KRTK-KTI WORKING PAPERS | KRTK-KTI MŰHELYTANULMÁNYOK

The Return of Diverse Higher Education Pathways

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ABSTRACT

The expansion of higher education has resulted in a fragmentation of student careers on a global scale. The number of students pursuing atypical pathways has been growing. In the European Union, the Bologna Process has facilitated the mobility of students across higher education institutions, the transition between different courses of study, increasing the diversity of pathways. The existing literature on higher education careers agrees that the most appropriate approach to studying training pathways is a dynamic one. In our paper, using a rich, individual-level administrative research database, we trace higher education pathways over six years at the monthly level and then categorise them using sequence analysis. For this information on the monthly educational statuses and on parallel employment status and parallel studies were taken into account. The resulting student life course categories were also examined regarding individuals' cognitive skills, educational and family background. Finally, regression estimates were used to examine each trajectory type's early labor market success. To examine the educational and labor market pathways of individuals over seven years is unique in the region, as the combined analysis of higher education careers and subsequent labor market success too.

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A felsőoktatási életút típusok munkaerőpiaci sikeressége

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A felsőoktatási expanzióval a hallgatói életpályák töredezettebbé váltak, így az atipikus pályát befutó hallgatók száma világszerte egyre növekszik. Az Európai Unióban a bolognai folyamat megkönnyítette felsőoktatási intézmények közötti mobilitást és a különböző képzések közötti átmenetet, ezáltal megnövelte a tanulmányi utak sokszínűségét. A felsőoktatási pályákat vizsgáló szakirodalom egyetért abban, hogy a képzési utakat leginkább dinamikus szemléletben érdemes vizsgálni. A tanulmányban egy gazdag adattartalmú, egyéni szintű adminisztratív kutatási adatbázisban hat éven keresztül, havi bontásban követjük nyomon a felsőoktatási pályákat, majd szekvenciaelemzéssel kategorizáljuk őket. Ehhez figyelembe vettük a havi oktatási, a párhuzamos foglalkoztatási és a párhuzamos tanulmányi státuszokat. Az így kapott hallgatói életpálya-kategóriákat az egyének kognitív képességei, iskolai és családi háttere tekintetében is megvizsgáltuk. Végül regressziós becslésekkel vizsgáltuk az egyes pályatípusok korai munkaerő-piaci sikerességét. A kutatás abban a tekintetben egyedülállónak mondható, hogy a régióban nem volt még példa egyének hét éven át tartó oktatási és munkaerő-piaci karrier vizsgálatára, ahogy a felsőoktatási pályafutás és a későbbi munkaerőpiaci sikerek együttes elemzésére sem.

1. Introduction

This study aims to identify the typical career pathways of students in higher education and subsequently examine the early labor market situation, labor mobility and success of the groups associated with different higher education career pathways. The period during which graduates enter the labor market can also be referred to as a transitional or job-shopping phase, depending on the research focus. In the social science literature on labor market transition, the principal focus is on the understanding that the transition from higher education to the labor market is not a one-time event but rather a transitional period in which student and employee statuses may change and overlap, without forming a linear-hierarchical system (Lindberg, 2008). This theoretical framework posits that the statuses of individuals in higher education and the labor market are mutually interactive. The concept of job-shopping suggests that the period following the exit from higher education to the labor market should be treated as an experimental phase, during which new entrants search for the most suitable positions and consequently tend to change jobs frequently. The tracking of academic pathways is based on the concept of transitional theory, which takes into account the simultaneous pursuit of academic and occupational roles. In selecting indicators for the labor market situation, our approach was informed by job-shopping theory. Consequently, the primary focus is on early labor market mobility and the success of different study path groups in the jobs they have obtained.

Although the issues of exit to and career progression in the labor market and return on investment are traditional and well-researched topics in higher education research, the life course approach used in our study offers a new perspective. It provides more detailed and accurate information about the process of exiting education than static, cross-sectional approaches. Furthermore, it allows for the simultaneous investigation of the interactions between education and the labor market over the entire educational life course. The research aims to establish a link between individual wage returns and educational pathways, utilising the patterns of educational pathways and controlling for educational and socio-economic effects, as well as the impact of personal skills, to explain the observed differences in wage returns.

In our research, we rely on a merged dataset comprising data from a range of administrative registers (Admin3). This research design can also be considered novel, as studies using sequence analysis focusing on higher education typically rely on panel data or institutional registers from higher education institutions. The Admin3 database has been cleaned based on the current research criteria, which allows me to identify typical higher education pathways and undertake a detailed analysis of the subsequent labor market situation. The typical student pathway categorisation identified through sequence analysis has yet to be produced in post-socialist countries. To our knowledge, no research has been conducted explicitly focusing on early labor market success involving typical higher education careers. Therefore, the approach is undoubtedly novel. Furthermore, the regression estimates generated in this study are based on competency outcomes and family background data, making our results distinctive in this regard as well.

2. Theoretical background and literature review

The typical approach to analysing students who have left higher education is to examine the labor market returns of their education. This research is grounded in Becker's human capital theory. This approach posits that attaining higher levels of education enhances an individual's productivity, thereby enabling graduates to command higher wages, secure employment more expeditiously, and obtain positions with superior status and more favourable working conditions (Becker, 1962). These studies consider former students' socio-demographic and educational backgrounds and occasionally examine student skills' influence on subsequent wage disparities or employment outcomes. A limitation of cross-sectional graduate tracking studies is that they do not account for the dynamic transformation of higher education structures.

In their 2020 study, Christina Haas and Andreas Hadjar conducted a comprehensive review of sociological research on higher education trajectories. A synthesis of the literature reveals the following principal findings. Most of the research was conducted in the United States, where the expansion of higher education commenced at an earlier stage and where higher education institutions, as economic entities, continuously monitor their own activities. A significant area of research has been examining decision-making theories, with a specific focus on analysing student choices through cost-benefit analyses. This incorporates a range of factors, including social status and the process of institutional integration. Another research area focused on students from disadvantaged backgrounds, with studies indicating that students from lower socio-economic backgrounds tend to have more fragmented and less linear academic trajectories. The research examining gender differences has revealed that women are more likely to choose continuous and more successful educational pathways. However, it is important to note that these effects can also be attributed to preferences for specific fields of study. It is evident that a significant amount of cross-sectional data is available on higher education, particularly regarding access, entry, and exit. However, longitudinal career path studies focusing on larger trajectories have been relatively scarce.

From an individual's life course perspective, higher education represents the concluding phase of their educational trajectory and a pivotal point of departure for their future career path. This trajectory is inextricably linked to broader life course domains, including family formation and health status (Haas, 2024; Hout, 2012; Vila, 2000). Consequently, examining higher education pathways is a crucial element in comprehending subsequent labor market outcomes.

The navigable higher education trajectory is structurally embedded within the higher education system of a given country at the macro level. Its Meso-level components include institutional and departmental rules and opportunities, such as incentive systems (e.g. various scholarships or tuition fees payable after exceeding the standard study period, see Appendix 1), followed by micro-level factors, such as the characteristics of different programmes (work schedule, programme duration, requirements, etc.). In addition, students make decisions about their

studies based on their labor market expectations, sometimes influenced by direct labor market impacts. This could include studying while working, the demand for transferable skills, or education pathways designed according to employer preferences (such as dual education programmes, which are explicitly designed in this manner). Students' characteristics – such as socioeconomic background, contextual knowledge, and skills, knowledge, and abilities – also impact their career paths. Furthermore, unforeseen personal life events can influence or alter the career trajectory of specific students.

The formation of a higher education trajectory commences before enrolment when prospective students determine the specific subject area, institution, and mode of study that aligns with their academic goals. After the initial enrollment decision, students are required to make a multitude of choices that ultimately determine the trajectory of their educational careers. They may elect to continue their studies by their initial decision or alternatively, modify their previous choice by switching to a different programme, modifying the number of courses they undertake, or extending the duration of their studies beyond the standard timeframe. Interruptions in studies ("stop-out" periods) and modifications of initial choices, such as changing the university or work schedule while staying in the same programme, are common. Consequently, changes to academic trajectories are not confined to conventional timeframes (Haas, 2022).

A wide range of opportunities is beneficial as it allows for flexible adaptation to unforeseen circumstances and labor market opportunities. Furthermore, the increasing flexibility of educational structures and the emergence of part-time and distance learning options have contributed to the growth of atypical student groups (Schuetze and Slowey, 2002). These students differ in age, gender, family background, work history, and origin (Clancy and Goastellec, 2007). This process occurred in Hungary following the political transition, during the 1990s and 2000s. However, this also presents a challenge in interpreting and utilising predetermined milestones in research (Haas, 2022). In OECD countries, only 39% of full-time students graduate within the prescribed standard study period, whereas three years later, this figure rises to 67% (OECD, 2019). The variability of academic trajectories, including duration, timing, and unexpected changes, provides compelling justification for a holistic approach to the study of educational pathways. The integration of a life-course perspective with return-on-investment studies enhances the relevance of the findings. Consequently, these outcomes can inform higher education policy-making and institutional strategies and may also influence student strategies.

3. Sequence Analysis in Social Sciences

The methodology employed to identify patterns in higher education trajectories is founded upon the comparison of individual sequences in their entirety. This approach has its roots in molecular biology, where it was initially deployed to examine the protein structures of DNA and RNA molecules (Abbott & Tsay, 2000). The dissemination of these applications in the social sciences has been facilitated by technological advancements in data analysis, as well as changes in data availability and abundance. The life-course approach was initially deployed in the social sciences during the second half of the 20th century, with a focus on the analysis of

temporal phenomena (Abbott, 1995). The advent of more sophisticated computing resources and the pervasive utilisation of longitudinal data have facilitated the temporal study of social processes. The methodology was initially deployed in demographic research, with a specific emphasis on the examination of patterns associated with distinct life stages. This included the identification of observable patterns during the transition to adulthood (Aassve, Billari and Piccarreta, 2007; Billari and Liefbroer, 2010). In the early 2000s, the limitations of sequence analysis in the social sciences were subjected to criticism, which in turn prompted the development of new methodological tools that facilitated further advancements in the method (Aisenbrey & Fasang, 2010). The field continues to evolve, with progress being made in both methodological and application areas. Research is primarily focused on studying career paths and transitions rather than static states. Typical applications of the approach include the identification of patterns in career trajectories and life stages.

In her 2022 literature review, Haas provides a comprehensive overview of research in the field of higher education that employs sequence analysis. Wallace (2016) investigated the extension of study duration through the lens of higher education life course patterns. Sánchez-Gelabert (2021) focused on the dropout risk for traditional and non-traditional students, constructing academic trajectories for university students in a Spanish region, and distinguishing the effects of distance learning and traditional in-person education. In the United States, the extensive range of study options and the relatively unstandardised transitions between education and employment have rendered sequence analysis a particularly crucial instrument in the field of higher education research. Monaghan (2020) employed a trajectory-based approach to examine the higher education experiences of an American cohort between the ages of 18 and 39. This method identified four primary trajectory types: fast finishers, marginal students, lifelong learners, and delayed finishers. Subsequently, these trajectories were linked to their subsequent labor market and family formation patterns. The findings indicated that the fast graduates constituted the most typical group, exhibiting the most consistent patterns in terms of both employment and family trajectories. In contrast, the other types demonstrated more fragmented patterns across all domains. Similarly, Boylan (2020) also examined a sample of American students over a period of 107 months, identifying six distinct post-secondary trajectories, which were found to be correlated with the students' social background. Based on her findings, the individual social background and ethnicity of students within the same cohort exerted a strong influence on the observed patterns in their academic life courses. In a study published in 2024, Haas and Hadjar examined the relationship between career trajectories and family background using American and German panel data. The findings indicate that in the USA, higher education pathways are more fragmented for students from disadvantaged backgrounds. In both countries, academic trajectories differ according to the type of higher education institution. A particular area of higher education with an emphasis on academic careers has employed this methodology, frequently combining sequence analysis with network methods (Benz, Bühlmann, and Mach, 2021; Rossier, 2020; Korom, 2020).

4. Data

For the analysis a uniquely detailed administrative database (Admin3) was used created by the HUN-REN CERS Databank (Sebők, 2019). The database contains linked administrative data

from 2003 to 2017 on about half of the Hungarian population in 2003 on a mothly basis. The wide-ranged dataset contains information on education, labor market, transfers (pensions and maternity payments) and healthcare. In addition, since 2008, the database can be linked to the family background index and the 10th-grade competency scores from the National Assessment of Basic Competencies (NABC). In this unique way, we can examine in detail the higher education pathway, taking into account family background, 10th-grade competency scores and later labour market position.

The creation of the database was preceded by extensive cleaning, as the administrative data had been recorded for purposes other than research. This significant task was carried out by the staff of the CERS Databank over several years before the database became suitable for research purposes. The cleaning of the higher education dataset and the processing of the data to fit research questions involved the following steps: we filtered the research database to create our subsample, the details of which are provided in the next section. We excluded programmes that lasted less than 4 months. We compared different qualification statuses and kept only those cases that displayed them in a plausible order. Additionally, we filtered out programmes with more than two consecutive semesters of passive status. We deleted entries with a "missing" status. We imputed the missing months between the two programmes with the values of the statuses before or after them. The same procedure was applied to parallel programmes and their status months. The steps outlined above only cover the initial data work. Overall, the research was preceded by significant database work that required many transformations. This study focuses on individuals who enrolled in Bachelor's (BA) courses in 2010 with no prior tertiary education and were enrolled in a single course at the beginning of the observation period. Since we wanted to examine those for whom a complete educational history was available, we excluded individuals who were under the age of 18 or over the age of 21 in 2010. The objective of the sequence analysis is to track the study pathway of this population with monthly statuses between 2010 and 2016. Subsequently, the labor market outcomes of students from different educational pathway categories will be examined in October 2017.

5. Methods and variables

The study is divided into two main methodological units. In the first, we use sequence analysis to identify the groups of the training pathways. In the second, we use regression analysis to examine the returns to training pathways.

The outcome variables in the second part of the analysis were wages and probability of employment using different regression models. We are examining employment using a probit model, and then explaining income differences with linear regression. In the regression analysis, independent variables included *gender* as a dummy (0/1) variable, with women defined as the reference category. The categorical variable of *fields of study* was transformed into a dummy variables. In the multinomial regression, the reference group was chosen to be the nature science field, as it is positioned at the average of the fields of study according to all examined aspects. In the regressions analyzing labor market success, the reference group was

the agricultural field. The arts, arts communication, and religious studies fields were not included in the analysis as they had small sample sizes.

In the *work experience* variable, we summed the months during which the students had employment status within the observation period. Those with no work experience were excluded from the wage regression (they accounted for 2.7% of the population). For better interpretability, the months were converted into years. The variable was included in the regression equations in squared form.

The number of distinct ISCO codes between September 2010 and December 2016 was aggregated in the *occupational changes* variable. A missing value was assigned for cases where no occupation code was recorded. In the regression equations, the variable was squared.
The reference group in the *private sector* dummy variable consisted of public sector employees.

The *family background index* is derived from the responses to the 2008 parental questionnaire of the 10th-grade Hungarian National Assessment of Basic Competencies (NABC). At that time, the population under consideration consisted of 16-17-year-olds. The index was used in a standardised form in the estimates. Students with better backgrounds have higher index values.

The *results of the mathematics and reading comprehension competency test*s, which were also recorded at the NABC in 2008, were included in the regression models in standardised form. The test points were derived from 10th-grade students, who were 16-17 years old at the time. Prior research has incorporated the test results into the model as a proxy variable for individual skills (Hermann et al., 2019).

The *wage* variable includes the total income reported by individuals to the tax authority. During the cleaning process, the top and bottom one percent of the cases were removed. The natural logarithm of the *wage* variable is used in the wage equations.

The *institution type* variable comprises categories of Hungarian higher education institutions. These have been classified according to whether they are state, private, or church-affiliated institutions, as well as according to their size and the diversity of their educational portfolio. In the regression estimates, the variable is included in the form of a dummy variable. We removed institutions with a sample size smaller than 25.

The *university in the capital* dummy variable refers to the location of the university. The reference group consisted of universities located outside of Budapest. The relevance of this category is derived from the fact that Hungary has a single city with a population exceeding one million, namely Budapest. This city is the seat of the majority of higher education institutions. In other towns, including the larger cities, only a single institution is located.

The *full-time training* variable refers to the type of study, with the reference category being the group of students in atypical training (distance, part-time training etc.).

The dummy variable *another diploma* refers to individuals who graduated from a different programme, distinct from the Bachelor's programme initiated in 2010, between September 2010 and October 2017. This could encompass a Master's degree or a Bachelor's degree from a programme disparate from the one utilised as the basis for inclusion in the sample. The

reference group is constituted by the category of individuals who did not obtain a diploma in any alternative programmes.

6. Results

6.1. Higher educational career paths

In the following, we aim to detect Hungarian higher education students' typical educational and labor market career paths using sequence analysis.

The first step in the process was to create monthly status sequences at the individual level between October 2010 and December 2016. In the prepared dataset, one study state is assigned to each person's month. In establishing the monthly status categories, it was important to ensure that they were mutually exclusive and exhaustive. Furthermore, sufficiently simple educational statuses were recorded to allow for a clear interpretation of the groupings that were subsequently created. In total, 10 states are considered. The defined statuses considered the baseline to be active undergraduate studies. The status was modified only if the student became inactive, obtained a certificate of completion, or dropped out of the programme. In the case of a passive semester, the participants were divided into distinct groups based on their circumstances. These groups were distinguished according to whether they had a parallel programme, were working with a diploma obtained from another training programme, or were without one. Additionally, we separated those who were not working while being in a passive main programme. It was determined that, by utilising the available database, it would not be beyond the scope of the methodology to include the drop-out group's employment data after graduation and categorise the graduates into NEET (Not in Education, Employment, or Training) and employed groups. In this breakdown, the cases were further divided based on whether or not they had obtained a degree from another programme. If a student successfully obtained a certificate of completion, they were categorised as a successful graduate until the end of the observation period.

The sequence analysis was performed on an individual-level time series, covering the period from September 2010 to December 2016. The procedure computes the distance matrix for each pair of student paths (sequences). Several parameterization methods can be used to calculate the matrix. Since the duration of academic statuses was identified as the most important aspect of our research question, we decided to use the EUCLID procedure after testing several methods. This approach is based on the longitudinal state distribution within each sequence. The sequence's dissimilarity is measured by the Euclidean distance between the distribution vectors (Studer-Ritschard, 2014). Furthermore, our decision was informed by the studies presented by Studer-Ritschard (2014, 2016), which illustrate the use of simulations. Subsequently, the sequence analysis utilises hierarchical clustering to generate groupings.

Figure 1. Sequence percentage point plots of five trajectory clusters
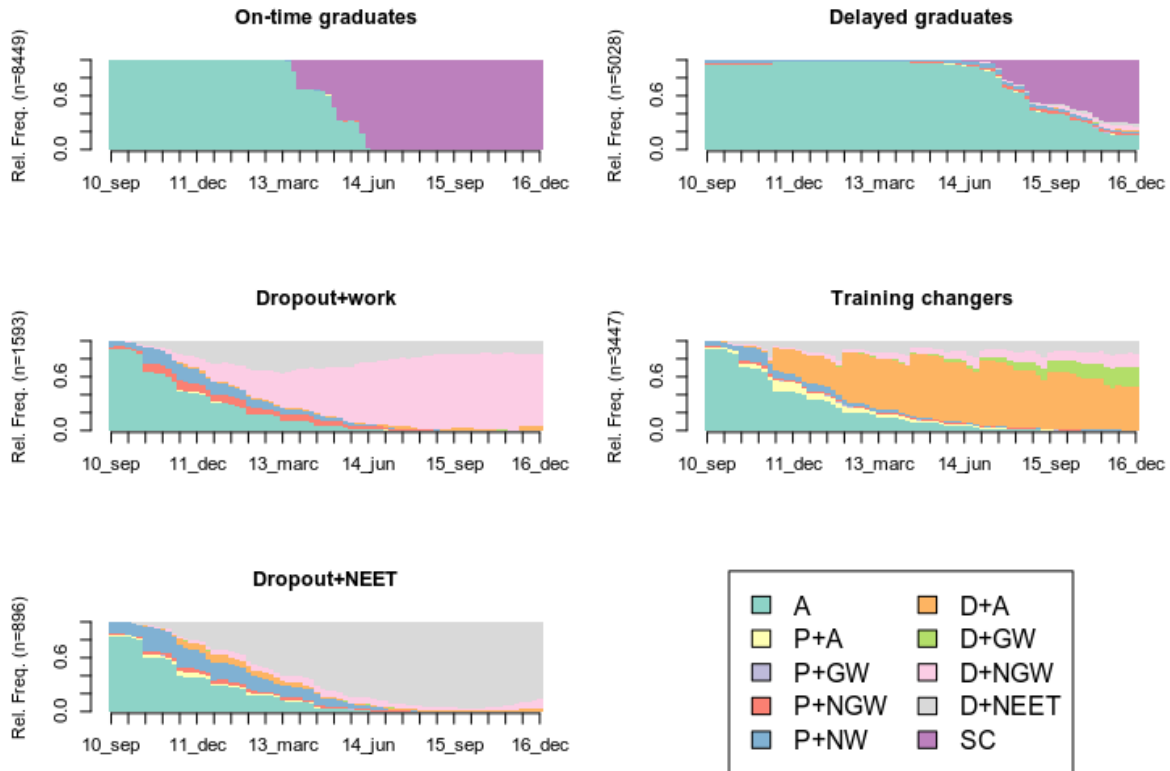
A	Active in the main training
P+A	Passive on main training, active on other training
P+GW	Passive, working with another diploma
P+NGW	Passive, working without a diploma
P+NW	Passive, not working
D+A	Dropout, active on other training
D+GW	Dropout, working with another diploma
D+NGW	Dropout, working without a diploma
D+NEET	Dropout NEET
SC	Successful Completion

The first category includes students who reached their graduation on time, or with only a slight delay, within 4 years. They make up 44% of our sample. Students are designated "graduate" upon attaining their "abszolutórium," a certificate confirming the completion of their studies. The "abszolutórium" is awarded upon the fulfilment of all academic requirements and the submission of the thesis. During the observation period, this did not automatically equate to

obtaining a degree in Hungary, unless the student had completed the requisite language examination and final examination for the specific degree. The date of the "abszolutórium" was selected as the point of graduation because, at that time in Hungary, a considerable number of students did not graduate as a result of the lack of a language exam. However, the conferral of an "abszolutórium" meant that students were already considered to be near-graduates in the labor market.

The second trajectory group represents 26% of the student sample. This group consists of students who graduated but were primarily active during the initial phase, with only a few months of inactivity within their main programme. These students completed their degrees after October 2014, which is why they are best described as "delayed graduates."

The third group comprises 8% of the student sample. These students typically gradually enter the labor market, having not yet completed their degree. Subsequently, they engage in employment, although there are instances where they are observed to be unemployed or commencing new programmes. The career trajectories of this group are the most fragmented. The group has the highest average number of sub-sequences, as well as the highest complexity.

The fourth group, which consists of 18% of the student sample, typically includes those who change their programme of study within four years of commencing their main programme of study. Subsequently, they either obtain a degree in the other training or endeavour to gain employment without one.

The fifth group consists of 5% of the students who leave their programme early and, following that, are typically not observed in the labor market. One possible reason for this is that they are not employed, or they may have relocated abroad, which is why they are not registered in Hungarian records. This hypothesis is supported by the fact that members of this group complete their programmes early and do not extend their studies.

We present the background of typical higher education career paths using multinomial logit regression (Table 1). The marginal effects show how a one-unit positive change in the dependent variable affects the probability of the given outcome category relative to the reference category. We merged the two drop-out groups in the regression presenting the types, due to the low sample size of the NEET group.

Table 1. Multinomial regression - dependent variable: categories of higher educational trajectory types, marginal effects

	On-time graduates	Delayed graduates	Training changers	Drop-out
Man	-0.1440***	0.0570***	0.0521***	0.0350***
Nature science	0	0	0	0

Humanities	0.2581***	-0.0734***	-0.1446***	-0.0401*
Social studies	0.2663***	-0.0636**	-0.1623***	-0.0404*
Information technology	-0.1730***	0.1028***	0.0383	0.0319
Law	-0.3509***	0.5800***	-0.1394***	-0.0898***
Public administration	0.3591***	-0.0858**	-0.1944***	-0.0789***
Economics	0.1694***	0.0011	-0.1326***	-0.0379*
Technology	-0.0431	0.1530***	-0.0757**	-0.0342*
Medicine and healthcare	-0.1715***	0.3773***	-0.1489***	-0.0568**
Teacher training	0.2859***	-0.0766**	-0.1580***	-0.0514*
Sport science	0.2008***	-0.0366	-0.1255***	-0.0388
Agriculture	0.1436***	0.0526	-0.1393***	-0.0569**
Universities with a broad portfolio	0	0	0	0
Universities of applied sciences	-0.0715***	0.0670***	-0.0049	0.0095
Private universities	0.0654	-0.0357	-0.0402	0.0105
Church-affiliated universities	-0.0305	0.0302	-0.0127	0.013
Specialised universities	-0.0037	0.0062	0.0099	-0.0124
University in the capital	-0.0285*	0.0279*	0.0149	-0.0143
Full-time training	0.0549	0.1189*	-0.0614	-0.1125***
Family background	-0.0184**	0.0106	.0279***	-0.0201***
Mathematics comprehension competency results	0.0353***	0.004	-.0260***	-0.0133**
Reading comprehension competency results	0.0239***	-0.0073	0.0029	-0.0195***
N	6616			

The probability of women completing their training on time is 14.4% higher than men. It is more common for men to exceed the standard study duration; however, they are also more likely to fall into other life course categories. In terms of fields of study, it is apparent that delayed graduation is more common in STEM (Science, Technology, Engineering and Mathematics) fields than on-time graduation. Moreover, these graduates are more likely to be classified as dropouts. Regarding the type of higher education institution, it appears that on-time graduation is more typical at private universities than at other institutions. This is an unsurprising outcome, given that this is the sole institution category where students are obliged to pay for all programmes, thereby providing an incentive for them to complete their studies as expeditiously as possible. A greater tendency to change fields of study is observed among students at specialized, large universities, while dropout rates are lower. On-time graduation is less common in capital city institutions, but delayed graduation is more likely than at universities in other cities. Students enrolled in atypical programs are 11.3% more likely to drop out than their peers in full-time programs and 6% more likely to switch programs.

Students from better family backgrounds are less likely to graduate on time than those with more limited opportunities. Additionally, better family circumstances provide relative protection against drop-out and make it easier to switch fields of study. It has been demonstrated that students who possess stronger mathematical and reading comprehension skills are more likely to graduate on time and less likely to drop out of higher education. Conversely, students with lower-level mathematical skills are more likely to change their training.

6.2. Early labor market success and career paths

This study also aims to examine the labor market return on higher education student career paths, which represents a significant area of enquiry. The following section presents an analysis of the labor market situation of the student life paths previously discussed as of October 2017. Among the created student categories, the training changer group is excluded from the analysis as its members are numerous in higher education and would distort the estimates. Additionally, since NEET students are typically not visible in Hungarian registers, it is assumed that the majority of them moved abroad during this period. Some of the individuals in question may reside in Hungary and are neither engaged in employment nor pursuing academic studies. However, as these two groups cannot be distinguished, they have been excluded from the analysis, thus ensuring the accuracy of the results. To ensure the accuracy of the results, we also have filtered out those who were active students or trainees in any programme in October 2017, and those engaged in public work have not been considered employed.

The marginal effects of the probit model explaining probability of employment (Table 2) demonstrate that men are markedly more likely to be employed (with a 4.6% increase). Regarding higher education career paths, it is evident that there is a significant difference in employment outcomes between on-time graduates and delayed graduates. Delayed graduates are 3.5% more likely to be employed during observation. However, individuals who drop out of their studies are 4.9% less likely to obtain employment than those who graduate on time. Ex-students from the sports science field are less likely to be employed than graduates from the agriculture field. Students in information technology, law, technology, medicine, and healthcare are significantly more likely to be employed later than students in agriculture. The probability of employment rises with lengthier professional experience and the number of occupational changes. Having another diploma significantly increases the likelihood of later employment by 11.3%.

Table 2. Probit model explaining probability of employment

	Average Marginal Effects b/se
man	0.046***
	(0.009)
on-time graduates	0
	(.)

delayed graduates	0.035***
	(0.010)
drop-out	-0.049***
	(0.014)
agriculture	0
	(.)
humanities	-0.012
	(0.025)
social studies	-0.034
	(0.026)
information technology	0.049*
	(0.024)
law	0.067**
	(0.025)
public administration	-0.010
	(0.035)
economics	0.005
	(0.022)
technology	0.059**
	(0.021)
medicine and healthcare	0.083***
	(0.022)
teacher training	-0.035
	(0.031)
sport science	-0.084*
	(0.043)
nature science	0.041
	(0.024)
occupational changes	0.003**
	(0.001
working experience	0.013***
	(0.001)
another diploma	0.113***
	(0.010)
N	6348

One of the most crucial indicators of the labor market returns on a student's investment in higher education is the remuneration offered by the labor market in exchange for the knowledge gained. In the wage regression that explains the earnings gap, only non-students who were employed at the time of the labor market success test in October 2017 were included (Table 3). The earnings advantage of men appears to increase when controlling for higher education categories, as they are more likely than women to attend STEM courses, where delayed degree attainment is more common. However, when all other factors are controlled for, the earnings advantage of men drops to only 13.7% in the early graduation period.

Table 3. Regression explaining wage differentials in October 2017

	1	2	3	4	5	6	7
man	0.197***	0.233***	0.236***	0.238***	0.153***	0.155***	0.137***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.020)	(0.020)	(0.021)
delayed		-0.104***	-0.0982***	-0.091***	-0.127***	-0.126***	-0.052*
graduates		(0.020)	(0.021)	(0.021)	(0.022)	(0.022)	(0.023)
drop-out		-0.243***	-0.243***	-0.241***	-0.275***	-0.275***	-0.265***

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		(0.027)	(0.027)	(0.027)	(0.026)	(0.026)	(0.0260)
occupational changes		0.004*	0.003	0.003	0.003	0.004*	
		(0.002)	(0.002)	(0.002)	(0.002)	(0.00178)	
working experience				0.003**	0.003**	0.003**	0.006***
				(0.001)	(0.001)	(0.001)	(0.001)
humanities					0.071	0.068	0.066
					(0.048)	(0.048)	(0.048)
social studies					-0.040	-0.043	-0.029
					(0.050)	(0.050)	(0.049)
information technology					0.322***	0.332***	0.317***
					(0.050)	(0.050)	(0.049)
law					0.167**	0.148**	0.127*
					(0.057)	(0.057)	(0.057)
public administration					0.228***	0.190**	0.177**
					(0.062)	(0.063)	(0.062)
economics					0.294***	0.305***	0.281***
					(0.043)	(0.043)	(0.042)
technology					0.353***	0.362***	0.329***
					(0.043)	(0.043)	(0.042)
medicine and healthcare					0.146**	0.108*	0.100*
					(0.049)	(0.050)	(0.049)
teacher training					-0.069	-0.103	-0.032
					(0.058)	(0.058)	(0.058)
sport science					-0.102	-0.109	-0.065
					(0.079)	(0.079)	(0.078)
nature science					0.091	0.091	0.082
					(0.050)	(0.050)	(0.050)
private sector						-0.083***	-0.083***
						(0.024)	(0.024)
family background							0.0164
							(0.009)
mathematics competency results							0.049***
							(0.012)
reading comprehension competency results							0.032**
							(0.011)
another diploma							0.150***
							(0.021)
Constant	12.43***	12.48***	12.46***	12.44***	12.29***	12.36***	12.27***
	(0.012)	(0.013)	(0.017)	(0.019)	(0.041)	(0.046)	(0.047)
Observations	4007	4007	4007	4007	4007	4007	4007
Adjusted R^2	0.029	0.050	0.051	0.052	0.106	0.109	0.139

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results demonstrate that career path types exert a considerable influence on wages. On average, graduates who delay their graduation earn 5% less than those who graduate on time. This result is observed despite controlling for the effects of professional experience, family background, and competencies in the estimation. The group of students who did not complete their studies earned, on average, 27% less than those who graduated on time. Furthermore, longer professional experience and more frequent job changes have been found to increase

wages. Graduates from the fields of information technology, technology, law, economics, medicine and healthcare, and public administration earn significantly more than graduates from the agriculture field. The positive effect of family background on income is not evident in the model, as it is already accounted for in the other control variables. Furthermore, individuals with higher mathematics and reading comprehension scores have also been observed to earn higher wages.

7. Conclusions

Our research aimed to track the higher education trajectories of young Hungarian people who began their undergraduate studies in 2010 for six years, after which we examined their subsequent labor market success. This was achieved using an individual-level, anonymous database that integrated data from a multitude of registers, thus providing a rich dataset (Admin3). Sequence analysis was employed to identify typical student career paths, with the categories of delayed graduates, training changers, non-working dropouts and working dropouts being established. A total of 44% of students obtained their degree within four years, with a further 26% graduating within the following two years. An analysis of the composition of students in different types of educational pathways yielded intriguing results. The findings revealed that male students were less likely to be classified as on-time graduates. However, they were more likely to be included in other categories, even after controlling for educational effects, than their female counterparts. The probability of delayed graduation and dropout was higher among students in STEM fields than in other fields. Most students in private institutions and those attending higher education institutions outside of the capital graduated on time. In Budapest, delayed graduation and programme switching were more prevalent life course trajectories. Students enrolled in full-time programmes were less likely to drop out than those enrolled in atypical programmes. The analysis of family background revealed that students from more advantageous circumstances are more likely to switch programmes and are less likely to drop out. Furthermore, these students are more financially able to delay graduation, which results in a lower proportion of students graduating on time. In contrast with the findings of previous studies, our analysis revealed that students from more privileged backgrounds are more likely to pursue a fragmented educational trajectory when compared to their less advantaged peers after controlling for a range of factors, including cognitive skills, socio-demographic characteristics, academic background and family background. This can be attributed to superior financial circumstances, as they can accommodate the income loss associated with delayed graduation and the extended funding of their student status. The same pattern is evident in students who switch programmes, as they can extend their time in higher education when embarking on a new programme. Students with stronger cognitive skills typically complete their studies on time and are less likely to drop out. It can also be posited that lower mathematics skills are a contributing factor to programme switching, which suggests that it is more challenging to accumulate credits in mathematics-based courses and that when students switch programmes, they engage in competency-based career development, in line with transition theory.

The analysis of labor market success is conducted following the observation of educational data in the seventh year after the commencement of training. Delayed graduates were 3.5%

more likely, and drop-out group members were 4.9% less likely to be employed during the observation period compared to their on-time graduating peers. It can be observed that an increase in the length of work experience is associated with an enhanced probability of employability during the job-shopping period. Furthermore, our findings indicate that individuals who demonstrate greater occupational mobility are more likely to be employed and receive higher wages. Therefore, the occupational changes experienced by young graduates can be defined as stepping stones towards positions that better match their skills and aspirations.

A study of earnings tests revealed that delayed graduates earned 5% less and drop-outs earned 27% less than on-time graduates. The superior earnings of on-time graduates may be attributed to the fact that, for employers, the efficient timing of study completion signals persistent and committed potential employees. This aspect can significantly impact the labor market situation in the early stages of their careers. This hypothesis is supported by the fact that the effect of work experience was controlled for in the model that was used to examine this issue.

The utilisation of sequence analysis to study higher education trajectories and the resulting categories provides a novel perspective on research focused on higher education success. Based on our findings, in models controlled for many relevant factors, the educational pathways still have a significant effect, indicating that the higher education trajectory captures information that traditional studies on higher education success have previously overlooked. These are individual decisions and strategies, as well as unforeseen life events that cannot be tracked through registers. However, they leave a discernible imprint on the life course.

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Appendix

Appendix 1. - The Hungarian Higher Education System

Hungary joined the Bologna Process in 2006, which aimed to harmonize and modernize European higher education. With the introduction of the Bologna System, the Hungarian higher education system was restructured into three main levels. A bachelor's degree (BA/BSc) typically takes 3-4 years to complete, after which students have the option to enter the workforce or continue their studies in a master's programme. For most fields of study, the bachelor's degree represents the first level of higher education. The master's program (MA/MSc) usually lasts 1-2 years and is intended to deepen students' professional and academic knowledge. Participating in a master's program allows students to obtain a higher level of qualification, making them more competitive in the job market. The doctoral program (PhD) lasts 3-4 years and is research-based, focusing on continuing scientific research and acquiring new knowledge. PhD students work closely with research institutions and universities.

The goal of introducing the Bologna system was to harmonize diploma recognition, increase mobility, and improve international recognition. Hungarian universities were given the opportunity to make their academic programmes more competitive both within Europe and internationally while making diplomas more easily transferable to other countries' education systems.