

Article

Multiple Enrollment Policy: Clustering Dropout and Graduation Constellations in Psychology and Sociology Bachelor's Programs

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Abstract: In Austria, it is possible to enroll in an unlimited number of programs simultaneously and consecutively. Study duration and student performance are important performance indicators of the university system. The disciplines of psychology and sociology share similarities in their curriculum structures but are different in selectiveness due to their admission rules. They show differences in their motivations to enroll and their trajectories through higher education, leading to different constellations of “dropout” and “graduation.” The aim was to identify and compare groups of students’ outcomes in bachelor’s programs of psychology and sociology along the dimensions of workload and duration, incorporating the possibility of enrolling in multiple programs. The sample consisted of 6498 students between the academic years of 2010/11 and 2022/23 who either graduated or dropped out of one or more programs. Cluster analyses using four algorithms per individual outcome constellation, categorization, and aggregation of the results suggest a longer overall study duration for students with more than one program. In graduation–graduation and graduation–dropout clusters, groups with less overall workload could be identified. The transferability of passed exams may be an important component for students in multiple programs. Implications for policy and practice are discussed.

Keywords: academic analytics; student retention; multiple enrollment; parallel enrollment; cluster analysis



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1. Introduction

Dropping out of a university system is a mixture of longer-lasting multifactorial processes on several different dimensions for students. Their load accumulates over time, which creates a set of problems until dropping out seems inevitable [1–4]. Among the demographic variables and financial aspects of students, academic readiness can be a factor influencing student retention and graduation [5]. Some students lack relevant university-level skills after finishing secondary education, which can be improved by specific bridge courses [6]. Other studies show that college dropouts perform better in the job market than their counterparts who never entered the university system [7]. Based on these findings, a certain degree of knowledge transfer can be expected in those who drop out. Even if students did not profit from explicit declarative knowledge gain, i.e., details and facts [8], the buildup of procedural knowledge as the ability to integrate concepts and problem-solving [9–11] and metacognition as the ability to plan strategies is possible [12]. Metacognition and prior knowledge have been shown to be academic performance predictors [13]. However, not being academically ready may hinder one’s progress and lead to dropping out, with the accumulated procedural knowledge and metacognition being lost for their use in the university system. Austria has policies that allow students to freely enroll in as many degree programs as they want. There are no restrictions on the parallelity or consecutiveness of programs [14]. This implies that students who would normally drop out can enroll in one or more other programs, possibly profiting from the knowledge transfer and their improved readiness from what they have learned in their first program. A multiple enrollment policy can give

students a second chance to graduate, even if this means a higher total workload and longer study duration. For instance, this should lead to the occurrence of groups of students with graduation–dropout as an outcome, with a high overall study duration and a high workload. There is currently a lack of research addressing these assumptions in Austria or similar university systems. Only one cross-sectional study focusing on multiple enrollments and student performance in Austria showed that there are different associations between student satisfaction and performance indicators dependent on having one or multiple enrollments [15]. No studies have looked at students' outcome constellations with regard to their workload and study time when allowed to enroll in multiple programs. Research is needed to identify different clusters of students to aid policymakers and program designers in making decisions on multiple enrollment policies. This makes this study an important foundation for both policymakers and future work.

1.1. The Austrian University System

Students enter the university system with a general university qualification, which is usually acquired after successfully finishing secondary education, i.e., high school. They can matriculate and enroll in an unlimited number of degree programs during official timeframes prior to the start of each semester [14]. Some programs have an entrance exam that needs to be passed, while others can be enrolled freely. What may support multiple program enrollment is the lack of tuition fees. Students do not pay fees until they cross a so-called “tolerance window”, which is the minimum required time to graduate plus two more semesters [14]. Given that a bachelor's program has six semesters [16], fees are attributed to the students beginning with the ninth semester in one of their programs. This rule is executed on the student level once one program fulfills these requirements [14].

To ensure fast and efficient studying, the university system has set up regulations centered on student workload. This is measured using the “European Credit Transfer and Accumulation System” (ECTS), with one credit being the equivalent of 25 real-time student working hours [17]. Students must successfully pass exams during their first two academic years in a program of 16 or more ECTS credits. If they fail to do so, their enrollment becomes invalid, and they are banned from enrolling in the same program again [18]. Programs without entrance exams can have a beginning and orientation phase, which is a list of mandatory first-semester courses that need to be passed in order to progress with the curriculum. Only a small number of additional credits are allowed to be obtained from other courses [14]. Another regulative has been set up on the governance level, making student workload under the term “student activity” one of the largest funding indicators of public university funding. Only programs that reach more than 16 ECTS credits in a given academic year are eligible for funding [19]. These regulations both put pressure on students and universities for fast and efficient studying.

1.2. Study Duration and Student Workload

Since the Austrian university system relies on measures for duration and workload, those dimensions can be considered central to university governance. It is, therefore, important to better understand their relationship in the context of students' outcomes. In the literature distinguishing between objective, subjective, and perceived workload [20], ECTS credits are treated as objective measures, providing a time estimation for students who are required to finish a course [20,21]. The workload from courses with continuous assessment or difficult curriculum contents that do not correspond to the abilities of students can have negative consequences for students' outcomes [22]. For instance, a heavy workload can put academic pressure on students [23], causing anxiety, stress, mental exhaustion, or burnout and affecting academic performance [24]. This load may lead to dropping out over time [1–4]. Credit readings as an information source for course selection

are important for students in their planning [25]. Those with better grades tend to choose a higher workload per semester than their peers [26]. Incentivizing higher workloads can reduce the time to graduation [27]. This indicates that workload and time to leave the university system as a graduate or dropout can be inherently related, making those two important dimensions in clustering student outcomes.

1.3. Psychology and Sociology Studies

Two fields of study that can be related in their underlying disciplines [28] and in their curricula [29–31] are the undergraduate programs in psychology and sociology. Although they share similarities, those fields of study also have a large contrast in their selectiveness in Austria. Psychology has a country-wide predefined number of places, which is different for each university [32] and is highly requested [33]. For instance, at the University of Vienna, there were 3761 applicants for 485 places (1:8) in 2019/20, 1964 (1:4) for the academic year 2022/23 [34,35], and at the University of Graz, there were 1132 applicants for 230 places (1:5) for the academic year 2022/23 [33]. This means this field of study is very selective at Austrian universities. Sociology has no entrance exams [33,36], and all applicants receive a place [34,35]. Compared to 3761 psychology applicants, sociology had 420 in the same year [34]. This field of study can be considered non-selective.

The reasons for pursuing higher education can be as follows: extending student life; continuing one's studies and obtaining a university degree due to expectations from family and friends; increasing one's social status or higher chances of better earnings; getting a dream job; and better career growth prospects [37]. More specifically, the reasons why students choose sociology can be the desire to interact with society and solve people's problems, a love for the social sciences specialization, or easy admission requirements with no special conditions [38]. In another study, sociology students reported that they chose this field because they were interested in the functioning of society or to deepen their understanding of people and the world. Some wanted to pursue a career in psychology but could not fulfill the requirements [39]. Psychology students' motivations were a general interest in psychology and the desire to help others and themselves [40–42]. Entering either field, previous research shows that entrance exam scores correlate with later academic performance [43,44]. Since only the best potential students are admitted to a place in psychology, academic performance, especially workload and study duration, can be expected to be different from sociology. In addition, some universities have not implemented beginning and orientation phases for psychology due to the entrance exam, while sociology has one [36]. In psychology students, intellectual ability and achievement motivation were correlated with academic success [45]. Barriers can be loneliness, the impostor phenomenon [46], a lack of confidence [47], perceived intelligence [48], or other factors [46]. Sociodemographic characteristics were associated with the success of sociology students, e.g., being a first-generation student [49]. Communication with others, review strategies in learning, and a younger age were associated with academic success in sociology [50]. In line with these results, sociodemographics, achievement motivation and motivational factors, self-regulatory learning strategies, students' approaches to learning, and other dimensions such as personality traits and psychosocial contextual influences are known as general influences on student success [51–53]. These factors have an influence on students' higher education trajectories. For instance, students with a low socioeconomic status often follow less smooth trajectories through higher education in that they show more interruptions and institution transfers [54,55] and drop out more often than those with a higher status [56]. Some of the effects on trajectories are explained by differences in academic preparedness and performance indicators, with social origin still being an influence after controlling for those variables [57]. However, a literature review concluded that the current research on trajectories in higher education is rather US-centered and that more research is needed [58]. Therefore, it is important to broaden the existing evidence on students' outcomes in different university systems.

The similarities and differences between the student populations of psychology and sociology make them interesting sub-groups of the general student population. In this study, they are considered two contrasting points on a selectiveness continuum. Based on previous findings, different study behavior and different dropout and graduation outcomes can be expected. In consideration of differences in outcomes and selectiveness, their related curriculum structures, and similar or overlapping motivations to enter those fields [39], psychology and sociology are chosen to explore the research question of this study. Since both the Austrian university system is rather unique in its ruleset for students and university governance, i.e., no tuition fees and a multiple enrollment policy [14], and the lack of specialized studies on trajectories [58], this study uses an exploratory research design.

1.4. Aims and Expectations

This study's goal is to identify and compare the groups of students' outcomes in undergraduate programs of psychology and sociology under the unique conditions of being allowed to enroll in an unlimited number of programs simultaneously or in a consecutive manner. An exploratory research question with two focus points was defined: Which clusters of sociology and psychology students exist in relation to their workload and study time for their individual outcome constellations? Among the different outcome constellations, which are the most frequent? The implications of the results of this study may aid practitioners and program designers in their decisions to allow parallel and consecutive enrollments for psychology and sociology, as well as comparable programs in terms of similar selectiveness, by being able to assess the outcomes associated with a multiple enrollment policy.

2. Materials and Methods

2.1. Data Background and Sample Characteristics

The sample consisted of 6498 unique students with 2704 studies in psychology and 4069 in sociology. Data were queried from the database of the University of Graz, which is the second biggest university in Austria, Europe, with around 30,000 enrollments per academic year. The inclusion criteria in the query were all students in a bachelor's program in psychology or sociology between 2010/11 and 2022/23 who completed a full student lifecycle [59]. This means all study programs with an outcome status of either "dropout" or "graduate"; programs with a valid enrollment at the end of the academic year 2022/23 in September 2023 were excluded. Based on this program view and the possibility of enrolling in multiple studies, all other study programs of these students at the undergraduate level were added to the data.

Data curation was conducted in multiple steps. After querying the raw data, a dataset of all psychology and sociology bachelor's students in the target timeframe was created, including all their programs. One row in the initial dataset represented one study program for those students. In the next step, parallel and consecutive program constellations were detected and added as a separate column. They were defined as each study program of a given student overlapping in the enrolled semesters with another program of the same student or being started up to one academic year after a program was ended. Since there is an entrance exam for psychology at the University of Graz, enrollment is only possible once per year, which is why students can end a program in the winter semester and start psychology in the next winter semester. Sociology has no entrance exam and can be started during the official matriculation timeframes ahead of each semester. Due to adding parallel programs in a new column, a multiplication effect affected all rows of students with more than one program. Each row represented one program, and each constellation was generated twice, e.g., with psychology as the observed program and another one as the additional program, as well as the additional program as the observed one and psychology as the additional program. To reduce this row multiplication effect, all rows with programs other than psychology and sociology

were filtered, and a distinct function was applied to the dataset. However, what could not be adjusted were multiplications of more than one parallel or consecutive program. This means that students with three programs, one being either psychology or sociology, have two rows for each multiple-program constellation. The more constellations, the more rows were created. Counting the number of parallel programs, 5527 students (83%) had only a single enrollment, 926 (14%) had one parallel program, i.e., one row in the dataset, 222 had two parallel programs, i.e., two rows, and 222 (3%) had two parallel programs, i.e., two rows, and 98 (1.5%) had more than two. Due to less than 5% of all data being affected by this multiplication effect, no large impact on the analyses was expected. Interpreting the results, it should be kept in mind that the data were entered on a program level, although 95% of all rows represent the student level.

2.2. Psychology and Sociology Student Flows

Using and modifying a visualization method for student flows that has been described earlier [60], data in the administrative database have been analyzed descriptively and depicted in Figures 1–4. Figure 1 shows how psychology students move through their studies at the University of Graz.

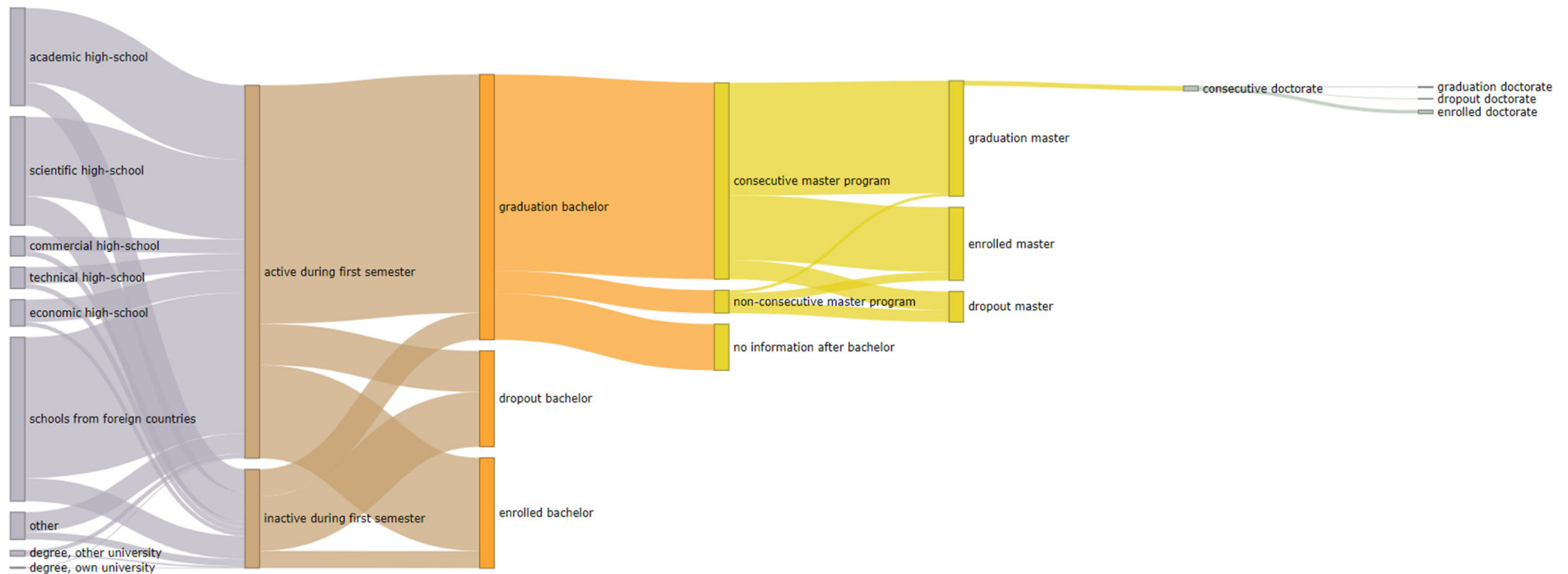


Figure 1. Student flows and outcomes of psychology bachelor's programs.

The majority of students had a school background in academic (21%) or scientific high schools (23%), or were coming from abroad (35%). In psychology, most students started actively (8+ ECTS credits) in their first semester (79%). Of all active beginners, 64% graduated. Of the inactive beginners, 27% graduated, which is 7% of all beginners. Among all students, 20% dropped out, and 56% graduated, with the rest being enrolled at the end of 2022/23. Those who graduated from their bachelor's programs were categorized as leaving university (17%), starting a consecutive psychology master's program (74%), and/or a non-consecutive master's program (9%). Among all bachelor graduates, 43% graduated from a master's program up to the end of 2022/23. Around 2% of those bachelor's graduates started a doctorate. In Figure 2, the method has been modified, and student flows have been visualized, incorporating multiple enrollments.

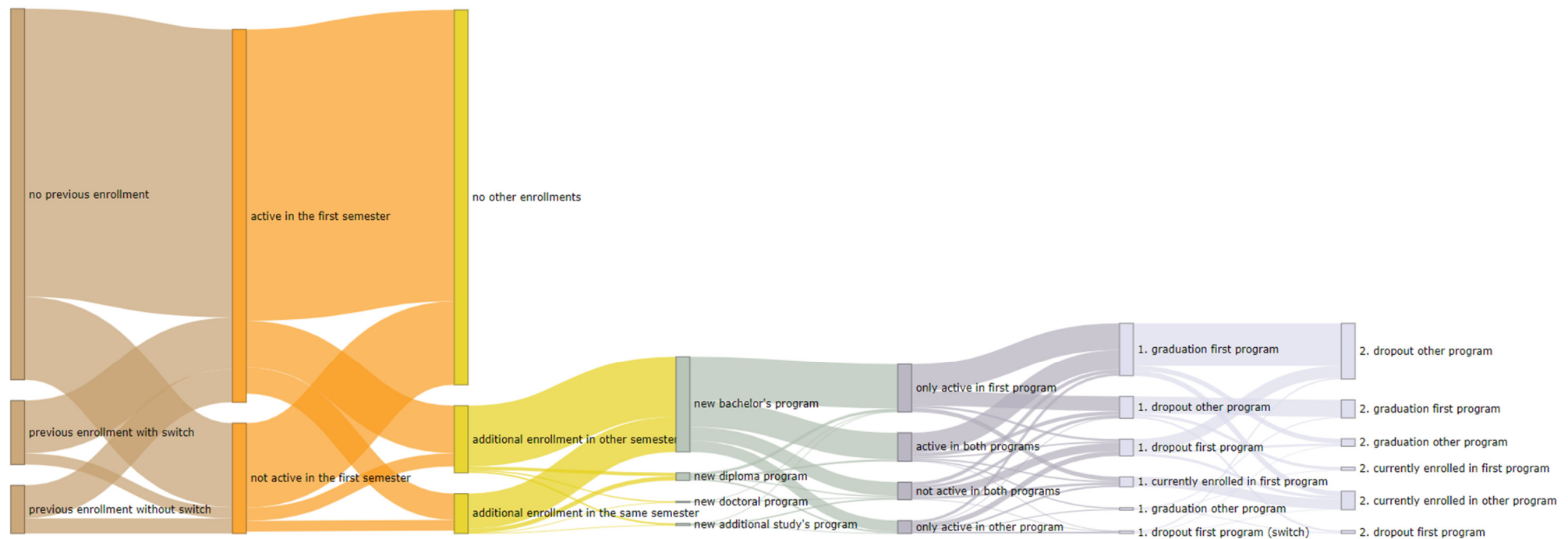


Figure 2. Student flows and outcomes of psychology bachelor's programs with multiple enrollments.

Of all psychology students in a bachelor's program, 77% started without having a previous enrollment. The others either switched directly to psychology by closing another program or kept it parallel to psychology. Around 14% of students started psychology and another program in a later semester, and 8% started psychology and another program simultaneously. In most cases, this was another bachelor's program (90%). Around half of the students with more than one enrollment were only active (8+ ECTS credits in the first semester of a program) in psychology (44%), 27% in both, 12% only in the other program, and 16% were inactive in both. The most frequent outcome was graduating from psychology and dropping out of another program (41%). Around 16% of students first closed another program and then graduated from psychology. Dropout-dropout was found in 25% of all cases. Student flows of sociology students are depicted in Figure 3.

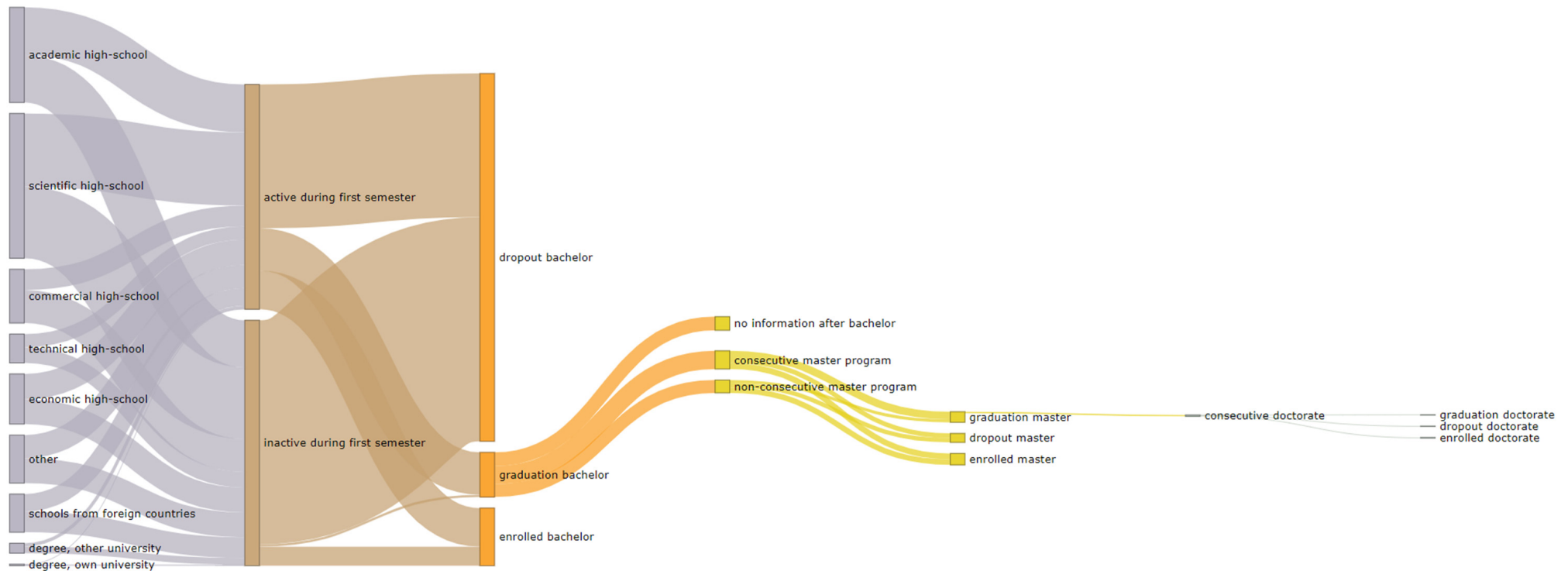


Figure 3. Student flows and outcomes of sociology bachelor's programs.

Compared to psychology, schools from foreign countries were less common (8%). Academic high schools (20%) and scientific high schools (31%) were the most frequent school types. Almost half of the students started actively in the first semester (48%). However, only 10% graduated from their bachelor's programs, with 78% of them dropping out. Of the remaining students who graduated, 31% did not start a master's program. Around 41% are enrolled in a consecutive sociology master's degree and 29% in another master's program. Of all bachelor's graduates, 24% graduated from a master's program, 20% dropped out, and around 3% started a doctorate. Student flows for multiple enrollments in sociology are shown in Figure 4.

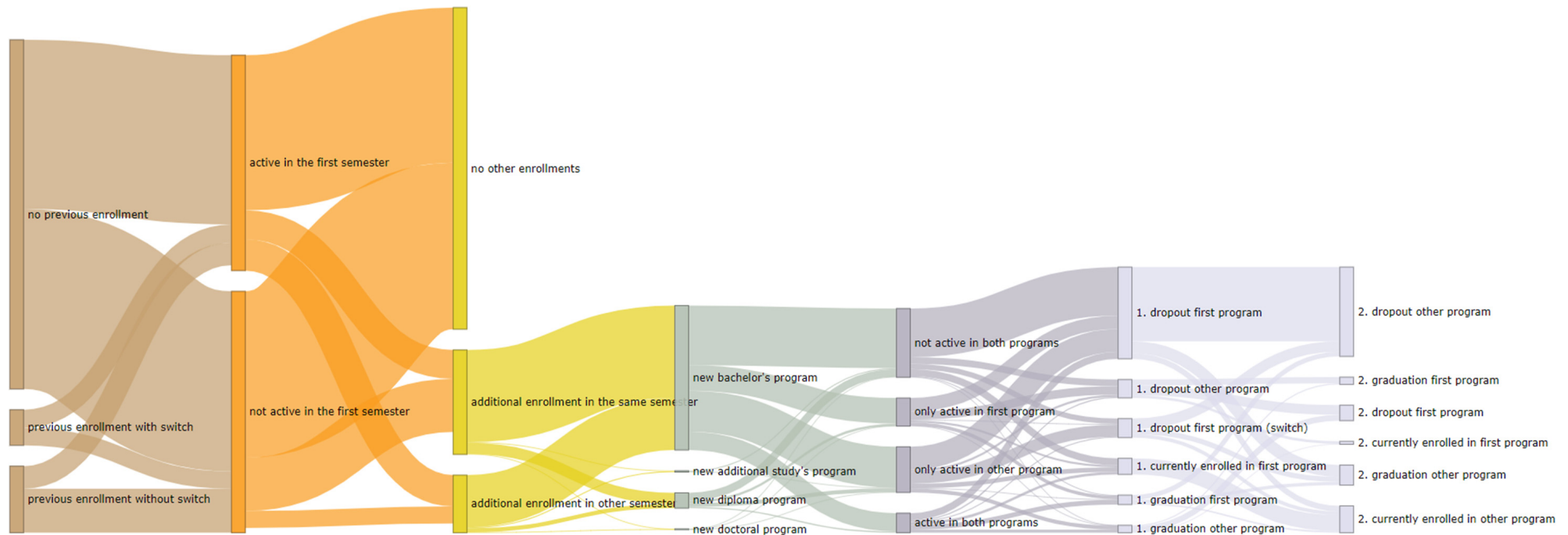


Figure 4. Student flows and outcomes of sociology bachelor's programs with multiple enrollments.

Incorporating multiple enrollments, 76% of the students had no previous enrollment, 8% switched, and 15% started sociology without closing another previous enrollment. Of all beginners, 23% started another program simultaneously, and 13% in another semester. Among those students with more than one program, 89% had another bachelor's enrollment. Most students (43%) were inactive in both programs: 28% in the other program, 17% only in sociology, and 12% in both. Dropout-dropout was the largest group among the outcomes (52%). Other constellations were less common.

2.3. Variables

The two dimensions, “ECTS credits” and “duration in semesters”, were used as the main cluster dimensions. For rows in the dataset of students with more than one enrollment, these were calculated both considering the observed program and the additional program. ECTS credits were summed up across both programs. However, only “real exams” have been counted, meaning that passed exams and credits transferred from one program to another have only been counted once in the program they originated from. ECTS credits that were linked to the thesis at the end of a program have not been included in the calculations. Thus, the total mean credits in studies with graduation as an outcome can be lower than the minimum ECTS credit threshold necessary to successfully finish a curriculum. The duration in semesters represents the overall number of semesters a student has spent completing the student lifecycles of the two programs in a given row. Overlap was counted as one semester, and the final variable was calculated from the earliest semester one of the programs was started to the last semester a program was closed. For instance, a student starting psychology and adding another program in their third semester, ending psychology in the fifth, and ending the second program in the sixth semester (counted from the beginning of psychology) obtains a semester count of six. If the second program ended in the fourth semester, the count would be five, as psychology ended later.

The student status outcome variable was used to split the analyses. Rows of students with one enrollment were either labeled “graduation” or “dropout”, and rows of students with more than one program were labeled “dropout-dropout”, “graduation-dropout”, or “graduation-graduation.” Since all of the outcomes can be expected to vary in the two dimensions of ECTS credits and duration in semesters, individual cluster analyses for each outcome constellation were performed. Descriptive statistics for these dimensions per outcome level can be found in Table 1.

Table 1. Descriptive statistics of the cluster dimensions ECTS credits and duration in semesters.

Field of Study	Outcome	<i>n</i>	<i>M</i>	<i>SD</i>	<i>SE</i>	<i>95% CI</i>
<i>ECTS credits</i>						
psychology	dropout	511	22.96	30.16	1.33	−1.29–3.96
	dropout-dropout	546	16.52	25.31	1.08	−1.04–3.21
	graduation	931	164.54	34.29	1.12	−1.08–3.33
	graduation-dropout	1322	146.32	44.20	1.22	−1.17–3.60
	graduation-graduation	546	147.36	26.29	2.07	−2.01–6.14
sociology	dropout	2054	11.31	18.57	0.41	−0.39–1.21
	dropout-dropout	2670	10.20	19.86	0.38	−0.37–1.14
	graduation	195	162.37	27.14	1.94	−1.89–5.78
	graduation-dropout	1236	46.52	65.98	0.26	−1.81–5.56
	graduation-graduation	78	141.6	24.58	1.13	−2.76–8.32
<i>duration</i>						
psychology	dropout	511	11.80	7.47	0.33	−0.32–0.98
	dropout-dropout	546	7.60	4.46	0.19	−0.18–0.57
	graduation	931	10.92	4.99	0.16	−0.16–0.48
	graduation-dropout	1322	9.01	3.21	0.09	−0.08–0.26
	graduation-graduation	546	10.20	3.30	0.26	−0.25–0.77
sociology	dropout	2054	8.11	5.33	0.12	−0.11–0.35
	dropout-dropout	2670	6.19	4.44	0.09	−0.08–0.25
	graduation	195	12.40	6.15	0.44	−0.43–1.31
	graduation-dropout	1236	9.10	3.08	0.09	−0.08–0.26
	graduation-graduation	78	10.09	3.35	0.38	−0.38–1.13

2.4. Apparatus

A Windows 11[®] installation on a desktop PC with 64 GB RAM and a 16-core CPU was used. The database from which the data were retrieved was an Oracle[®] SQL database, using the Oracle Instant Client 19[®] as the database client. Data curation and general code were written using R [61], and SQL was executed via the ROBC package [62]. The cluster analyses and data visualizations were coded and performed using the factoextra and cluster packages [63,64]. Visualizations were customized and created with ggplot2 [65].

2.5. Statistical Analyses, Algorithms and Settings

Cluster analysis was chosen as an appropriate method to structure student outcomes [66]. Four algorithms were used for clustering the outcome datasets: “clara”, “hclust”, “kmeans”, and “pam.” In total, 2 (fields of study) $\times$ 6 (outcome levels) $\times$ 4 (algorithms) analyses were performed, i.e., 48 individual results. ECTS credits were set to 0 if students had not taken a single exam. The two clustering dimensions (ECTS credits and duration) were standardized before the calculations were conducted. An optimal number of clusters was determined via the average silhouette method and applied to each subset separately. The method requires a matrix generation of $n \times 3$, with n being the number of rows for each subset [64]. To avoid memory issues on the hardware, a random sample of 1000 rows was generated out of each subset larger than 1000 cases. The graphs show an annotation in the bottom left corner of the individual plots if this randomization technique was used. Average silhouette methods are based on finding which data points lie well within clusters or merely between them, leading to measures of the relative quality of clusters. These measures are then used to determine an appropriate number of clusters [67]. The optimal number retrieved from the average silhouette method for each subset was then used as input for the number of clusters in the algorithms. Those were applied the same way over all subsets, using the following settings:

- kmeans: algorithm = “Hartigan–Wong”, nstart = 25, maximum iterations = 1000.
- pam: metric = “euclidean”.
- clara: metric = “euclidean”, number of samples = 25.
- hclust: metric = “euclidean”, method = “average”.

The kmeans algorithm is based on minimizing the sum of squared Euclidean distances from data points to their assigned cluster centers, which splits the data points into k groups [61,68]. “Partitioning Around Medoids”, i.e., pam, is a robust version of kmeans, focusing on minimizing the sum of dissimilarities. So-called medoids are the objects that represent clusters, of which the algorithm searches for a representative number of k medoids among the data points. After finding that number, the data points are assigned to their nearest medoid by minimizing the sum of dissimilarities to the closest medoids [64,69]. “Clustering Large Applications”, i.e., clara, uses the same algorithm as pam but can handle larger datasets as memory usage is non-quadratic but linear [64,69]. “Computes Hierarchical Clustering and Cuts the Tree”, i.e., hcut, is a package that includes several algorithms, of which “hclust” was used. This is a hierarchical clustering method that uses a set of dissimilarities for the data points. In an iterative process, data points are added to clusters, distances are computed between clusters, and clusters are joined based on similarity until a single one remains [61].

Based on the cutoff values for ECTS credits and the duration, a 3×3 matrix was created to count and aggregate the results of the algorithms per analysis. The groups for ECTS and duration were created as follows:

- Low ECTS: <30 ECTS
- Medium ECTS: 30 to <100 ECTS
- High ECTS: 100+ ECTS
- Low duration: <6
- Medium duration: 6–8
- Long duration: >8

Groups for ECTS were defined in the official regulations for bachelor's programs, with a goal of 180 ECTS credits and a minimum required time of six semesters [16]. Completing one semester equates to 30 ECTS credits, which was used as a lower mark. The upper mark was defined as an ECTS credit goal that ensures more than half of the curriculum has been completed successfully, i.e., 100+ ECTS. The duration boundaries were based on the Austrian law [14] and the minimum time requirement of six semesters [16]. Thus, everything below six semesters was considered low. Studying six to eight semesters is the official tolerance timeframe, and everything beyond that has students pay tuition fees, which mark medium and long labels. The total n is counted and transformed into relative frequencies.

3. Results

3.1. Cluster Analyses

Using clara, hclust, kmeans, and pam algorithms on six subsets for each psychology and sociology bachelor's program, 48 individual cluster analyses have been calculated. Results for each field of study, outcome, and algorithm on the two dimensions of ECTS credits and duration can be found in Table 2. Average silhouettes and cluster plots are depicted in the Supplementary Materials. Individual model parameters for each analysis are listed in Appendix A, Tables A1–A4, separately for each algorithm.

Table 2. Cluster and descriptive statistics based on the dimensions of ECTS and duration in semesters.

Outcome	Cluster	Method	<i>n</i>	<i>M</i> ECTS	<i>SD</i> ECTS	<i>SE</i> ECTS	95% <i>CI</i> ECTS	<i>M</i> Duration	<i>SD</i> Duration	<i>SE</i> Duration	95% <i>CI</i> Duration
<i>Psychology: bachelor's programs</i>											
dropout	1	clara	300	8.73	10.82	0.62	−0.60–1.85	3.67	1.70	0.10	−0.09–0.29
	2		113	68.36	30.28	2.85	−2.80–8.49	7.60	3.81	0.36	−0.35–1.07
	3		98	14.18	16.10	1.63	−1.60–4.85	12.51	4.45	0.45	−0.44–1.34
	1	hclust	486	18.42	22.41	1.02	−0.98–3.01	5.92	4.33	0.20	−0.19–0.58
	2		25	111.18	25.71	5.14	−5.47–15.75	12.24	4.10	0.82	−0.87–2.51
	1	kmeans	125	55.85	39.92	3.57	−3.5–10.64	11.92	4.90	0.44	−0.43–1.31
	2		386	12.31	15.07	0.77	−0.74–2.27	4.39	2.35	0.12	−0.12–0.35
	1	pam	340	8.99	11.6	0.63	−0.61–1.87	4.14	2.22	0.12	−0.12–0.36
	2		171	50.75	35.96	2.75	−2.68–8.18	10.40	5.04	0.39	−0.38–1.15
dropout–dropout	1	clara	190	6.63	8.77	0.64	−0.62–1.89	10.83	3.62	0.26	−0.26–0.78
	2		252	6.05	9.38	0.59	−0.57–1.75	3.98	1.61	0.10	−0.10–0.30
	3		104	59.96	26.11	2.56	−2.52–7.64	10.49	3.91	0.38	−0.38–1.14
	1	hclust	15	5.43	9.89	2.55	−2.92–8.03	20.13	2.39	0.62	−0.71–1.94
	2		510	13.42	18.93	0.84	−0.81–2.49	7.00	3.80	0.17	−0.16–0.50
	3		2	160.00	22.63	16.00	−187.30–219.30	10.00	2.83	2.00	−23.41–27.41
	4		19	93.58	15.14	3.47	−3.82–10.77	13.63	2.99	0.68	−0.75–2.12
	1	kmeans	69	71.51	25.01	3.01	−3.00–9.02	10.58	4.02	0.48	−0.48–1.45
	2		309	6.18	10.04	0.57	−0.55–1.70	4.59	1.97	0.11	−0.11–0.33
	3		168	12.96	13.82	1.07	−1.04–3.17	11.92	3.46	0.27	−0.26–0.79
	1	pam	206	35.08	32.01	2.23	−2.17–6.63	11.75	3.96	0.28	−0.27–0.82
	2		340	5.28	8.63	0.47	−0.45–1.39	5.09	2.40	0.13	−0.13–0.39
graduation	1	clara	92	77.72	39.54	4.12	−4.07–12.31	5.72	2.49	0.26	−0.26–0.78
	2		52	162.58	26.75	3.71	−3.74–11.15	16.00	3.55	0.49	−0.50–1.48
	3		355	171.72	14.40	0.76	−0.74–2.27	8.33	1.09	0.06	−0.06–0.17
	4		432	177.36	11.63	0.56	−0.54–1.66	6.08	0.42	0.02	−0.02–0.06
	1	hclust	896	164.53	34.80	1.16	−1.12–3.44	7.06	1.76	0.06	−0.06–0.17
	2		35	164.59	16.89	2.85	−2.95–8.66	17.57	3.27	0.55	−0.57–1.67
	1	kmeans	72	64.94	35.14	4.14	−4.12–12.40	5.19	2.50	0.29	−0.29–0.88
	2		807	173.55	15.33	0.54	−0.52–1.60	7.10	1.37	0.05	−0.05–0.14
	3		52	162.58	26.75	3.71	−3.74–11.15	16.00	3.55	0.49	−0.50–1.48
	1	pam	86	72.50	37.38	4.03	−3.98–12.05	5.86	2.98	0.32	−0.32–0.96
	2		845	173.90	14.28	0.49	−0.47–1.46	7.62	2.64	0.09	−0.09–0.27

Table 2. Cont.

Outcome	Cluster	Method	<i>n</i>	<i>M</i> ECTS	<i>SD</i> ECTS	<i>SE</i> ECTS	95% <i>CI</i> ECTS	<i>M</i> Duration	<i>SD</i> Duration	<i>SE</i> Duration	95% <i>CI</i> Duration
graduation–dropout	1	clara	863	153.08	34.28	1.17	−1.12–3.46	7.16	1.31	0.04	−0.04–0.13
	2		459	133.60	56.34	2.63	−2.54–7.80	12.50	2.79	0.13	−0.13–0.39
	1	hclust	1307	146.19	44.26	1.22	−1.18–3.63	8.88	2.98	0.08	−0.08–0.24
	2		15	157.23	37.98	9.81	−11.23–30.84	20.40	1.59	0.41	−0.47–1.29
	1	kmeans	128	26.68	28.70	2.54	−2.48–7.56	11.13	4.63	0.41	−0.40–1.22
	2		1194	159.14	19.36	0.56	−0.54–1.66	8.79	2.93	0.08	−0.08–0.25
	1	pam	829	158.74	20.14	0.70	−0.67–2.07	7.19	1.30	0.05	−0.04–0.13
	2		372	158.75	19.90	1.03	−1.00–3.06	12.47	2.57	0.13	−0.13–0.39
	3		121	23.00	24.53	2.23	−2.18–6.64	10.85	4.23	0.38	−0.38–1.15
graduation– graduation	1	clara	44	120.10	27.07	4.08	−4.15–12.31	12.05	2.27	0.34	−0.35–1.03
	2		74	153.16	17.44	2.03	−2.01–6.07	7.41	1.19	0.14	−0.14–0.41
	3		44	164.86	14.41	2.17	−2.21–6.55	13.07	2.82	0.43	−0.43–1.28
	1	hclust	149	151.96	17.97	1.47	−1.44–4.38	10.05	2.97	0.24	−0.24–0.72
	2		10	75.30	29.74	9.40	−11.87–30.68	9.40	3.50	1.11	−1.40–3.61
	3		3	159.17	3.62	2.09	−6.9–11.07	20.67	1.53	0.88	−2.91–4.68
	1	kmeans	76	152.07	13.44	1.54	−1.53–4.61	7.62	1.23	0.14	−0.14–0.42
	2		44	136.18	14.87	2.24	−2.28–6.76	13.95	2.59	0.39	−0.40–1.18
	3		9	74.22	31.33	10.44	−13.64–34.53	8.56	2.40	0.80	−1.05–2.65
	4		33	171.35	13.77	2.40	−2.49–7.28	11.61	1.71	0.30	−0.31–0.91
	1	pam	70	138.40	31.98	3.82	−3.80–11.45	13.17	2.54	0.30	−0.30–0.91
	2		92	154.17	18.41	1.92	−1.89–5.73	7.95	1.59	0.17	−0.16–0.49
<i>Sociology: bachelor’s programs</i>											
dropout	1	clara	1071	1.55	2.82	0.09	−0.08–0.26	2.39	1.24	0.04	−0.04–0.11
	2		983	21.94	22.26	0.71	−0.68–2.1	5.00	3.91	0.12	−0.12–0.37
	1	hclust	2038	10.27	14.43	0.32	−0.31–0.95	3.57	3.03	0.07	−0.06–0.20
	2		16	142.81	18.73	4.68	−5.30–14.66	12.56	3.22	0.81	−0.91–2.52
	1	kmeans	1852	8.28	9.90	0.23	−0.22–0.68	2.82	1.55	0.04	−0.03–0.11
	2		202	39.10	41.95	2.95	−2.87–8.77	11.15	3.91	0.28	−0.27–0.82
	1	pam	1071	2.04	3.51	0.11	−0.10–0.32	2.20	0.95	0.03	−0.03–0.09
	2		983	21.41	22.62	0.72	−0.69–2.14	5.21	3.85	0.12	−0.12–0.36

Table 2. Cont.

Outcome	Cluster	Method	<i>n</i>	<i>M</i> ECTS	<i>SD</i> ECTS	<i>SE</i> ECTS	95% <i>CI</i> ECTS	<i>M</i> Duration	<i>SD</i> Duration	<i>SE</i> Duration	95% <i>CI</i> Duration
dropout–dropout	1	clara	1151	16.27	27.48	0.81	−0.78–2.40	10.34	3.39	0.10	−0.10–0.30
	2		1519	5.60	8.50	0.22	−0.21–0.65	3.05	1.74	0.04	−0.04–0.13
	1	hclust	2637	8.71	14.63	0.28	−0.27–0.84	6.07	4.31	0.08	−0.08–0.25
	2		33	128.82	24.24	4.22	−4.37–12.81	15.79	4.01	0.7	−0.72–2.12
	1	kmeans	1677	5.69	8.51	0.21	−0.20–0.62	3.41	2.00	0.05	−0.05–0.14
	2		897	9.59	11.83	0.40	−0.38–1.17	10.85	3.11	0.10	−0.10–0.31
	3		96	94.52	30.65	3.13	−3.08–9.34	11.22	4.97	0.51	−0.50–1.51
	1	pam	1151	16.27	27.48	0.81	−0.78–2.4	10.34	3.39	0.10	−0.10–0.30
	2		1519	5.60	8.5	0.22	−0.21–0.65	3.05	1.74	0.04	−0.04–0.13
graduation	1	clara	33	171.29	18.92	3.29	−3.41–10	13.58	4.58	0.80	−0.83–2.42
	2		125	171.83	9.69	0.87	−0.85–2.58	7.65	1.23	0.11	−0.11–0.33
	3		37	122.45	36.14	5.94	−6.11–17.99	8.89	2.70	0.44	−0.46–1.34
	1	hclust	192	164.65	20.13	1.45	−1.41–4.32	8.89	3.17	0.23	−0.22–0.68
	2		3	16.33	15.95	9.21	−30.41–48.82	9.00	7.55	4.36	−14.4–23.11
	1	kmeans	180	166.94	17.32	1.29	−1.26–3.84	8.34	1.93	0.14	−0.14–0.43
	2		15	107.53	53.66	13.86	−15.86–43.57	15.40	6.97	1.80	−2.06–5.66
	1	pam	6	149.42	19.90	8.13	−12.76–29.01	22.50	2.66	1.09	−1.71–3.88
	2		135	173.71	10.68	0.92	−0.90–2.74	7.93	1.58	0.14	−0.13–0.4
	3		54	135.44	35.85	4.88	−4.91–14.66	9.76	2.72	0.37	−0.37–1.11
graduation–dropout	1	clara	678	8.55	11.98	0.46	−0.44–1.36	7.64	1.48	0.06	−0.05–0.17
	2		260	18.18	32.07	1.99	−1.93–5.91	13.60	2.81	0.17	−0.17–0.52
	3		298	157.65	22.16	1.28	−1.24–3.81	8.49	2.14	0.12	−0.12–0.37
	1	hclust	1159	47.54	66.85	1.96	−1.89–5.82	8.57	2.26	0.07	−0.06–0.20
	2		77	31.26	48.91	5.57	−5.53–16.67	17.16	2.42	0.28	−0.27–0.83
	1	kmeans	300	157.25	22.62	1.31	−1.26–3.88	8.51	2.15	0.12	−0.12–0.37
	2		678	8.55	11.98	0.46	−0.44–1.36	7.64	1.48	0.06	−0.05–0.17
	3		258	17.56	31.40	1.95	−1.89–5.8	13.62	2.81	0.18	−0.17–0.52
	1	pam	600	8.72	12.09	0.49	−0.48–1.46	7.34	1.29	0.05	−0.05–0.16
	2		339	15.89	29.27	1.59	−1.54–4.72	12.76	2.89	0.16	−0.15–0.47
	3		297	157.86	21.90	1.27	−1.23–3.77	8.48	2.14	0.12	−0.12–0.37

Psychology students with one enrollment and the outcome dropout were clustered into two clusters by hclust, kmeans, and pam and into three clusters by clara. For the outcome of graduation, four (clara), three (kmeans), and two clusters (hclust and pam) were calculated. Dropout–dropout also showed an inconsistency in the number of clusters, ranging from two (pam) to four (hclust), although those four clusters contained three with less than 20 cases per element. Graduation–dropout showed two clusters, with the exception of pam, revealing four. The hclust defined another small cluster with 15 cases. Inconsistency could also be seen in the clustering of graduation–graduation with two (pam), three (hclust and clara), and four clusters (kmeans).

Sociology students with the outcome of dropout had two clusters in each algorithm. For the outcome of graduation, two or three clusters were identified. Students with two or more programs and the outcome dropout–dropout showed two clusters, and those with graduation–dropout showed three clusters, except for hclust, which identified two. No results could be obtained for graduation–graduation of sociology students due to the sample size being too small.

The results for the explained variance of the two dimensions ECTS credits and duration in the kmeans algorithm (Table A1) are consistent at 40% and higher, except for sociology students' statuses of dropout–dropout (38%) and graduation (34%). The maximum explained variance was 74% for the graduation–dropout outcome of sociology students.

3.2. Cluster Aggregation

Summing up the total n for all algorithms at each outcome level, the results have been transformed into relative frequencies and are shown in Figure 5.

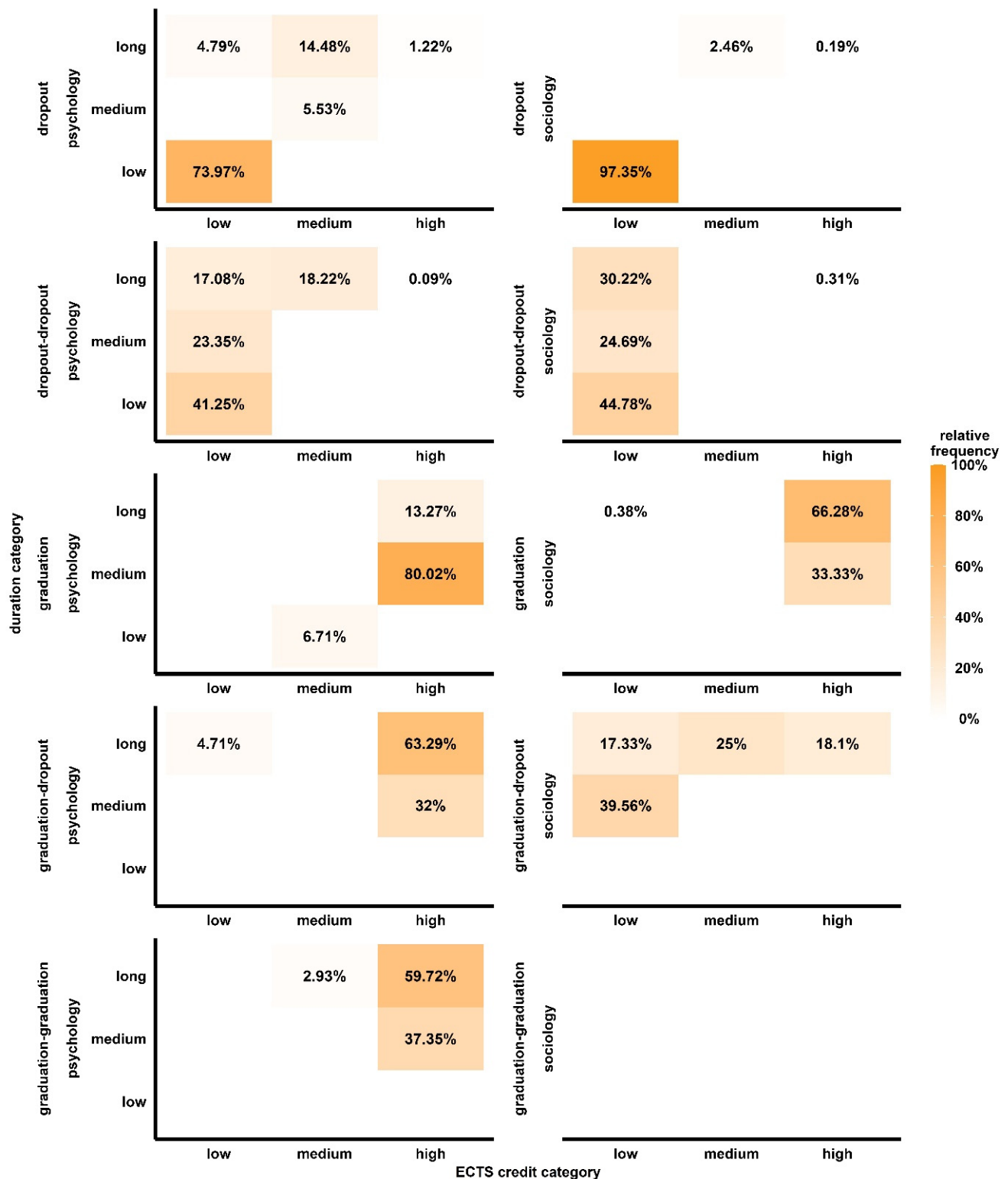


Figure 5. Cluster aggregation in relative frequencies of the total n over all algorithms per outcome; from 0% (white) to 100% (orange).

Psychology dropouts were most frequently clustered in the low ECTS-low duration group. Other groups were less frequent, with medium ECTS-long duration being the largest of those. Dropout-dropout clusters showed the most common group to be low ECTS-low duration, followed by low ECTS-medium duration, medium ECTS-long duration, low ECTS-long duration, and two cases in high ECTS-long duration. The most frequent

cluster for graduation was high ECTS-medium duration. Graduation–dropout showed the largest total n for high ECTS-long duration, followed by high ECTS-medium duration. Graduation–graduation revealed the same distribution for those two groups.

Sociology dropouts' largest group was low ECTS-low duration. Compared to psychology, other groups of dropouts were less frequent. Similar distributions were found for dropout–dropout, with low ECTS combined with low, long, and medium durations being the most frequent ones. Graduation distributions were also similar to those in psychology. However, graduation–dropout showed that the most frequent group was low ECTS-medium duration.

4. Discussion

4.1. Outcome Clusters

This study wanted to identify and compare the student groups' outcomes in undergraduate programs of psychology and sociology, considering multiple enrollments. The explorative research question had two focus points: (1) Which clusters of sociology and psychology students exist in relation to their workload and study time for their individual outcome constellations? (2) Among the different outcome constellations, which are the most frequent? Cluster analyses using four algorithms identified different clusters per outcome and field of study.

4.1.1. Dropout and Dropout–Dropout

The results showed that both fields of study had the highest frequencies in the low-low groups for single program dropouts. However, psychology also showed a more diverse profile than sociology, meaning that there were higher frequencies of groups with long-duration and medium ECTS credits. These groups were only marginally represented or nonexistent in sociology. The student flow visualizations and analyses showed that sociology generally has a higher relative number of dropouts than psychology at the University of Graz, which happened earlier with a less accomplished workload involved. Previous research showed that entrance exams lead to a reduced dropout risk among the remaining students [70]. Considering that sociology can have less strict admission criteria than psychology, the results reflect this finding in their relative frequencies of student dropout. Since sociology has no admission criteria, the selection process for students and early dropouts happens after enrollment, contrary to psychology programs. This explains why some psychology students tend to stay longer in the system before dropping out and why the relative number of dropouts is lower. Since sociology can have little or no admission criteria in other countries as well, while psychology does [38,39], the situation can be similar at other institutions worldwide. For policymakers, this means that restricting access and setting up admission criteria can, therefore, change student flows. In Austria, however, there are no tuition fees [14], and being a student on paper, i.e., being enrolled without workload, can give people social benefits such as being granted perks for events, public transport tickets, or Amazon Prime [71]. It can be implied that enrolling in a single program with no admission criteria is a good choice for those seeking such benefits without wanting to attend courses. Changing admission criteria in one program would possibly shift this group to another program, producing a similar student flow diagram.

Dropout–dropout prolonged the duration, as frequencies were distributed across the duration categories. However, only psychology showed a group of medium ECTS-long duration in the dropout–dropout outcome. The same group was also present for single-program psychology dropouts, with a minimal frequency for sociology dropouts. This indicates a higher workload for psychology students in two programs, even if they drop out. For more than one enrollment, this group was not found for sociology students. Considering the student flow diagrams in Figures 2 and 4, sociology's largest outcome groups are dropout–dropout, while that is graduation–dropout for psychology students. A previous study in Austria on multiple and parallel enrollments found that students with two or more programs can prioritize their enrollments as primary and secondary

programs. Depending on the priority, different variables were associated with student performance [15]. In light of some sociology students originally considering psychology [39], these results suggest that making it through the admission barrier of psychology makes it more of a main program than a secondary one for students. Sociology is more likely to be treated as a secondary program, as indicated by dropout rates and the relative number of dropout-dropout outcomes with only low workload outcomes.

4.1.2. Graduation and Graduation-Graduation

Graduation groups for psychology students with one enrollment were obtained in the medium duration segment, whereas sociology students had lower frequencies for the medium duration and higher frequencies for the long duration. Following previous research that found that entrance exam results and preparation are performance predictors [72], this result may depict the difference in the selectiveness of both fields of study in Austria. Only those students with the highest scores in the entrance exam are admitted to a bachelor's program in psychology, whereas sociology has no specific admission requirements. In contrast, sociology has a beginning and orientation phase that must be completed to progress with the curriculum, and that can slow progress in one's curriculum if not completed. Entrance exam scores can be associated with academic readiness [73], which can influence student retention and graduation [5]. The student flow visualizations of the sample showed that psychology students have a much higher proportion of active first-semester students compared to sociology, possibly reflecting these results. This may affect their time to graduate, leading to a higher relative frequency of graduates in the medium-duration segments of psychology compared to sociology.

Graduation-graduation clustering was only possible for psychology, as n was too low for the analyses of sociology. Both high ECTS-long duration and medium duration exist. Medium duration is defined as six to eight semesters; this means that there are a considerable number of students graduating from two bachelor's programs in time before having to pay fees. This result can be explained by the possibility of transferring ECTS credits of passed exams from one curriculum to another if the requirements match [14]. For instance, a student enrolling in psychology and sociology has to take courses on statistics. Once passed, it can be transferred from one program to another. The more similar the two curricula, the more direct transfer is possible. Some courses can be transferred unidirectionally, i.e., only the more challenging course, and others in a bidirectional manner, meaning it does not matter in which program it has been conducted. Other courses, which are not similar or the same in the two programs, can only be used as substitutes for elective subjects (around 15 ECTS credits per curriculum). The results of this study have implications for policymakers in that the transferability of exam results has potentially positive outcomes on time to degree in multiple enrollment policies for students who strive to achieve more than one degree. What may also facilitate time to graduation and performance is prior knowledge. For similar programs, it can be expected that declarative knowledge helps students progress faster and more efficiently [8]. In addition, both procedural knowledge [9–11] and metacognition [12] were shown to positively affect academic performance predictors [13]. Therefore, several structural and cognitive dimensions can play a role in this outcome.

Showing too few cases in sociology in the graduation-graduation outcome for analysis ($n < 100$) also may be an effect attributed to the different student populations due to the selectiveness of the two programs. Although student flows suggest that more than one enrollment of sociology students is more common than in psychology students, they also show that the frequencies of graduation per se are lower. If sociology had the same selection process as psychology with a fixed number of places, only the best students would be admitted to the program, leading to a lower number of beginners and a better ratio of dropouts and graduates. However, the total number of successful students who graduate is unlikely to change. If the admissions process is bound to a certain point threshold, admitting only those that are better than a certain performance threshold, the total number of students may decrease, also not increasing graduates by much. Both scenarios imply

that sociology is less popular than psychology. This discrepancy in popularity is a known issue in other institutions, and strategies have been proposed to increase access, visibility, and vitality of sociology programs [74,75].

4.1.3. Graduation–Dropout

The outcome group for graduation–dropout had different frequency distributions for psychology and sociology. While psychology showed a similar distribution to graduation–graduation, i.e., high and medium ECTS and long duration, sociology showed clusters in each ECTS group in the long duration segment as well as in the low ECTS-medium duration group. Graduation in a low ECTS group is possible due to the transferability of exams [14]. Since ECTS credits from theses have not been considered, some credits are missing for each graduate. What is more, the data structure did not allow for control for other programs that have been enrolled more than one year apart from the beginning of sociology and for programs that were conducted as third or fourth parallel programs. This means that there are missing ECTS credits that were conducted in other programs and are not included in the data structure, facilitating the time to graduation.

Performing an additional descriptive analysis of the dataset, sociology was the program that has been enrolled as a secondary program the most out of all curricula at the university. This means that there is a high fluctuation and possibly a chance to graduate after another program is closed due to various reasons. In view of the student flow outcomes of multiple programs in sociology and the clusters that were found, this suggests that sociology outcomes are more unstable compared to psychology. Psychology students show graduation–dropout as the most frequent outcome in the student flows, which can partly be explained by a limit of credits that can be conducted from master's courses in psychology prior to finishing a bachelor's program. Students can circumvent this rule of master's curricula by enrolling in another program and taking psychology courses from this parallel program as elective subjects. Due to sociology being the most common secondary program, a number of graduation–dropout outcomes in both programs can be expected to originate from this behavior. The instability of sociology in this outcome category can come from the time it takes these students to finish their psychology program.

4.2. Limitations

It has been known for a long time that objective workload can only explain a little variance in perceived workload [76]. Learning takes place in the time that is available to students. Although time is essential to learning, even an infinite amount of time will not guarantee learning [21]. ECTS credits can also differ from the real workload students accomplish to finish a course, with large possible interindividual differences [77,78]. It has been shown that perceptions of the learning environment have more influence over students than the objective context [79]. In view of these studies, it can be argued that the objective workload measures of ECTS credits are not ideal for clustering student outcome groups. In contrast, a perceived workload measure over the entire duration a student is enrolled in a program would be necessary to accurately represent the impact on the student level. Teaching approaches, assessment, and curriculum design can influence how workload is perceived [80]. This implies that the perception can change depending on the course level and over time. Due to the sample size, such an indicator would have to be assessed on the same scale. Since neither such a variable exists in the university database used for this study nor can the assessment be economically justified, the objective workload measures of ECTS credits were the only measures available. In interpreting the results, it needs to be considered that ECTS credits can be limited in their interpretability in terms of workload, which is a reason for the observed outcomes.

Following the model parameters of the kmeans algorithm, the variance that could be explained by the two dimensions of workload and duration was generally moderate to high. However, some outcome groups had lower coefficients than others, indicating that there is a difference between the factors needed to explain outcomes. Graduation and

dropout–dropout in sociology had the lowest values, which were higher for psychology and in other groups. More variation can be expected in sociology due to the lower selectiveness of the program, which may have led to these results. Studies that are not only interested in workload and duration may use more complex models to obtain better clustering results. However, previous research on student performance prediction used a long list of variables from administrative databases and still did not obtain a near-perfect predictive value [81]. This means that using registrar data will only be able to account for a certain amount of variance. Personal and socioeconomic reasons to change one’s study behavior, which are usually not part of such a database, have an influence and cannot be controlled by such a design [82].

The sample has been obtained from the database of the same institution. Still, it needs to be considered that the results for the two bachelor’s programs may be limited in their generalizability to each other. Although both programs share a lot of similarities in their curriculum structures at the institution where this study was carried out, there are still some differences that may affect student behavior. For instance, psychology has an entrance exam but no beginning or orientation phase, while the opposite is the case for sociology [36], which affects the sample. As shown in Figures 1 and 3, the relative number of graduates is a lot smaller in sociology compared to psychology. One reason is likely the pre-selection psychology students experience via the entrance exam. While only the best potential students are admitted to the program, pre-selection in sociology is shifted backward and happens during the beginning and orientation phases. Due to its low selectiveness, sociology is a common choice for multiple-enrollment students, while psychology cannot be. This leads to unbalanced sample sizes and a limitation on the generalizability of the results in certain aspects between the programs.

In terms of generalizability for higher education institutions in other countries, curriculum structures may be different. How similar or selective the programs are depends on both the general ruleset of the university systems and how similar the curricula of psychology and sociology are set up. Previous research summarizing reports of sociology students shows that psychology is more restrictive than in other countries and sociology is not, with some of them starting sociology because they could not meet the requirements for psychology [38,39]. It should also be noted that the unbalanced sample of this study does not reflect any kind of selection bias, as data from all psychology and sociology programs in the target timeframe in the database were used. Spanning from 2010/11 to 2022/23, every program was included, which means that the sample is the population of psychology and sociology students at the University of Graz during these academic years. This imbalance reflects the real situation due to the restrictive access to psychology studies in Austria [14]. Therefore, the representativeness of Austrian institutions can be considered very high. For foreign countries, the university system and the curricula need to be taken into consideration.

4.3. Implications for Policy, Practice, and Research

Evidence was obtained that multiple enrollments are associated with longer study durations. For policymakers and program designers, this means that introducing a multiple enrollment policy should be accompanied by measures to inform students about the possible outcomes or to help them with the challenges of being enrolled in more than one program. Support structures on an institutional level need to be identified, and targeted deployment is recommended [83–86].

Student groups of graduation–dropout were identified that graduate with a low “real” workload, which means they likely have transferred exams from one program to another, which makes transferability an important cornerstone of such a policy. In line with this, this study also found evidence that dropout risk is lower when there is an admission exam [70]. A higher rate of active first semesters was obtained in psychology compared to sociology. Both the relative number of dropouts, the activity measures, and the sizes of the outcome group “graduation–graduation” can be connected to the lower popularity of sociology

programs. Measures to decrease this discrepancy exist [74,75] and may be implemented in policy and practice. However, aside from popularity issues, it needs to be noted that structural components of curricula can be responsible for the differences observed in this study between the two programs. For instance, this can be a credit limit for psychology students, not allowing them to do master's courses early during the end phase of their bachelor's programs. This can lead to them seeking a program with no admission criteria to circumvent this rule. Changing the admission criteria or other structures in sociology for the purpose of improving popularity may shift the outcomes in student flows and clusters observed in this study elsewhere and not actually solve the problem. Outside factors, such as the perks of just being enrolled in the university system, can also have an influence on enrollment and flow patterns. An evaluation of the structures, outside factors, and student flows is therefore recommended.

It also needs to be considered that the selectiveness of programs entails different student populations and outcomes. Austria's university system per se is not selective in that it enables everyone with a university entrance qualification to matriculate and study without tuition fees [14]. The generalizability of the results of this study should always be brought into the context of another university system. Institutional evaluations and future research may be necessary, as well as trying to replicate the results in other university systems in order to ensure the stability of the evidence from this study.

5. Conclusions

Visualizing student flows and clustering outcomes for students in one and multiple enrollments in the bachelor's programs in psychology and sociology showed that multiple programs tend to increase the study duration. In line with previous works, this study found a lower relative number of dropouts in psychology, i.e., the program with an admission exam, compared to sociology, which has no entrance test. Popularity may also have been a factor that contributed to the differences between the two fields of study. In this study, psychology and sociology were interrelated in the outcomes, as students can enroll in both. They may see psychology more often as the main program, while sociology seems to be a secondary program. In conclusion, when introducing a multiple enrollment policy, evaluation of the university system and outside factors, as well as the provision of support structures, is recommended. One of these structures can be to allow students with multiple enrollments to transfer their exam results from one program to another, facilitating progress in the curricula.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/higheredu3020023/s1>, Average Silhouette Figures and Cluster Visualizations.

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Appendix A. Model Parameters

Table A1. Model parameters for the kmeans algorithm.

Outcome	Cluster	Variable	Value	<i>n</i>	Total SS	Total within SS	Within SS	Between SS	Iterations	Variance Explained
Psychology: bachelor's programs										
dropout	1	total ECTS credits (standardized)	1.09							
	2		−0.35							
	1	total time in the university system (standardized)	1.26							
	2		−0.41							
	1	model parameters		125	1020	562.24	362.7	457.76	1	44.88%
	2		386			199.54				
dropout–dropout	1	total ECTS credits (standardized)	2.17							
	2		−0.41							
	3		−0.14							
	1	total time in the university system (standardized)	0.67							
	2		−0.68							
	3		0.97							
	1	model parameters		69	1090	380.34	121.6	709.66	3	65.11%
	2		309			108.59				
	3		168			150.14				
graduation	1	total ECTS credits (standardized)	−2.9							
	2		0.26							
	3		−0.06							
	1	total time in the university system (standardized)	−0.83							
	2		−0.13							
	3		3.14							
	1	model parameters		72	1860	619.69	134.57	1240.31	2	66.68%
	2		807			366.95				
	3		52			118.17				

Table A1. *Cont.*

Outcome	Cluster	Variable	Value	<i>n</i>	Total SS	Total within SS	Within SS	Between SS	Iterations	Variance Explained
graduation–dropout	1	total ECTS credits (standardized)	−2.71							
	2		0.29							
	1	total time in the university system (standardized)	0.66							
	2		−0.07							
	1	model parameters		128	2642	1542.15	317.96	1099.85	1	41.63%
	2		1194			1224.19				
graduation–graduation	1	total ECTS credits (standardized)	0.18							
	2		−0.43							
	3		−2.78							
	4		0.91							
	1	total time in the university system (standardized)	−0.78							
	2		1.14							
	3		−0.5							
	4		0.42							
	1	model parameters		76	322	103.11	30.02	218.89	3	67.98%
	2		44			40.12				
	3		9			15.59				
	4		33			17.38				
Sociology: bachelor's programs										
dropout	1	total ECTS credits (standardized)	−0.16							
	2		1.5							
	1	total time in the university system (standardized)	−0.26							
	2		2.4							
	1	model parameters		1852	4106	2318.85	979.98	1787.15	1	43.53%
	2		202			1338.87				
dropout–dropout	1	total ECTS credits (standardized)	0.47							
	2		−0.25							
	1	total time in the university system (standardized)	1.1							
	2		−0.58							
	1	model parameters		926	5338	3320.46	2637.36	2017.54	1	37.80%
	2		1744			683.11				

Table A1. *Cont.*

Outcome	Cluster	Variable	Value	<i>n</i>	Total SS	Total within SS	Within SS	Between SS	Iterations	Variance Explained
graduation	1	total ECTS credits (standardized)	0.17	180	388	256.04	136.59	131.96	1	34.01%
	2		−2.02							
	1	total time in the university system (standardized)	−0.17							
	2		2.01							
	1	model parameters								
	2		15							
graduation–dropout	1	total ECTS credits (standardized)	1.68	300	2470	633.16	181.19	1836.84	3	74.37%
	2		−0.58							
	3		−0.44							
	1	total time in the university system (standardized)	−0.19							
	2		−0.47							
	3		1.47							
	1	model parameters								
	2		678							
	3		258							

Table A2. Model parameters of the clara algorithm.

Outcome	Cluster	Variable	Value	n	Max Diss	M Diss	Isolation	Med Iteration	Cluster M Width	M Width	Objective
Psychology: bachelor's programs											
dropout	1	total ECTS credits (standardized)	−0.56								
	2		1.29								
	3		−0.36								
	1	total time in the university system (standardized)	−0.71								
	2		0.17								
	3		1.27								
	1	model parameters		300	1.23	0.47	0.62	158	0.7	0.46	0.71
	2		113	3.87	1.11	1.94	336	0.15			
	3		98	2.97	0.97	1.49	152	0.33			
dropout–dropout	1	total ECTS credits (standardized)	−0.53								
	2		−0.53								
	3		1.64								
	1	total time in the university system (standardized)	0.31								
	2		−0.81								
	3		0.54								
	1	model parameters		190	3.6	0.74	3.21	342	0.49	0.45	0.68
	2		252	1.68	0.45	1.5	11	0.49			
	3		104	4.68	1.13	2.14	370	0.3			
graduation	1	total ECTS credits (standardized)	−2.14								
	2		0.13								
	3		0.33								
	4		0.39								
	1	total time in the university system (standardized)	−0.53								
	2		2.78								
	3		0.2								
	4		−0.53								
	1	model parameters		92	2.97	1.34	1.17	636	0.17	0.36	0.51
	2		52	3.69	1.25	1.43	210	0.34			
	3		355	1.9	0.48	2.57	515	0.33			
	4		432	1.22	0.27	1.66	924	0.54			

Table A2. *Cont.*

Outcome	Cluster	Variable	Value	n	Max Diss	M Diss	Isolation	Med Iteration	Cluster M Width	M Width	Objective
graduation-dropout	1	total ECTS credits (standardized)	0.26								
	2		0.06								
	1	total time in the university system (standardized)	−0.63								
	2		0.93								
	1	model parameters		863	3.79	0.63	2.41	134	0.73	0.5	0.83
	2			459	4.67	1.2	2.97	384	0.04		
graduation-graduation	1	total ECTS credits (standardized)	−0.62								
	2		0.25								
	3		0.37								
	1	total time in the university system (standardized)	0.54								
	2		−0.97								
	3		0.54								
	1	model parameters		44	4.34	0.91	4.38	49	0.25	0.4	0.76
	2			74	2.58	0.6	1.7	144	0.59		
	3			44	3.03	0.9	3.06	129	0.41		
Sociology: bachelor's programs											
dropout	1	total ECTS credits (standardized)	−0.61								
	2		0.36								
	1	total time in the university system (standardized)	−0.52								
	2		−0.2								
	1	model parameters		1071	1.59	0.31	1.56	1882	0.7	0.3	0.72
	2			983	9.45	1.17	9.26	230	−0.03		
dropout-dropout	1	total ECTS credits (standardized)	−0.11								
	2		−0.36								
	1	total time in the university system (standardized)	0.86								
	2		−0.72								
	1	model parameters		1151	8.39	1.07	5.26	1930	0.31	0.52	0.74
	2			1519	3.58	0.5	2.24	1924	0.68		

Table A2. Cont.

Outcome	Cluster	Variable	Value	<i>n</i>	Max Diss	M Diss	Isolation	Med Iteration	Cluster M Width	M Width	Objective
graduation	1	total ECTS credits (standardized)	0.37								
	2		0.34								
	3		−1.19								
	1	total time in the university system (standardized)	0.96								
	2		−0.27								
	3		0.03								
	1	model parameters			4.1	1.12	3.32	26	0.24	0.43	0.68
	2				1.46	0.44	1.18	21	0.59		
	3				5.29	1.09	3.39	180	0.1		
graduation–dropout	1	total ECTS credits (standardized)	−0.58								
	2		−0.51								
	3		1.75								
	1	total time in the university system (standardized)	−0.36								
	2		1.27								
	3		−0.36								
	1	model parameters			1.95	0.44	1.2	418	0.59	0.58	0.56
	2				4.31	0.77	2.65	864	0.5		
	3				2.28	0.67	0.98	245	0.61		

Table A3. Model parameters of the pam algorithm.

Outcome	Cluster	Variable	Value	<i>n</i>	Max Diss	<i>M</i> Diss	Diameter	Separation	Med Iteration	Cluster <i>M</i> Width	<i>M</i> Width	Objective Build	Objective Swap
<i>Psychology: bachelor's programs</i>													
dropout	1	total ECTS credits	−0.53										
	2	(standardized)	0.8										
	1	total time in the university	−0.49										
	2	system (standardized)	0.61										
	1	model parameters		340	1.56	0.55	2.59	0.08	12	0.67	0.47	0.88	0.84
	2			171	4.11	1.43	6.14	0.08	135	0.09			
dropout– dropout	1	total ECTS credits	0.69										
	2	(standardized)	−0.53										
	1	total time in the university	0.76										
	2	system (standardized)	−0.58										
	1	model parameters		206	5.61	1.32	7.38	0.22	264	0.14	0.46	0.88	0.84
	2			340	1.75	0.55	2.5	0.22	25	0.65			
graduation	1	total ECTS credits	−2.55										
	2	(standardized)	0.33										
	1	total time in the university	−0.53										
	2	system (standardized)	−0.17										
	1	model parameters		86	3.77	1.38	5.62	0.06	296	0.36	0.65	0.78	0.78
	2			845	6.64	0.72	7.73	0.06	333	0.68			
graduation– dropout	1	total ECTS credits	0.33										
	2	(standardized)	0.31										
	3		−3.04										
	1	total time in the university	−0.63										
	2	system (standardized)	0.93										
	3		0.31										
	1	model parameters		829	2.45	0.51	3.86	0.31	56	0.57	0.5	0.67	0.64
	2			372	3.75	0.74	4.51	0.31	85	0.36			
	3			121	4.05	1.22	6.27	0.31	859	0.45			

Table A3. Cont.

Outcome	Cluster	Variable	Value	n	Max Diss	M Diss	Diameter	Separation	Med Iteration	Cluster M Width	M Width	Objective Build	Objective Swap									
graduation– graduation	1	total ECTS credits (standardized)	−0.2																			
	2		0.29																			
	1	total time in the university system (standardized)	0.85																			
	2		−0.67																			
	1	model parameters	70											4.76	1.12	6.79	0.23	153	0.2	0.38	0.99	0.88
	2		92											2.71	0.69	4.42	0.23	141	0.52			
Sociology: bachelor’s programs																						
dropout	1	total ECTS credits (standardized)	−0.61																			
	2		0.31																			
	1	total time in the university system (standardized)	−0.52																			
	2		0.12																			
	1	model parameters	1071											0.96	0.28	1.52	0.03	12	0.75	0.33	0.77	0.72
	2		983											9.39	1.2	10.11	0.03	563	−0.12			
dropout– dropout	1	total ECTS credits (standardized)	−0.11																			
	2		−0.36																			
	1	total time in the university system (standardized)	0.86																			
	2		−0.72																			
	1	model parameters	1151											8.39	1.07	9.03	0.15	409	0.18	0.45	0.81	0.74
	2		1519											3.58	0.5	3.83	0.15	276	0.65			
graduation	1	total ECTS credits (standardized)	−0.55																			
	2		0.37																			
	3		−0.7																			
	1	total time in the university system (standardized)	4.35																			
	2		−0.27																			
	3		0.34																			
	1	model parameters	6											1.73	0.87	2.5	0.93	33	0.64	0.45	0.7	0.69
	2		135											2.29	0.5	3.24	0.09	22	0.6			
	3		54											5.87	1.13	7.59	0.09	95	0.04			

Table A3. Cont.

Outcome	Cluster	Variable	Value	<i>n</i>	<i>Max</i> Diss	<i>M</i> Diss	Diameter	Separation	<i>Med</i> Iteration	Cluster <i>M</i> Width	<i>M</i> Width	Objective Build	Objective Swap
graduation– dropout	1	total ECTS credits (standardized)	−0.61										
	2		−0.55										
	3		1.7										
	1	total time in the university system (standardized)	−0.68										
	2		0.94										
	3		−0.36										
	1	model parameters			1.63	0.39	2.51	0.32	1019	0.69	0.56	0.65	0.56
	2				4.62	0.78	5.28	0.22	608	0.3			
	3				2.29	0.67	3.37	0.22	892	0.59			

Table A4. Model parameters of the hclust algorithm.

Outcome	Cluster	<i>n</i>	Cluster <i>M</i> Width	<i>M</i> Width
<i>Psychology: bachelor's programs</i>				
dropout	1	486	0.58	0.58
	2	25	0.55	
dropout–dropout	1	15	0.74	0.48
	2	510	0.47	
	3	2	0.45	
	4	19	0.60	
graduation	1	896	0.68	0.68
	2	35	0.61	
graduation–dropout	1	1307	0.57	0.57
	2	15	0.68	
graduation–graduation	1	149	0.47	0.47
	2	10	0.36	
	3	3	0.80	
<i>Sociology: bachelor's programs</i>				
dropout	1	2038	0.82	0.82
	2	16	0.76	
dropout–dropout	1	2637	0.77	0.77
	2	33	0.70	
graduation	1	192	0.76	0.76
	2	3	0.46	
graduation–dropout	1	1159	0.48	0.48
	2	77	0.60	

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