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FACTORS EXPLAINING BUSINESS STUDENTS' SUCCESS IN BUSINESS STATISTICS: A CASE FROM A SCANDINAVIAN BUSINESS SCHOOL

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ABSTRACT

Statistical skills are strongly linked success in business studies, especially in analyzing risk and in the financial sciences. Therefore, it is useful to acquire more knowledge about factors that can explain the grades achieved in Business Statistics. The objective of this study is to identify variables that are related to performance in Business Statistics among a cohort of business school students in Norway. By using linear regression models, this study tries to identify the relationship between achievement in Business Statistics and several independent variables, including gender, grade point average (GPA) from high school, mathematical background, Big Five personality traits, and attitudes towards statistics (SATS-36). Only attitudes towards statistics were significantly associated with the performance. There is a positive correlation between success in Business Statistics and the two Cognitive Competence and Effort (from SATS-36) dimensions. This is useful knowledge to ensure good results in Business Statistics.

JEL: A20, A22, M20

KEYWORDS: Gender, Big Five, Attitudes Towards Statistics, Mathematical Skills, Regression Model, Success in Business Statistics, Norway, Business School

INTRODUCTION

The introductory Business Statistics course is a major landmark in business courses, especially in the field of finance. Undergraduates need statistical skills to succeed in business subjects; Business Statistics is no different. A strong background in Business Statistics is useful in students' later career (Parker et al., 1999). Despite the usefulness of Business Statistics, many business students have little interest in this field and struggle learning this subject (Nilsson and Hauff, 2018). Business studies appeal to both men and women and there are equal numbers of both undertaking a bachelor's degree in business studies in Norway. Nevertheless, some gender differences remain, and this issue attracts interest among researchers. Why do female students have less interest in statistics and mathematics than the males? (Griffith et al., 2012; Reilly et al., 2019). This might explain why males outperform females in statistics courses (Haley et al., 2007), and to a higher degree choose quantitative economic majors (Worthington and Higgs, 2004). Women tend to prefer accounting, marketing, and management, while a higher percent of male students choose finance. This is in line with findings from Norway (Opstad, 2019).

The choice of educational pathway depends on the students' skills, preferences, and career interests. There is a close relationship between statistics and mathematics (Primi et al., 2020). Students who have any passion and interest in mathematics tend to have the same passion for statistics. The purpose of this study is to identify which factors are linked to grade scores in Business Statistics by using data from a Norwegian University, with a focus on gender, personality traits (Big Five), attitudes towards statistics (SATS-36), and mathematic and academic skills. Since performance in statistics is one of the key factors for success in business studies, it is important to research what determines the achievement in Business Statistics. It is of great value for planning within this field to identify which factors influence the performance in Business

Statistics. The investigation of this issue in this paper will hopefully be a useful contribution. An important contribution of this article is that it simultaneously combines gender, mathematical and academical abilities, and personal characteristics and attitudes towards statistics in the analysis of students' success in Business Statistics. This paper is organized in the following way. First, previous research is presented. On that basis, we will establish a research model as well as postulate some hypotheses. The discussion section focuses on analyzing the various contexts in the research model.

LITERATURE REVIEW

In the first part of this section, it is explained personality traits and attitudes towards statistics. They are key instruments linked to the research model and hypotheses.

The Big Five Personality Traits

The Big Five model for ascertaining personal characteristics (Costa et al., 1992) is widely accepted among researchers. It measures five factors: Agreeableness, Conscientiousness, Neuroticism, Extraversion, and Openness (see Table 1).

Table 1: The Big Five

Trait	Explanation
Openness to experience (O)	This person is open to new experiments and ideas
Conscientiousness (C)	This person is well organised, responsible, self-disciplined, effective, and target-oriented
Extraversion (E)	This person is social and oriented towards other people and the world
Agreeableness (A)	This person shows trust and tends to have unselfish manners
Emotional Stability (ES) (Opposite of Neuroticism)	This person tends to be emotionally stable

Openness is linked to intellectually curiosity, Conscientiousness is associated with achieving goals, agreeableness is characterized by the wish to contribute and help others, extraverts are outgoing, and emotional stability relates to not being depressed.

Attitudes Towards Statistics (SATS-36)

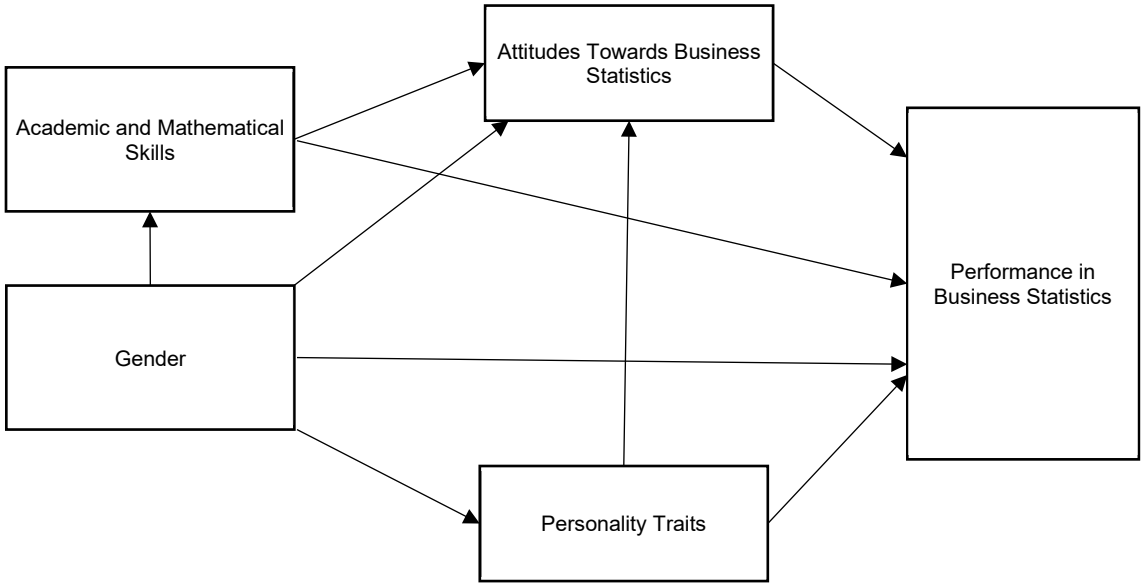
Different methods have been applied for measuring Attitudes towards statistics. This study uses SATS-36, as developed by Schau et al. (1995). It comprises 36 items and six components: Affect (6 items), Cognitive Competence (6 items), Value (9 items), Difficulty (7 items), Interest (4 items), and Effort (4 items). Affect gives an indicator of the person's feelings (positive or negative) about statistics. Cognitive Competence measures intellectual knowledge and skills towards statistics. Value determines the usefulness value of statistics. Difficulty measures if an individual finds it easy or difficult to apply statistics. Interest is an indicator of the degree of interest in statistics. Finally, Effort reveals how much time and effort an individual spends learning statistics. The literature shows that SATS-36 seems to have a high level of reliability and validity (Nolan et al., 2012; Persson et al., 2019).

The Research Model

In line with previous research, this paper introduces a model which analyzes the connection between gender, academic and mathematical skills, personality traits, attitudes towards statistics, and achievement in

Business Statistics. In analyzing the varied factors impact on individual's performance in Business Statistics, one must distinguish between direct and indirect effects (see Figure 1). For example, gender has a direct effect on performance, but also an indirect effect since one can assume there is a link between gender and certain variables like Academic and Mathematical skills, Attitudes towards statistics, and Personality traits. Personality traits and Academic and Mathematical skills can also be divided into a direct and indirect impact; they have a direct influence on performance in Business Statistics, but also indirect via for instance SATS-36 (Attitudes towards Statistics).

Figure 1: Research Model Illustrating Links Between Gender, Personality Traits, Mathematics Skills, Attitudes to Statistics, and Performance in Business Statistics



The figure illustrates the links between gender, personality traits, academic and mathematical skills, attitudes towards statistics and performance in Business Statistics. The model also takes into account that gender is correlated with academic and mathematical skills, personality traits and attitudes towards statistics. Furthermore, academic, and mathematical skills as well as the Big Five influence the attitudes towards statistic. In this way, the research model shows the distinction between direct and indirect effects.

Gender Impact

The gender effect on achievement in statistics is unclear. Some researchers have failed to find any gender impact (Esnard et al., 2021; Lester, 2007; Rabin et al., 2021; VanEs and Weaver, 2018), whereas others state females outperform males in statistics (Lester, 2016), or report higher scores for males (Schram, 1996). For Norwegian business students, Opstad (2018) concluded that male students achieve better grades than female students. Gender matters regarding attitudes towards statistics using SATS-36. Male students tend to have higher values in the Competence, Value, and Interest dimensions according to Hommik and Luik (2017). Rejón-Guardia et al. (2019) report mostly the same result, although they did not find any gender gap regarding Interest. However, they identified a higher score for females for the Effort dimension; specifically, females study harder than males. This is in line with results from a Norwegian Business school (Opstad, 2020). For all the other dimensions, Opstad registered a significant gender gap with the highest value for males and strongest impacts for Difficulty, Value, and Interest. Other researchers suggest the same tendency (Chiesi and Primi, 2015; Tempelaar and Nijhuis, 2007). Additionally, males express more positive attitudes towards statistics, and females are less confident using statistics as a tool. However, some investigators have come to a different conclusion. For instance, Coetzee

and Merwe (2010) did not find any gender differences and Mahmud and Zanol (2008) suggested women had more positive attitudes towards statistics than men.

The previous literature recognized a gender gap regarding personality traits. Many scientists have reported higher values for men than women for Openness and Conscientiousness, while women attained the highest scores for Extraversion, Agreeableness, and Neuroticism (Costa et al., 2001; Weisberg et al., 2011). Schmitt et al. (2008) concluded that females score higher values in the Extraversion, Conscientiousness, Agreeableness, and Neuroticism dimensions (opposite of Emotional Stability), and lower scores for Openness compared to males across many cultures and countries (55 nations and N=17 637). This in line with findings from Norwegian students (Opstad, 2020). Therefore, the first hypothesis is:

H1: *Gender matters in performance in Business Statistics.*

Academic Skills and Mathematical Background

Some studies have not discovered any association between academic skills, mathematic skills, and success in statistics (Esnard et al., 2021). Others suggest a strong positive relationship exists between mathematical abilities and performance in statistics (Johnson and Kuennen, 2006; Lester, 2007). Quantitative skills are crucial in introductory statistics, and Johnson and Kuennen report a positive link between GPA (Grade Point Average) and achievement in statistics. Moreover, there is a strong positive correlation between mathematical and statistical competence. High mathematical score gives a positive attitude toward statistics (Stanisavljevic et al., 2014), and higher qualifications in mathematics are also positively linked to better grades in statistics (Choudhury and Radakrishnan, 2009; Johnson and Kuennen, 2006).

Among Norwegian business students, Opstad (2018) reported a positive significant correlation between performance in Business Statistics and the academic skills (GPA from high school) and mathematical skills variables; indeed, students skilled in theoretical mathematics in high school tend to get better grades. Mathematics and statistics are connected; this has an impact on students' attitude towards statistics. Put simply, mathematical background matters. Students with mathematical skills have more positive attitudes towards statistics (Carmona, 2004). This is in line with Opstad (2020) for Norwegian business students. For students skilled in theoretical mathematics in high school, there was a significant positive relationship to the Affect, Value, and Difficulty dimensions (SATS-36). The second hypothesis will therefore be:

H2: Academic Skills and Mathematics Background Are Associated with Success in Business Statistics.

Personality Traits

The Conscientiousness dimension helps students to focus on academic tasks and is a good indicator of academic success (Duckworth et al., 2019; Zell and Lesick, 2021). Some argue that Conscientiousness is the only predictor of academic achievement (Buju, 2013). Additionally, Openness tends to be related to academic success, while the result is mixed for the other dimensions.

According to Goldberg (2001), Emotional Stability may be important, while Extraversion and Agreeableness probably have little impact. Opstad (2021b) found a negative correlation between Openness and achievement in mathematics, but when controlling for attitude towards mathematics this impact disappeared. Opstad (2021a) also reported a significant negative connection between performance in macroeconomics and the two dimensions of Openness and Agreeableness. Conscientiousness was positively related to success in macroeconomics. Other researchers have also reported negative associations between Openness and performance (Busato et al., 2000; De Fruyt and Mervielde, 1996). Opstad (2020) suggested a link between personal characteristics and attitude towards statistics. Neuroticism was significantly negatively connected to Cognitive Competence and Affect, while Openness was significantly

positively related to Interest, but negatively to Cognitive Competence. Furthermore, he found a significant relationship between Conscientiousness and all dimensions in attitudes towards statistics (SATS-36), although this was not significant for Difficulty; the impact was most strongly linked to Effort. Furnham and Chamorro-Premuzic (2004) confirm that there seems to be a strong link between Conscientiousness and attitudes towards statistics; statistics might apply for Conscientiousness in particular. Hard-working and goal-oriented students use a lot of energy in learning statistics, and they have a positive attitude towards doing so. On the basis of previous findings, the following hypothesis is postulated:

H3: Personality traits are connected to performance in Business Statistics.

Attitudes Towards Statistics

Finney and Schraw (2003) reported a positive link between self-efficacy in statistics and performance. This is in line with Esnard et al., (2021). Several articles have also reported a strong link between performance in statistics and the Affect and Cognitive Competence dimensions (Bechrakis et al., 2011; Nolan et al., 2012). Students with positive attitudes towards statistics tend to perform well in statistics (Lavidas et al., 2020; Sesé et al., 2015; Stanisavljevic et al., 2014). The final hypothesis is thus:

H4: Attitudes towards business statistics are associated with performance in Business Statistics.

DATA AND METHODOLOGY

Sample

The sample consists of 131 students examined in 2019. Students attending the compulsory second-year course in macroeconomics answered the questionnaire. This means that the students have taken the exam in the compulsory course in Business Statistics that runs in the first year. The students answered questions based on the items in Big Five and SATS-36. The participation was voluntary. Around 70 percent of the students attended the course on their chosen day, hence the data might be marginally biased. Even so, the survey gives a good picture of students' attitudes (Bonesrønning and Opstad, 2015). The data are mixed with administrative information about mathematical background, Grade Point Average (GPA) from high school and performance in Business Statistics. Some students did not report personal data. Therefore, regarding information about GPA and grades in statistics, we lacked data for these students (see Table 2).

The average grade in statistics was quite high (close to B). One explanation for this is that there were many applicants to the program and high GPAs from high school are required to be accepted. There is considerable variation in the attitudes towards statistics, with highest scores for Effort. The values for dimensions in the Big Five personality traits vary between 3.3 to 3.9. There are slightly more women than men in the sample, and the values of Skewness, Kurtosis, and Scale Reliability are within the accepted intervals. The Appendix presents the correlations between the variables.

Table 2: Sample Information

Variable	N	Min	Max	Mean	St. Dev.	Skewness	Kurtosis	Scale Reliability Cronbach's Alpha
Performance Statistics (0:F,1:E,2:D,3:C,4:B,5:A)	79	1	5	3.96	0.980	-0.929	0.730	
Cognitive Competence [1)]	131	1.83	7	5.19	1.079	-.516	-0.053	0.84
Value[1)]	131	1.33	6.7	4.44	0.996	-0.220	-0.015	0.85
Difficulty[1)] (Find statistics easy to learn)	131	1.14	5.2	3.52	0.751	.065	.0189	0.65
Interest [1)]	131	1	7	4.50	1.291	-0.222	-0.192	065
Affect [1)]	131	1	7	4.59	1.249	-0.460	0.151	0.84
Effort [1)]	131	1.50	7	5.67	1.086	-1.250	1.847	0.70
N-math [2)] (0:Non N-math,1 :N-math)	131	0	1	0.29	0.456	0.936	-1.142	
Extraversion[3)]	130	1.75	5	3.64	0.783	-0.211	-0.483	0.84
Agreeableness[3)]	130	2.25	5	3.91	0.570	-0.574	0.110	0.49
Conscientiousness[3)]	130	1.50	5	3.67	0.702	-0.569	0.223	0.71
Emotional Stability[3)]	130	1.50	5	3.30	0.791	-0.041	-0.471	0.74
Openness[3)]	130	1.50	5	3.33	0.726	-0.120	-0.482	0.59
Gender (0:F,1:M)	131	0	1	.48	0.502	0.077	-2.025	
GPA (High School)	85	46.9	66.7	51.16	3.20	1.642	5.308	

In statistics, the Likert scale ranged from 1 to 7; 2) Students who have chosen mathematics for natural science at high school; 3) the Likert scale ranged from 1 to 5. Since one relies on students' permission to link the data to GPA and results in Business Statistics, the number of observations for these factors is lower than for the other variables. There are acceptable values on Skewness, Kurtosis and Cronbach's Alfa.

The Regression Models

By using a linear regression model, we can see how different independent variables are linked to the chosen dependent variable (performance in Business Statistics). By using mediation analyses, it is possible to distinguish between direct and indirect effects (Park et al., 2019). Alternatively, one can use different sets of variables in the regression model (Opstad, 2020; Shi et al., 2020). Model 1 (set 1) includes only gender (see Figure 1), whilst Model 2 (Set 2) also includes mathematical and academic skills. Model 3 (set 3) adds personality traits. Finally, Model 4 (set 4) incorporates the complete model. The changes between the models (sets) gives a picture of the indirect impact. For instance, Model 1 (see equation 1) shows the total effect of gender, Model 4 (equation 4) the direct effect, and the difference between (1) and (4) indicates the indirect influence between gender and performance in Business Statistics.

Model 1: $Y_i = a_0 + a_1 \mathrm{X1}_i + + \varepsilon_i$ (1)

Model 2: $Y_i = a_0 + a_1 \mathrm{X1}_i + a_2 \mathrm{X2}_i + a_3 \mathrm{X3}_i + + \varepsilon_i$ (2)

Model 3: $Y_i = a_0 + a_1 \mathrm{X1}_i + a_2 \mathrm{X2}_i + a_3 \mathrm{X3}_i + a_4 \mathrm{X4}_i + a_5 \mathrm{X5}_i + a_6 \mathrm{X6}_i + a_7 \mathrm{X7}_i + \varepsilon_i$ (3)

Model 4: $Y_i = a_0 + a_1 \mathrm{X1}_i + a_2 \mathrm{X2}_i + a_3 \mathrm{X3}_i + a_4 \mathrm{X4}_i + a_5 \mathrm{X5}_i + a_6 \mathrm{X6}_i + a_7 \mathrm{X7}_i + a_8 \mathrm{X8}_i + a_9 \mathrm{X9}_i + a_{10} \mathrm{X10}_i + a_{11} \mathrm{X11}_i + a_{12} \mathrm{X12}_i + a_{13} \mathrm{X13}_i + a_{14} \mathrm{X14}_i + \varepsilon_i$ (4)

where:

Y = grade attained in Business Statistics (0: F, 1: E, 2: D, 3: C, 4: B, 5: A),
i = student, α0 = constant,

X1 = Gender (0: F, 1: M),
X2 = High school GPA,
X3 = dummy variable for N-maths (0: did not take N-maths, 1: took N-maths),
X4 = Openness, X5 = Extraversion, X6 = Agreeableness, X7 = Conscientiousness,
X8 = Emotional stability, X9 = Cognitive Competence in statistics,
X10 = Perception of the value of statistics, X11 = Difficulty (Stat),
X12 = Interest in statistics X13= Affect in statistics, X14 = Effort in statistics,
ε = stochastic error.

The Big Five personality traits were measured by using 20 items on a 5-point Likert scale where 1 = strongly disagree and 5 = strongly agree. Similarly, SATS-36 were computed on a 7-point Likert scale where 1 = strongly disagree and 7 = strongly agree. In this study, we did not have access to experimental data. Even if there is a correlation between the dependent variable and the independent variables, one must be careful to monitor any causal effects.

RESULTS AND DISCUSSION

Table 3 presents the results from the regression models. Since none of the models show any significant gender effects, there is neither any direct nor indirect gender differences associated with the performance in statistics. Hence, hypothesis 1 (H1) is rejected.

Table 3: Outputs from the Four Linear Regression Models

Variable	**Model 1 (Set 1)**		**Model 2 (Set 2)**		**Model 3 (Set 3)**		**Model 4 (Set 4)**		
	B	***p***	**B**	***p***	**B**	***p***	**B**	***p***	**VIF**
Constant	3.91		2.21		1.40		-1.19		
Gender	0.118	0.60	0.056	0.81	-0.072	0.708	-0.045	0.831	1.52
	(0.224)		(0.227)		(0.259)		(0.208)		
GPA			0.32	0.45	0.054	0.205	0.041	0.222	1.15
			(0.042)		(0.042)		(0.034)		
N-Maths			0.305	0.22	0.248	0.305	0.052	0.792	1.19
			(0.245)		(0.240)		(0.195)		
Openness					-0.396	0.019	-0.168	0.243	1.68
					(0.164)	**	(0.142)		
Extraversion					-0.064	0.682	-0.154	0.220	1.48
					(0.156)		(0.125)		
Agreeableness					0.098	0.665	0.160	0.368	1.19
					(0.225)		(0.176)		
Conscientiousness					0.042	0.829	-0.108	0.490	1.25
					(0.194)		(0.156)		
Emotional Stability					0.238	0.155	0.094	0.519	1.86
					(0.175)		(0.146)		
Affect									
Value							-0.013	0.927	2.43
							(0.139)		
Difficulty							-0.169	0.261	1.73
(find statistics easy)							(0.149)		
Interest							-0.003	0.979	2.58
							(0.107)		
Cognitive Competence							.625	0.000	2.53
							(.123)	***	
Effort							.174	0.087	1.46
							(0.100)	*	
	N=78		N=78		N=77		N=77		
	Adj.R^2=-0.09		Adj.R^2 =-0.02		Adj.R^2 = 0.052		Adj.R^2 = 0.429		
	R^2= 0.04		R^2 = 0.036		R^2= 0.151		R^2 = 0.526		

*Model 1-4 , see equation 1-4. The models show how the different steps influence the estimated variables for identifying direct and indirect impacts. Std. Error in parentheses B= Standardized Coefficients. ***p < 0.01, **p < 0.05 and *p < 0.1, VIF = Variance Inflation Factor . Due to high VIF value (4.5), Affect is not included in the regression models.*

The model specifications (Set 2-Set 4) do not indicate any significant impact on success in Business Statistics related to Mathematical and Academical skills. Therefore, hypothesis 2 (H2) is also not confirmed. Model 3 reveals that only one dimension of personality traits is significantly linked to achievement in Business Statistics; Openness is negatively related to performance in statistics but when controlling for attitudes towards statistics (SATS-36, see Model 4) this effect disappears. The conclusion is that hypothesis 3 (H3) is not confirmed. Two dimensions of SATS-36 are significantly positively correlated with achievements in Business Statistics. Cognitive Competence is strongly related with a high value of the parameter (B= 0.625), whilst the impact of Effort is lower (B=0.174) and only significant at the 10 percent level. The findings confirm hypothesis 4 (H4): Attitudes towards Business Statistics are associated with performance in Business Statistics. In line with other published articles (Nolan et al., 2012), this study reports a strong and significant relationship between Cognitive Competence in statistics and achievement in statistics.

Gender and Performance (Hypothesis 1)

In the field of business administration, there are approximately the same number of males and females. Prior research indicates that a gender difference exists among business and economics students in Norway in performance inclusive Business Statistics (2018) and in choice of major (Opstad, 2019). Despite the gender equalization in Norway, girls tend to a lesser degree to select theoretical mathematics at high school; they prefer more practical mathematics, and this is a disadvantage when studying business subjects (Opstad, 2018; 2019). This is in line with research from other countries (Pritchard et al., 2004). The gender difference in mathematics and attitudes towards mathematics might explain the underrepresentation of women in science, technology, and engineering. Even with a high degree of gender equality, this might explain the existing gender gap (Stoet and Geary, 2018). Opstad and Årethun (2019) report a gender difference in favor of males regarding attitudes towards mathematics. However, it looks like this is changing. Updated figures indicate that the traditional gender divide in attitudes towards statistics is disappearing in Norway. The Pisa test of 2018 reported a higher score in mathematics for females than males in Norway (OECD education, 2020). Furthermore, Utvær (2019) did not find any gender difference in attitudes towards mathematics among Norwegian pupils in primary schools. In recent research among Norwegian business students, Opstad (2020, 2021b) did not notice any gender differences in attitudes towards statistics in either mathematics or in performance in mathematics (Opstad 2021c). The results in this study confirm this tendency. There is no longer any gender difference in performance in business statistics among Norwegian business students.

Mathematical Background and Academic Skills (Hypothesis 2)

According to Opstad (2018), GPAs from high school may not be a good predictor of success at business schools in Norway. The situation seems to be different for mathematical skills since Opstad (2018) suggests background and knowledge in mathematics are a key factor explaining good performance. However, after controlling for attitudes towards mathematics this correlation disappeared in performance in mathematics (Opstad 2021c). This is in line with this study. There is no significant correlation between mathematical abilities and results in Business Statistics in models 3 or 4, even though mathematics and statistics are closely related, and quantitative abilities are important for success in business studies. One explanation may be that N-mathematics focuses on mathematics applied to science areas. This may be less applicable in Business Statistics. Furthermore, it is a requirement to be able to take statistics within a mandatory introductory course in mathematics. This may have contributed to reducing the differences in mathematical abilities from high school.

Personality Traits (Big 5) and Success in Business Statistics (Hypothesis 3)

Previous research provides a mixed picture when it comes to the link between personal characteristics and academic success. Although several researchers point out that there is a correlation between personality traits and attitudes to statistics (Chiesi and Bruno, Opstad, 2020), it is still unclear what the link is between personality traits and successes in statistics. This study does not find any significant correlation in relation to this issue. There is a significant link between Openness and performance in statistics in Model 3, but this effect disappears in Model 4.

Attitudes Towards Statistics (SATS-36) and Achievement in Business Statistics (Hypothesis 4)

In line with other published articles (Nolan et al., 2012), this study reports a strong and significant relationship between Cognitive Competence in statistics and achievement in statistics. This makes sense, as Cognitive Competence is an indicator of knowledge and the ability to use statistics. Furthermore, increased effort in the subject will be rewarded with better grades. This is consistent with previous research results (Dotterweich and Rochelle, 2012). Moreover, dimensions like interest in statistics, value of statistics, and finding statistics easy were not correlated to performance in this subject. However, the overall attitudes towards statistics seem to play an important role in explaining the success therein. To illustrate, adjusted R square increases from 0.052 to 0.429 by including SATS 36. All other variables except attitudes to statistics have little explanatory effect on the results in this investigation.

Limitations and Some Implications

The dataset in this study is only from a single business school in Norway. Subsequently, one must be careful when interpreting these findings in a wider context. In this research, we applied the original version of the Big Five and SATS-36 (translated into Norwegian); an alternative and more robust version might use explanatory factor analysis and present a modified version of the Big Five and SATS-36. Nevertheless, the original version is used in this paper to ensure consistency with previous research. Effort and Cognitive Competence are positively associated with performance in Business Statistics. On the other hand, good grades in Business Statistics will increase the level of Cognitive Competence in statistics, so the causal relationship could go in both directions. Regardless, educators should consider boosting students' attitudes towards statistics

CONCLUDING COMMENTS

The purpose of this article is to identify factors that influence performance in Business Statistics since this subject is an important tool for business students. By using regression models based on data from NTNU Business School, we try to find variables that are significant correlated to achievement in Business Statistics. The data are based on a questionnaire handed out to the students. This information was linked to administrative available data. In order to capture both direct and indirect effects, several regression models are presented with different sets of explanatory variables. Previous research suggests there is a gender gap in performance in Business Statistics. This study does not confirm this. The reason for the lack of identification of the purported gap might be that it has shrunk or no longer exists in business students. GPAs from high school are an indicator of academic skills. This study did identify this variable's relation to performance in Business Statistics. However, the author found no relationship between success in Business Statistics and the two independent variables: mathematical background from high school and personality traits (Big Five). Only attitudes towards statistics were significantly related to performance in Business Statistics. There are also positive relationships between success in this field and two dimensions, specifically Cognitive Competence and Effort. This paper suggests that attitudes towards statistics are a key factor for success in Business Statistics. Further research may be exploring factors that motivate students to learn Business Statistics.

APPENDIX

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1	-0.011	0.116	-0.083	0.105	-0.052	0.079	0.079	0.120	-0.111	0.053	-0.163	0.024	0.091
2	-0.011	1	0.060	0.172	0.250	0.290	0.274	-0.257	0.046	-0.015	-0.172	-0.114	0.445	0.193
3	0.116	0.060	1	0.637	0.410	0.301	0.314	0.254	-0.268	-0.078	0.065	0.130	0.097	0.166
4	-0.083	0.172	0.637	1	0.574	0.572	0.481	0.071	-0.093	0.035	-0.066	0.249	0.267	0.267
5	0.105	0.250	0.410	0.574	1	0.290	0.698	0.134	0.052	-0.041	-0.088	0.142	0.182	0.305
6	-0.052	0.290	0.301	0.572	0.290	1	0.245	-0.164	-0.084	0.040	-0.106	0.074	0.176	0.210
7	0.079	0.274	0.314	0.481	0.698	0.245	1	0.056	0.169	-0.043	-0.066	0.117	0.172	0.200
8	0.079	-0.257	0.254	0.071	0.134	-0.164	0.056	1	-0.136	0.025	0.272	0.418	-0.213	-0.065
9	0.120	0.046	-0.268	-0.093	0.052	-0.084	0.169	-0.136	1	0.355	-0.105	-0.273	0.271	0.007
10	-0.111	-0.015	-0.078	0.035	-0.041	0.040	-0.043	0.025	0.355	1	0.152	-0.072	0.304	-0.121
11	0.053	-0.172	0.065	-0.066	-0.088	-0.106	-0.066	0.272	-0.105	0.152	1	0.295	-0.025	-0.045
12	-0.163	-0.114	0.130	0.249	0.142	0.074	0.117	0.418	-0.273	-0.072	0.295	1	-0.050	0.049
13	0.024	0.445	0.097	0.267	0.182	0.176	0.172	-0.213	0.271	0.304	-0.025	-0.050	1	0.125
14	0.091	0.193	0.166	0.267	0.305	0.210	0.200	-0.065	0.007	-0.121	-0.045	0.049	0.125	1

1:GPA, 2:Gender, 3: Performance Business Stat, ¤ Stat CogC, 5:Stat Value, 6: Stat Difficult, 7: Stat Interest, 8: Stat Effort, 9: Openness, 10: Extraversion, 11: Agreeableness, 12 : Conscientiousness,13: Emotional Stability, 14: N-mat

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