relevant to VET students' career success (Achatz et al., 2022; Boehm & Lyubomirsky, 2008; Idris et al., 2023) but that also have been related to peer influences in past research: satisfaction, motivation and dropout (Nikolov & Dumont, 2020; Rathmann et al., 2018; Rjosk et al., 2015; Wu & Becker, 2023).

2 Theoretical Background

2.1 Reference-Group Effects: Contrast and Assimilation

Educational psychologists have demonstrated repeatedly that adolescents' learning environments shape their self-perceptions, academic performance and career development (e.g. Kyriakides et al., 2021; Marsh et al., 2023; Reynolds et al., 2014; van den Broeck et al., 2023). *Reference-group research* is one psychological research tradition that focuses on such educational context effects and has identified two opposing mechanisms underlying these relations: negative *contrast* and positive *assimilation* effects (Kelley, 1952; Marsh, 1984, 1987; Sherif, 1937).

Contrast effects describe negative influences of peer group *achievement* on academic and career outcomes. According to reference-group theory they result from comparisons *within* the reference-group, which stress differences between oneself and other group members (Bergold et al., 2021; Marsh, 1984, 1987). The most prominent contrast effect is the *big-fish-little-pond effect* (BFLPE), which describes a negative effect of average group achievement on academic self-concept—while controlling for individual achievement (Marsh, 1984, 1987, 1991; Marsh et al., 2000). Assimilation effects, on the other hand, describe a positive effect of reference-group

status on educational outcomes. The assumed underlying mechanism is a *between-group* comparison process, which leads to an identification with one's own reference-group. Consequentially, norms, values and behaviours of one's group members spill over to the individual (Bergold et al., 2021; Lüdtke et al., 2005; Marsh, 1984, 1987; Marsh et al., 2000; Ryan, 2000). A well-known assimilation process is the *basking-in-the-reflected-glory-of-others-effect* (BIRGE), which describes a positive influence of reference-group status on academic self-concept (Cialdini et al., 1976; Marsh, 1984, 1987, 1991; Marsh et al., 2000; Marsh et al., 2023).

Psychological research shows that assimilation and contrast effects exist simultaneously, although sometimes the contrast effect is reported to be stronger (Göllner et al., 2018; Lüdtke et al., 2005; Marsh et al., 2000, 2023; Wolff et al., 2021). In order to disentangle the two mechanisms from each other, the majority of current studies model contrast and assimilation effects simultaneously (e.g. Göllner et al., 2018; Marsh et al., 2023; Nagengast & Marsh, 2012; Wolff et al., 2021). Hence, in our study, we will adapt this procedure to gain a comprehensive picture of the opposing reference-group effects at play.

2.2 Reference-Group Effects in German VET

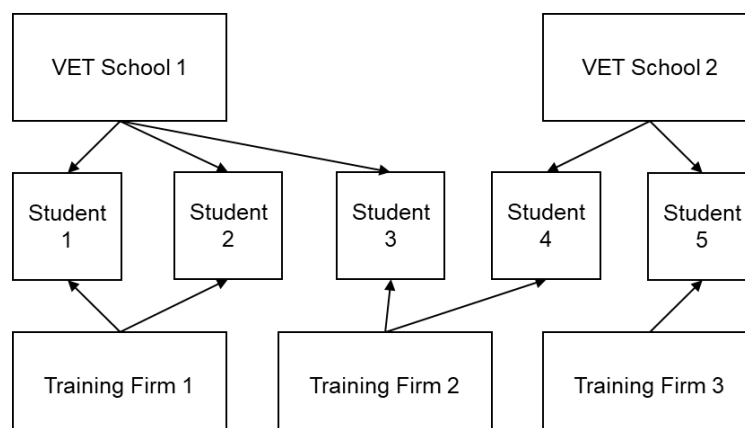
Although reference-group effects have been found to be highly robust across nations (Fang et al., 2018; Nagengast & Marsh, 2012; Seaton et al., 2009) and compulsory educational settings (e.g. Kohlmeier, 2024; Preckel et al., 2010; Szumski & Karwowski, 2015), they have only rarely been tested in non-compulsory educational contexts. Most research focuses on various types of primary or secondary schools, whereas we only know of few studies examining reference-group effects in higher education (Payne & Smith, 2020; Zhang, 2021) and in VET (Warwas et al., 2016).

Although VET constitutes the major educational pathway for German secondary school graduates (BIBB, 2023), we are aware of only one study exploring reference-group effects in VET: Warwas et al. (2016) examined the influence of VET classroom achievement on students' intrinsic learning motivation and did not find significant contrast effects. One possible explanation for these null-results lies within the unique structure of the German VET system. The authors argue that VET classrooms might not be the most relevant frame of reference for VET students, as they also spend time in a second learning environment: training firms.

While learning in VET schools is highly standardised, training firms constitute workplace-based learning environments. Depending on their VET occupation, students spend more time in one of the two contexts: In dual VET occupations (e.g. service and industrial occupations), students visit school 1-2 days per week and work at the training firm the rest of the week. In school-based VET occupations (e.g. social and health occupations), longer periods of schooling alternate with multiple-week-long internships in training firms (Cedefop, 2020). The former type of VET makes up the majority of positions (BIBB, 2023).

Usually, VET students from multiple training firms, but from the same occupations are clustered within VET classrooms. This structure fosters multiple types of comparisons between VET students: They might relate their own status and achievement to that of their peers at school and/or in the training firm. These peers, in turn, are impacted by an often-different group of VET students, as they spend time in different VET schools or training firms. Consequently, training firm and VET school environments are strongly intertwined in the German VET context, resulting in a complex system of multiple direct and indirect reference-group influences (see Figure 1).

Based on these considerations, we argue that it is necessary to identify reference-groups that are able to depict this complex network of peers. Therefore, in our study we will focus on VET occupational groups instead of examining either training firm or VET school effects in isolation. We believe that this methodology allows us to capture the effect of VET reference-groups on career success.

Figure 1*Exemplary Clustering of VET Students Within VET Schools and Training Firms*

2.3 Reference-Group Effects on VET Success

Traditionally, contrast and assimilation effects have been examined on academic self-concept (Marsh, 1984, 1987; Marsh et al., 2000). However, they have long been generalised to a variety of outcome variables, including interest (Lohbeck et al., 2024; Trautwein et al., 2006), educational attainment (Göllner et al., 2018; Marsh et al., 2023), aspirations (Göllner et al., 2018; Nagengast & Marsh, 2012; Marsh et al., 2023), career choices (Rosenqvist, 2018; van den Broeck et al., 2023) and labour market outcomes (Göllner et al., 2018). In our study, we will focus on multiple indicators of success that are relevant to VET students' career pathways: satisfaction, motivation and dropout. We argue that these outcomes are not only relevant to positive occupational development, but also that their association with reference-group effects is highly plausible.

Previous research shows that satisfaction and motivation are positively associated with VET success: Both have been related to dropout from VET (Böhn & Deutscher, 2022; Holtmann & Solga, 2023), which in turn is an important risk factor for long-term negative career development, including unemployment or unskilled labour (Achatz et al., 2022; Brzinsky-Fay, 2022; Brzinsky-Fay & Solga, 2016).

Furthermore, reference-group research has related these two indicators of career success to peer group influences. In some studies, satisfaction (Bear et al., 1998; Rathmann et al., 2018; Wu & Becker, 2023) and intrinsic motivation (Rjosk et al., 2015) were found to be impacted by reference-group achievement. Others, however, did not find such contrast effects, neither on satisfaction (Nikolov & Dumont, 2020; Wu & Becker, 2023; for review see Dijkstra et al., 2008), nor on motivation (Warwas et al., 2016). We aim to shed light on these inconsistencies by examining reference-group status and achievement effects on both of these indicators of VET success. Additionally, we will examine effects on dropout from vocational training, as dropout is related to both satisfaction and motivation (Böhn & Deutscher, 2022; Holtmann & Solga, 2023). Hence – although not tested previously – we hypothesise that reference-group influences might also be at play here.

3 Methods

3.1 Sample

We worked with data from Starting Cohort 4 of the National Educational Panel Study (NEPS-SC4, Blossfeld & Roßbach, 2019)¹. NEPS is a multi-cohort-sequence survey that follows adolescents' educational and occupational trajectories over their life course. It comprises a large set of information on adolescents' competencies, sociodemographic backgrounds, socio-emotional resources and educational environments, including secondary school and VET contexts. Hence, it is well suited to examine reference-group effects on VET success (Blossfeld et al., 2011; Fuß et al., 2016).

Our sample consists of adolescents who reported to be in VET during wave 8 (autumn/winter 2014/15) of the study, when information on all outcome variables was available. We only included VET students from reference-groups with data from at least 10 individuals to minimise sampling error of reference-group information (Lüdtke et al., 2008). This procedure is in line with previous reference-group studies (Jansen et al., 2022; Stäbler et al., 2017). It leads to a final sample size of $N = 3,282$.

3.2 Measures

3.3 VET Success: Satisfaction, Motivation and Dropout

In an exploratory manner, we examined reference-group effects on eight outcome variables in total, most of which were measured in wave 8: three subdimension of satisfaction, 4 types of learning motivation and dropout from VET (LifBi, 2024).

Self-reported satisfaction with VET school, with VET overall and with life in general was measured using one 11-point item each. The wording of the items was: "All in all, how satisfied are you with your life at the moment?" for life satisfaction and "How satisfied are you with your vocational training (school situation)?" for satisfaction with VET (VET school). Individuals answered on a scale from *completely unsatisfied* (0) to *completely satisfied* (10).

Apart from that, we examined effects on four types of learning motivation: profession-oriented, competition-oriented, performance-related and intrinsic motivation. All of them were measured using four 4-point-scale items each. Item examples for each subdimension of motivation can be found in Table 1 (see Appendix). For each dimension, we calculated Weighted Likelihood Estimates (WLEs) based on Multidimensional Item Response Theory, making use of the *mirt* package in R (Chalmers, 2012; R Core Team, 2023). Reliability levels were acceptable (performance-related: .76, competition-oriented: .83, profession-oriented: .68, intrinsic: .75). Lastly, we dummy-coded dropout based on self-reported episodic information, indicating whether the training in question was completed successfully (0 = no, 1 = yes).

3.4 Contrast Effects: Individual, VET-Average and School Average Achievement

To measure contrast effects of reference-group achievement, we used math achievement test scores. Previous research has shown that reference-group effects are strongest in the mathematical domain (Becker et al., 2024; Bergold et al., 2021). Consequently, if we do not find significant effects in this domain, we would not expect to find them in any other domain.

The main focus of our study are the effects of VET reference-group achievement; additionally, we included individual achievement and secondary school-average achievement data into

¹ This paper uses data from the National Educational Panel Study (NEPS; see Blossfeld & Roßbach, 2019). The NEPS is carried out by the Leibniz Institute for Educational Trajectories (LifBi, Germany) in cooperation with a nationwide network.

our analyses. Modelling individual achievement is common practice in reference-group research to disentangle individual from group achievement effects (e.g. Marsh, 1991; Marsh et al., 2023; Wolff et al., 2021). Furthermore, we controlled for secondary school average achievement, as previous reference-group studies found lasting secondary school reference-group effects on individual development, even after graduation (Göllner et al., 2018; Marsh, 1991; Marsh et al., 2023).

All three variables were calculated based on Weighted Likelihood Estimates (WLEs) of math achievement test scores. Tests were conducted in wave 1 (grade 9) and wave 7 (grade 12). For each individual, we used the most current test score available before entering VET (Fuß et al., 2024). Reliability was acceptable (wave 1: .79; wave 7: .76; Duchhardt & Gerdes, 2013; Fischer et al., 2017). To account for VET reference-group effects, we averaged math achievement scores within VET contexts. These were identified based on 4-digit KldB-classifications (German Classification of Occupations), which differentiate between 702 occupational groups (BA, 2010; Paulus & Matthes, 2013). To minimise sampling errors, we included data from all students who reported to be in VET at some point during data collection to calculate cluster-means (i.e. not only those VET students from the final sample).

Secondary school average achievement was calculated in the same manner, using school identifiers and all students from the study to create meaningful reference-groups (Keyserlingk et al., 2019).

3.5 Assimilation Effects: Individual Social Status, VET Status and Secondary School Status

Again, we included individual, VET-average and secondary school social status information into our analyses to disentangle VET-related assimilation effects from secondary school assimilation and individual status effects.

To measure individual status, we used parental ISEIs (International Socio-Economic Index of Occupational Status, ISEI-08; Ganzeboom et al., 1992; Ganzeboom, 2010). If data of both parents was available, we created the combined maximum, i.e. we used the larger value for analyses (Ganzach, 2000; Hartung et al., 2022). We preferred data from parent questionnaires over student reports and more recent information over earlier time points.

VET-related social status was also calculated using ISEIs. We averaged ISEI information on self-reported VET occupations within 4-digit KldB-2010-clusters.

Lastly, we used school track information to measure reference-group status of secondary schools, as is common practice in reference-group research (Wolff et al., 2021; Wu & Becker, 2023). The data was dummy-coded, differentiating between lower, intermediate, academic and mixed track schools. Lower track schools were used as the reference category.

3.6 Covariates

We also controlled for covariates that might confound the relationships under examination, including sex, migration background and school leaving certificate (Achatz et al., 2022; Beicht & Walden, 2019; Hillmert et al., 2017; Holtmann & Solga, 2023; Nießen et al., 2020). We defined migration background as having at least one parent who was born in a foreign country (Olczyk et al., 2014) and dummy-coded the information. Furthermore, we distinguished between male (1) and female (0) sex. Lastly, we included a dummy-coded variable into our analyses indicating whether VET students had obtained a lower, intermediate or higher school leaving certificate. A lower degree was used as the reference category.

3.7 Analytic Strategy

In our data, individuals are clustered a) within VET occupational groups and b) within (former) secondary schools. These clusters overlap partly, meaning that adolescents from the same secondary school transition into multiple occupational groups and that an occupational group is made up of students from multiple secondary schools. This data structure calls for the use of cross-classified multilevel models (Becker et al., 2024; Hox et al., 2017). Linear models were calculated for satisfaction- and motivation-outcomes, logistic models for dropout.

Models were built in a stepwise manner, first examining contrast effects of VET occupational groups (Model 1), then adding assimilation effects of VET occupational groups (Model 2) and covariates (Model 3). Lastly, we included secondary school reference-group effects into the models (Model 4). All analyses were conducted in R, after multiple imputation of missing data using the *mice* package (Enders, 2022; R Core Team, 2023; van Buuren, 2018; van Buuren & Groothuis-Oudshoorn, 2011). In line with reference-group research we z-standardised all numeric variables based on grand-mean-centering before multivariate analyses (Becker et al., 2024; Huguet et al., 2009; Lüdtke et al., 2008; Bryk & Raudenbush, 2002). All results were pooled using Rubin's Rules (Enders, 2022; Rubin, 1987; van Buuren, 2018).

4 Results

4.1 Descriptive Results

Findings of descriptive analyses are presented in Tables 2-4 (see Appendix). Medium correlations between VET and secondary school variables suggest that VET reference-groups are indeed distinct from secondary school reference-groups. This finding indicates the necessity to analyse their effects on VET success separately and conjointly. Correlation coefficients of average VET achievement and average VET status with VET success differ depending on the outcome variable. These findings hint at the possibility that reference-group effects are dependent on the success indicator under examination. Multivariate analyses will shed more light on these findings.

4.2 Multivariate Analyses

4.3 Reference-Group Effects on Satisfaction

We found significant VET reference-group effects on two subdomains of satisfaction (see Table 5 and 6, Appendix). Firstly, average VET status positively influences general VET satisfaction ($\beta = .04, p = .08$), suggesting that VET students in prestigious occupations are happier about their training than those in low-status jobs. These results are in line with reference-group theory, suggesting that individuals identify with the status of their learning environment. Additionally, we found a negative contrast effect of average VET achievement on satisfaction with VET school ($\beta = -.08, p = .008$). This effect also supports reference-group theory: It indicates that in VET occupations with higher average achievement, VET students are less happy with VET school. Each of these effects was only found on one domain of satisfaction.

Over and above VET-related reference-group effects, we found multiple positive assimilation effects of secondary school status on the same two dimensions of satisfaction. Specifically, average secondary school status positively affects both VET school satisfaction. Individuals who went to higher school tracks report more satisfaction with VET school and with VET in general than those who visited low-track schools.

Lastly, we did not find significant effects of any reference-group measures on life satisfaction (see Table 7, Appendix). Possibly, this is due to the broadness of the construct: Arguably, educational reference-groups are not relevant to all subdimensions of life satisfaction, e.g. health,

family and living environment (Proctor et al., 2009), so that their overall effect might be negligibly small.

4.4 Reference-Group Effects on Motivation

The exploration of VET reference-group effects on motivation reveal somewhat unexpected findings. We found a negative effect of VET-average status on competition-oriented motivation ($\beta = -.11, p < .001$). Contradictory to reference-group research, these findings suggest that VET students who train in prestigious occupations have lower competition-oriented motivation. We suggest that high-status occupations per se might function as signals of career success, so that these VET students do not feel the need to further prove themselves by outperforming their peers. No other VET reference-group effects on motivation were detected.

Regarding secondary school effects, we found a positive assimilation effect on competition-oriented motivation (see Table 8, Appendix): Former intermediate track students reported higher motivation than lower track students ($\beta = .12, p = .02$). Possibly, these students are confident that they can outperform their peers from low track schools, hence develop stronger competition-oriented motivation.

The other three dimensions of motivation – intrinsic, profession-oriented and performance-related motivation – were not affected by reference-group effects in our study (see Tables 9-11, Appendix), indicating that neither VET nor secondary school reference-groups influence these types of motivation. Our results suggest that these subdimensions of motivation are influenced by factors other than learning environments. For instance, labour-market influences might play a larger role for profession-oriented motivation than learning contexts, as they are known to impact adolescents' career behaviour (Hartung & Weßling, 2024; Weßling et al., 2015).

4.5 Reference-Group Effects on Dropout

We did not find any significant effects of VET reference-groups on dropout from VET, neither status nor achievement effects (see Table 12, Appendix). However, a positive effect of secondary school track indicates that students who went to intermediate tracks have a higher chance of completing their training (versus those from lower track schools; $\beta = .44, p = .04$).

5 Discussion

In this study we examined VET reference-group effects on multiple indicators of VET success. In an exploratory manner we focused on how average VET status and achievement impact eight indicators of VET success, over and above the influence of long-lasting secondary school reference-group effects.

We detected multiple VET status effects. Whereas we found a positive assimilation effect – in line with reference-group theory – on VET satisfaction, the effect of VET status on competition-oriented motivation was negative. These results indicate that VET status shapes adolescents' experience during VET but also hint at the danger of an over-generalisation of these influences. Whereas VET students in high-prestige occupations are more likely to be satisfied, they might report low competition-oriented motivation. Nevertheless, we argue that VET students in low-status occupations would profit from a positive change of societal perceptions of these occupations, as they would feel more satisfied with their training and might feel less need to compete against their peers. More generally speaking, researchers and practitioners should take into consideration that reference-group effects are outcome-specific as they try to enhance adolescents' experience during vocational training.

This interpretation is supported by the fact that we found a negative contrast effect of VET average achievement on satisfaction with VET school, but not on any of the other outcomes under examination. Hence, not all indicators of VET success are impacted by negative contrast

effects. It would be helpful to learn more about these differential influences to understand under which circumstances reference-group effects impact VET success (and when they do not).

Over and above VET-related reference-group effects, we also found long-lasting assimilation effects of secondary schools on satisfaction with VET, VET school satisfaction, dropout from VET and competition-oriented motivation. These findings indicate that early educational stratification has a long-term impact on adolescents' careers. Going to low track secondary schools negatively influences career trajectories, even after students have transitioned into VET. Practitioners and policy makers should be aware of this long-lasting disadvantage for low-track students. These adolescents need to receive tailored support during vocational training to ensure that they remain satisfied and motivated and ultimately are able to successfully complete their training. Otherwise, these disadvantages for low-track students will persist throughout their further career pathways.

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Biographical Notes

Nele Theuer is a PhD student in psychology at the Federal Institute for Vocational Education and Training (BIBB) and at Tübingen University. In her dissertation, she explores reference-group effects in vocational education and training contexts as part of the BIBB project ConVET.

Appendix

Table 1

Item Examples Learning Motivation

Subdimension	Item example
Intrinsic motivation	I learn for the vocational training program...
Performance-related	...because I find working with the content fun.
Competition-oriented	...because I want to successfully complete the vocational training.
Profession-oriented	...because I want to be one of the best.
	...in order to have good career opportunities later.

Table 2

Distribution of Categorical Variables

variable	response	count	percent
Dropout from VET	completion	2902	88.4%
	non-completion	379	11.6%
Sex (0 = female)	female	1476	45.0%
	male	1807	55.0%
Migration background	yes	721	22.0%
	no	2561	78.0%
School	academic track	443	13.5%
	intermediate track	951	29.0%
	lower track	1249	38.1%
	mixed track	639	19.5%
School leaving certificate	HE entrance degree	722	18.9%
	intermediate certificate	774	23.6%
	lower certificate	1786	54.4%
type of VET (0 = dual)	dual VET	2733	83.3%
	school-based VET	549	16.7%

Table 3

Means and Standard Deviations of Numeric Variables

Variable	M	SD
Individual math achievement	0.68	0.61
VET-average math achievement	0.68	0.11
Secondary school-average math achievement	0.71	0.27
Individual socioeconomic status	44.67	18.61
VET-average socioeconomic status	38.79	12.47
Satisfaction with VET school	7.51	1.56
Satisfaction with VET	8.02	1.59
Satisfaction with life	8.21	1.15
Intrinsic motivation	-0.01	0.94
Competition-oriented motivation	0.02	1.04
Performance-related motivation	-0.11	0.88
Profession-oriented motivation	-0.16	0.80

Table 4
Correlations of Predictor and Outcome Variables

	3	4	5	6	7	8	9	10	11	12	13	14	
1. School track													
Academic	.10*	.09	.75***	.18***	.18***	-.01	.04*	.04*	-.01	.04 ⁺	-.05*	-.04*	-.01
intermediate	.02	.11	-.08	.12***	.12***	.12*	.02	.01	.01	-.03 ⁺	.03 ⁺	-.01	.02
mixed	-.03	-.04	-.09**		-.01	-.02	-.00	-.00	-.00	.03	-.01	.03 ⁺	.01
3. individual achiev		17***	.14**		.02	.01	-.01	-.00	-.01	-.01	.01	-.03	-.01
4. VET-average achievement			.12 ⁺		.13	.05*	-.08**	.01	.01	.02	.00	-.04	.00
5. school-average achievement					.17***	.03	.01	.02	-.00	.03	-.04*	-.05*	-.02
6. VET-average SES						-.01	-.00	.05*	.01	.06**	-.12***	-.01	-.01
7. dropout							.01	.05*	.05*	.01	.02	.02	.02
8. VET school satisfaction								.33***	.24***	.19***	.11***	.20***	.15***
9. VET satisfaction									.29***	.31***	.12***	.22***	.17***
10. life satisfaction										16***	.08***	.13***	.13***
11. intrinsic motiv.											.26***	.44***	.32***
12. competition-oriented motivation												.43***	.37***
13. performance-related motivation													.55***
14. profession-oriented motivation													

Note. Tetrachoric correlations were calculated between two binary variables; Pearson correlations between all other variables (Makowski et al., 2022; Revelle, 2022). The reference category for school track is 0 = lower track
 *** $p < .001$, ** $p < .01$, * $p < .05$, ⁺ $p < .10$

Table 5
Reference-Group Effects on VET School Satisfaction

	Model 1 β (p)	Model 2 β (p)	Model 3 β (p)	Model 4 β (p)
(Intercept)	-.00 (.92)	-.00 (.92)	.02 (.63)	-.10 (.09) ⁺
Individual achievement	.00 (.88)	.00 (.87)	.01 (.83)	.00 (.90)
VET-average achievement	-.07 (.01)*	-.08 (.008)**	-.07 (.01)*	-.08 (.008)**
Socioeconomic status		-.01 (.62)	-.01 (.70)	-.02 (.27)
VET-average social status		.01 (.71)	-.00 (.92)	-.02 (.58)
Intermediate certificate			.02 (.69)	.00 (.95)
Higher education entrance degree			.05 (.47)	.01 (.84)
Migration background			.03 (.56)	.05 (.27)
Sex (0 = female)			-.08 (.08) ⁺	-.07 (.11)
School-average achievement				-.05 (.15)
Intermediate school track				.17 (.003)**
Academic school track				.37 (.001)**
Mixed school track				.10 (.09) ⁺
df	2, 254.76	2, 175.75	4, 584.43	4, 1115.57
F-value	3.19 (p = .04)*	0.16 (p = .85)	0.85 (p = .49)	4.16 (p = .002)**

Note. The reference categories for school leaving certificate and school track are 0 = lower certificate and 0 = lower track. *** $p < .001$, ** $p < .01$, * $p < .05$, ⁺ $p < .10$

Table 6
Reference-Group Effects on Satisfaction with VET

	Model 1 β (p)	Model 2 β (p)	Model 3 β (p)	Model 4 β (p)
(Intercept)	-.01 (.63)	-.01 (.66)	-.00 (.95)	-.06 (.22)
Individual achievement	-.00 (.85)	-.00 (.89)	-.00 (.88)	-.01 (.81)
VET-average achievement	.01 (.76)	.01 (.80)	.01 (.81)	.00 (.93)
Socioeconomic status		-.05 (.008)**	-.05 (.008)**	-.06 (.002)**
VET-average social status		.06 (.02)*	.05 (.04)*	.04 (.08) ⁺
Intermediate certificate			.00 (.99)	-.01 (.86)
Higher education entrance degree			.01 (.85)	-.01 (.91)
Migration background			-.03 (.52)	-.02 (.75)
Sex (0 = female)			-.01 (.88)	-.00 (.96)
School-average achievement				-.02 (.52)
Intermediate school track				.08 (.15)
Academic school track				.21 (.04)*
Mixed school track				.06 (.29)
df	2, 200.00	2, 1087.64	4, 616.06	4, 1814.14
F-value	0.06 (p = .94)	5.62 (p = .003)**	0.09 (p = .99)	1.54 (p = .19)

Note. The reference categories for school leaving certificate and school track are 0 = lower certificate and 0 = lower track. *** $p < .001$, ** $p < .01$, * $p < .05$, ⁺ $p < .10$

Table 7
Reference-Group Effects on Life Satisfaction

	Model 1	Model 2	Model 3	Model 4
(Intercept)	-.02 (.32)	-.02 (.31)	-.04 (.39)	-.04 (.43)
Individual achievement	-.01 (.60)	-.01 (.60)	-.01 (.62)	-.01 (.63)
VET-average achievement	-.01 (.72)	.01 (.75)	.01 (.77)	.00 (.78)
Socioeconomic status		.00 (.82)	.01 (.68)	.01 (.68)
VET-average social status		.01 (.69)	.01 (.66)	.01 (.67)
Intermediate certificate			.02 (.77)	.02 (.77)
Higher education entrance degree			-.01 (.90)	-.01 (.91)
Migration background			.06 (.24)	.06 (.24)
Sex (0 = female)			.01 (.80)	.01 (.83)
School-average achievement				.00 (.98)
Intermediate school track				.01 (.98)
Academic school track				-.01 (.92)
Mixed school track				-.00 (.99)
df	2, 233.69	2, 1112.00	4, 377.63	4, 1180.77
F-value	0.19 ($p = .82$)	0.11 ($p = .89$)	0.26 ($p = .90$)	0.02 ($p = .99$)

Note. The reference categories for school leaving certificate and school track are 0 = lower certificate and 0 = lower track. *** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table 8
Reference-Group Effects on Competition-Oriented Motivation

	Model 1	Model 2	Model 3	Model 4
(Intercept)	-.00 (.83)	-.00 (.88)	-.04 (.31)	-.09 (.09) ⁺
Individual achievement	.01 (.80)	.01 (.78)	.01 (.81)	.01 (.73)
VET-average achievement	-.00 (.91)	.01 (.57)	.00 (.85)	.00 (.95)
Socioeconomic status		-.01 (.64)	-.01 (.61)	-.01 (.54)
VET-average social status		-.12***	-.11***	-.11***
Intermediate certificate			-.02 (.78)	-.02 (.68)
Higher education entrance degree			-.01 (.93)	-.01 (.83)
Migration background			.01 (.79)	.02 (.70)
Sex (0 = female)			.07 (.08) ⁺	.08 (.08) ⁺
School-average achievement				-.02 (.39)
Intermediate school track				.12 (.02)*
Academic school track				.05 (.65)
Mixed school track				.02 (.68)
df	2, 134.19	2, 1130.37	4, 660.95	4, 1767.64
F-value	0.03 ($p = .97$)	14.62 ($p < .001$)***	0.57 ($p = .69$)	1.93 ($p = .10$)

Note. The reference categories for school leaving certificate and school track are 0 = lower certificate and 0 = lower track. *** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table 9
Reference-Group Effects on Intrinsic Motivation

	Model 1	Model 2	Model 3	Model 4
(Intercept)	-.01 (.82)	-.01 (.80)	.03 (.59)	-.00 (.97)
Individual achievement	-.01 (.63)	-.01 (.64)	-.01 (.66)	-.01 (.54)
VET-average achievement	.02 (.61)	.02 (.68)	.02 (.61)	.02 (.63)
Socioeconomic status		-.02 (.39)	-.02 (.36)	-.02 (.24)
VET-average social status		.04 (.25)	.03 (.36)	.03 (.46)
Intermediate certificate			.01 (.82)	.01 (.88)
Higher education entrance degree			-.02 (.81)	-.03 (.68)
Migration background			-.04 (.33)	-.03 (.48)
Sex (0 = female)			-.05 (.36)	-.04 (.41)
School-average achievement				.01 (.88)
Intermediate school track				-.01 (.77)
Academic school track				.13 (.20)
Mixed school track				.07 (.23)
df	2, 250.45	2, 768.74	4, 551.73	4, 1436.48
F-value	0.22 ($p = .80$)	0.93 ($p = .40$)	0.38 ($p = .82$)	1.79 ($p = .13$)

Note. The reference categories for school leaving certificate and school track are 0 = lower certificate and 0 = lower track. *** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table 10
Reference-Group Effect on Profession-Oriented Motivation

	Model 1	Model 2	Model 3	Model 4
(Intercept)	-.01 (.56)	-.01 (.55)	.05 (.29)	.01 (.80)
Individual achievement	-.01 (.49)	-.01 (.49)	-.01 (.51)	-.01 (.59)
VET-average achievement	.00 (.92)	.00 (.93)	.01 (.70)	.01 (.69)
Socioeconomic status		.00 (.91)	.00 (.99)	.00 (.99)
VET-average social status		-.01 (.76)	-.02 (.50)	-.02 (.49)
Intermediate certificate			-.02 (.75)	-.02 (.72)
Higher education entrance degree			-.02 (.81)	-.02 (.81)
Migration background			-.06 (.17)	-.06 (.18)
Sex (0 = female)			-.07 (.11)	-.07 (.12)
School-average achievement				-.04 (.28)
Intermediate school track				.05 (.32)
Academic school track				.07 (.52)
Mixed school track				.04 (.46)
df	2, 623.79	2, 723.45	4, 712.14	4, 1645.14
F-value	0.25 ($p = .78$)	0.04 ($p = .96$)	0.87 ($p = .48$)	0.65 ($p = .62$)

Note. The reference categories for school leaving certificate and school track are 0 = lower certificate and 0 = lower track. *** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table 11*Reference-Group Effects on Performance-related Motivation*

	Model 1	Model 2	Model 3	Model 4
(Intercept)	-.01 (.80)	-.01 (.80)	.07 (.11)	.06 (.15)
Individual achievement	-.03 (.26)	-.03 (.27)	-.02 (.31)	-.02 (.18)
VET-average achievement	-.03 (.26)	-.03 (.26)	-.01 (.62)	-.01 (.18)
Socioeconomic status		-.01 (.54)	-.01 (.64)	-.00 (.77)
VET-average social status		-.00 (.96)	-.03 (.29)	-.02 (.86)
Intermediate certificate			.01 (.88)	.01 (.95)
Higher education entrance degree			.02 (.82)	.03 (.69)
Migration background			-.00 (.99)	-.01 (.81)
Sex (0 = female)			-.14 (.002)**	-.14 (<.001)**
School-average achievement				-.04 (.25)
Intermediate school track				-.01 (.92)
Academic school track				-.01 (.93)
Mixed school track				.07 (.26)
df	2, 272.06	2, 511.30	4, 619.04	4, 1090.64
F-value	1.47 ($p = .23$)	0.19 ($p = .83$)	1.92 ($p = .11$)	1.52 ($p = .20$)

Note. The reference categories for school leaving certificate and school track are 0 = lower certificate and 0 = lower track. *** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table 12*Reference-Group Effects on Dropout from VET*

	Model 1	Model 2	Model 3	Model 4
(Intercept)	2.08***	2.08***	2.11***	2.03***
Individual achievement	.01 (.92)	.01 (.91)	.00 (.98)	-.00 (.96)
VET-average achievement	.14 (.12)	.16 (.13)	.14 (.16)	.13 (.19)
Socioeconomic status		-.01 (.89)	-.04 (.51)	-.07 (.33)
VET-average social status		-.02 (.82)	-.03 (.80)	-.05 (.61)
Intermediate certificate			.13 (.44)	.09 (.60)
Higher education entrance degree			.18 (.32)	.13 (.51)
Migration background			-.42 (.008)**	-.36 (.02)*
Sex (0 = female)			.01 (.96)	.01 (.95)
School-average achievement				.11 (.39)
Intermediate school track				.44 (.04)*
Academic school track				-.12 (.76)
Mixed school track				.12 (.51)
df	2, 219.08	2, 248.83	4, 743.03	4, 601.14
F-value	1.10 ($p = .33$)	0.04 ($p = .96$)	2.16 ($p = .07$) ⁺	1.52 ($p = .19$)

Note. The reference categories for school leaving certificate and school track are 0 = lower certificate and 0 = lower track. *** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$