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## WHAT ABOUT MY FUTURE CAREER AFTER THE PANDEMIC? SARS-COV-2 AND DISTANCE LEARNING IN THE EVALUATION OF FUTURE PROFESSIONAL OPPORTUNITIES

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**ABSTRACT.** In this article we present the results of a survey among 556 Polish university students, conducted in the summer of 2020 using an online CAWI survey questionnaire method. We investigated whether the students perceived that the transition to distance learning during the pandemic period had changed their future career prospects. The survey shows a distinct influence of the university (and its support) and the course of study on the students' assessment of their career prospects. In addition, the results of exploratory factor analysis, multiple linear regression, and logistic regression indicate that attractive and engaging distance learning bolsters the students' belief in their perceived value on the labor market. Notably, the students perceived the pandemic as an important structural factor that went beyond individual biographies. The students' assessment of how the pandemic is changing the economy was an important predictor of how they perceived their chances on the job market.

**Keywords:** pandemic, SARS-CoV-2, students, distance learning, higher education, career prospects

### Introduction

The COVID-19 pandemic has caused a series of direct and indirect consequences in social life around the world. Some of these problems are local, others more global; one of the latter is the transition from the common mode of face-to-face education to online learning during lockdowns. Remote education, especially at the university level, can have many consequences for future careers, as shown by numerous studies on careers, choices of particular career paths, and commitment to the implementation of the various stages of a career during the pandemic (Dickinson, Miller, & Beeson, 2021; Patel et al., 2020; Kinsky, Merle, & Freberg, 2021). We know from previous analyses that often the mental and physical health problems of

students and staff who have switched to online learning are not being addressed quickly or well enough. These health issues can even deteriorate after lockdowns as a result of burnout among health workers and the subsequent inadequacy of the health-care system (Çalışkan & Kargın, 2021).

The negative effects of social distancing have also been analyzed by psychologists and psychiatrists (Both et al., 2021). An Italian study has revealed that those most vulnerable to the depressive effects of the pandemic are women, young adults, single people, those with low socioeconomic status, those unable to go to work outside the home, and those whose family members had Covid (Delmastro & Zamariola, 2020). The stress and austerity associated with the pandemic can take a particularly negative toll on young people's mental health, which can reduce their chances for academic success and career prospects. A survey among British university students showed high levels of anxiety and depressive moods in more than half of the 1173 respondents. It also identified low levels of resilience, which the authors attributed to isolation that reduced their ability to engage in coping strategies. Higher rates of perceived stress were correlated with less time spent exercising, more frequent smoking, and concerns about financial well-being, among other factors (Chen & Lucock, 2022). A study among students in Saudi Arabia during the Covid pandemic showed that psychological problems were common in that country, especially among those whose friends or family members had contracted the virus or who had died as a result (Mohammed et al., 2021). Those who watched or read information about the pandemic for more than two hours a day and those who did not receive emotional support from family, universities, and wider society, were also at risk. Thus, the special role of the university becomes apparent here. Some researchers compare the pandemic to war, especially for those in the medical profession. The pandemic, and especially potential subsequent waves, could cause an exodus of medical workers and a drain that may impair access to health care for generations to come (Hall, 2021).

Studies of remote work prove that working from home is more mentally challenging than working with other people (Traunmüller, Stefitz, Gaisbachgrabner & Schwerdtfeger, 2020; Riaz, Abid & Bano, 2021). Participation in a group is always an important form of support – an affirmation of one's social value, proof of acceptance by others, and the meaningfulness of one's choices (others do what I do, are in the same space, engage in the same activity). The lack of students studying together must have raised a number of questions and doubts about the very meaning of studying as well. The limits on social contacts, resulting in going beyond routine forms of reproducing the social world, must have resulted in re-imagining of the world and the students' role in it. The new remote learning reality must also have had an impact on their preparation for exams and earning credits. The very realization that it would be possible to use a computer and Internet resources during a test was a significant demotivator. The learning process was also affected by "infrastructural" difficulties such as the lack of access to a private space to participate in the class in silence, or even to a working laptop. Observations made in the course of remote contact with students and the growing number of studies inspired us to further scientific analysis. In the quantitative research we undertook, we sought to capture the impact of the new pandemic situation, and of remote learning in particular, on the perceptions of career opportunities among students. Is the pandemic a source of concern (and for whom) regarding the development of their careers? What is the role of universities in offsetting these concerns? What is the role of social support and study conditions on the assessment of career opportunities? These were the key questions guiding our quantitative research.

## 1. Literature review

The pandemic has affected the perception of life for a huge number of people around the world, especially among those who had already had a low sense of agency (Riemann & Schütze, 1984). Global upheavals such as wars spanning several continents or natural disasters always leave their mark on individual biographies. This time it was the SARS-CoV-2 pandemic that became a force largely beyond our individual, collective, and institutional control. The subjective and objective loss of control may exacerbate the problem of precarization which affected many people even before the pandemic. Precarization and the pandemic are accompanied by similar defense mechanisms aimed at maintaining the belief in causality (adaptation-influence strategies). Polish sociologists have written about “biographical work” in the process of coping with precarization (Burski, Mrozowicki, Drabina-Rózewicz & Krasowska, 2022). Australian researchers have shown how pandemonium contributes to precarization (Cook, Threadgold, Farrugia & Coffey, 2021). Some studies further indicate that women in particular, both those working outside the home and at home, have suffered from the lockdowns (Sharma, Ukey, Rathod & Ughade, 2021). The different perspectives of pandemic research are linked by cross-cutting issues such as work, education, economic position, mental condition, and also gender and age.

### *1.1. The glories and shadows of remote learning*

Remote learning suddenly became a common practice for both academics and students during the COVID-19 pandemic. In many countries – and at many universities – this was a real revolution. Such a major change raised concerns about the effectiveness of the new approach among students as well as teachers, parents, and the authorities responsible for organizing education. It included students’ concerns about their future chances on the job market. Some scientific reports deal with the effectiveness of various forms of online education introduced as a substitute for the traditional mode of education. Randy D’Amico et al. (2021) obtained evaluations of a series of webinars on neurosurgery. Nearly 87% of the surveyed participants rated this form of continuing education as helpful in replacing missed opportunities, an effective method of expanding access to careers in medicine. The authors also emphasize that in fields such as neurosurgery, certain populations/nations are underrepresented. Online dissemination of medical knowledge may help level the playing field for access to expertise and can increase diversity in such circles (one of few positive effects of the pandemic in terms of social equality). Other advantages of the sudden and often forced shift to remote learning are presented by Leann Kaiser and Kelly McKenna (2021) who point out that despite the initial difficulties, the new mode of education eventually yielded positive results, with adult educators being able to improve their teaching skills, diversifying and enriching them. These changes persisted regardless of whether they returned to face-to-face teaching or stayed with online education.

The benefits of switching to remote learning did not come without costs, including mental health. A Canadian survey among first-year engineering students on remote learning during the pandemic pointed to its positive as well as negative aspects. Most of the students were afraid of the unknown, with the main motif of their responses being their mental condition. The researchers’ recommendations for teachers included the need to foster communication, cooperation, and engagement among university students (Howcroft & Mercer, 2022). The mental condition of university students in pandemic conditions has been studied in many countries on several continents (Ghazavy et al., 2021; Wathelet et al., 2020; Woltmenr et al., 2021; Moy & Ng, 2021; Sundaray, Sarangi & Patra, 2021). They show that young people may have to modify their career plans because of the disruption caused by the pandemic. Scientists

who have studied nursing students report problems with mental health and with sleep (Mulyadi et al., 2021). Other studies also report insomnia and symptoms of anxiety and depression (Babb, Rufino & Johnson, 2022; Amran, 2022; Srinivasan et al., 2021). Provision of psychological support for university students has also been advocated by researchers in Ethiopia (Woday Tadesse, Mihret, Biset & Kassa, 2021), whose regression analysis revealed that the female gender and living in an urban environment were independent predictors of psychological problems among university students in that country (n=408).

Monitoring the aforementioned difficulties is the first step toward solving the problem. In Canada, a mobile app has been used to study the mental state of students (including risks and protective factors), which has so far only helped to collect data (Bogly et al., 2021). Some authors, on the basis of already conducted research, postulate the creation of tools that would support students in the current situation and in the future, should further pandemics occur (e.g. Herbert, El Bolock & Abdennadher, 2021). Thus, the first ideas are emerging on how to support young people whose lifelines have collapsed as a result of a pandemic or forced mass isolation in the world. The authors of a qualitative study of twenty-five Pakistani students show that the anxiety and stress experienced by them in online classes also related to concerns about their future career trajectory, i.e. the chance for professional development (Shahbaz et al., 2021). The researchers called for stress-reduction sessions and mental health assessments to be introduced into online courses so that the situation does not threaten to trigger depression.

### ***1.2. The economy and career during the pandemic***

The SARS-CoV-2 pandemic created uncertainty among entrepreneurs. For example, start-ups founded during the pandemic crisis consisted of fewer people (Kuckertz, 2021). The risk of precarization and the loss of jobs by those who already had the lowest wages also increased (Han & Hart, 2021). However, objective economic difficulties did not always translate directly into the subjective realm of feelings. In New Zealand, a survey among 24 students of tourist services showed that after an initial period of concern about their careers, these students then gained a lot of optimism about their professional prospects. They also showed a lot of determination and commitment to persevere with their profession. They wanted to rebuild the sector so that it would be more resilient to similar challenges in the future (Reichenberger & Raymond, 2021). Thus, in this case, economic difficulties became not so much a cause of collapse or disillusionment for the students, but a source of inspiration and activation.

The question of whether the pandemic will disrupt the planned careers of students who have switched to distance learning has been formulated quite often in academia. A survey of chemistry students in the USA did not notice any major changes in these perspectives. The respondents made only minor adjustments to their plans and, in general, the transition to remote education did not disrupt their projected career paths (Forakis, March & Erdmann, 2020). An article on Chilean teacher candidates suggests that for this type of profession, remote education is desirable and such experience can positively influence future careers in the industry (Sepulveda-Escobar & Morrison, 2020).

However, there are other voices as well. Young scholars specializing in public health describe the difficulties they faced in fulfilling their career plans right after their doctorate (postponed or canceled post-doc scholarships, fellowships) (Pasqual, Avila-Palencia, 2021). Authors who surveyed university students in Asian countries add that the pandemic, in addition to financial difficulties and problems with the transition to online learning, also caused uncertainty about academic achievement and future career prospects (Chinna et al., 2021). The authors of an article presenting the results of a study among New Zealand dentistry students

make a similar statement. They report that the students were more concerned about their career prospects than, for example, their financial situation during the pandemic restrictions (Poma, Al Amri, Tawse-Smith & Ma, 2021). A Canadian study of foreign students found that pandemic-related concerns about their future careers were also associated with impeded or even prevented mobility (Hari, Nardon & Zhang, 2021). The very phenomenon of changes in career paths is also already being recorded and analyzed (Bay et al., 2021).

Awareness of the existing problems is causing some countries to try to implement systemic solutions. Using various social policy tools, they have been trying to stimulate the economy and labor market since the first waves of the pandemic. Some governments are introducing programs to identify and support courses of study that will prepare sought-after professionals and offer graduates a well-paid job immediately after graduation. However, a proposed Australian 'Job-ready Graduate Package' has already been criticized on the grounds that it should be up to young people themselves to choose their careers (Daly, Lewis, 2020). This approach resonates with the expectations of the younger generation. Research on young Poles who have experienced the pandemic before entering the labor market shows that they will be more likely to be interested in the opportunity to develop their hobbies and maintain a work-life balance than in rapid career advancement (Laskowska & Laskowski, 2021).

In this study, which joins the aforementioned discussion, we focus on how young people who have experienced remote learning evaluate it in the context of their future plans and career prospects. We ask them about some of the consequences resulting from changes in daily routines and well-established educational models.

## 2. Methodological approach

The survey was conducted from 14 June to 30 July 2020, a period in which the pandemic clearly affected the operation of universities in Poland. Similar online surveys on the effects of the transition to remote learning have been conducted in other countries among university students (Babacan & Dogru Yuvarlakbas, 2022; Di Malta, Bond, Conroy, Smith & Moller, 2022; Göksu, Ergün, Özkan & Sakız, 2021; Aresteidou & Cross, 2021) and academic teachers (Johnson, Daum & Norris, 2021). Students had to face the completely new phenomenon of widespread participation in online classes, which continued in Poland from the end of March 2020 until the end of the 2020/2021 academic year, i.e., June 2021. It could be assumed that this change would play an important role for:

- social relations of students – particularly relevant here was the lack of what can be called student life, the lack of direct contact with other students and with lecturers,
- organizing life while studying – a change in understanding of what studying is and what one can do while studying at a university (a less time-consuming form of study could have been a motivator to get a job, for example),
- assessment of one's professional situation – functioning in a less predictable situation must have given rise to questions about the value of university education in the new circumstances.

Our quantitative research targeted the following specific research questions: How do students assess the impact of the pandemic on the subsequent (future) course of their careers? How do they evaluate the quality of remote learning? How do they assess the conditions for studying during the pandemic (do they have sufficient infrastructural facilities, have they received social support)? How do they assess the impact of the pandemic on economic development? We conducted research using a sample of 556 students at three different universities: the University of Szczecin, the West Pomeranian University of Technology, and

the West Pomeranian Business School, all in the city of Szczecin, Poland. The survey was conducted using the CAWI technique, which eliminated the need for contact during the pandemic. The three months of remote learning ensured that the students had assimilated information technology to a degree that gave them full freedom to take part in an online survey (so the survey was not problematic for them in terms of computer skills). The surveys were anonymous and voluntary and gave students a chance to voice their opinions on a topic relevant to their lives. The low number of missing data (compare Figure 1. Annex) indicated the high motivation of the respondents and the perceived importance of the issues mentioned in the questionnaire.

The data gaps (black lines) shown in Figure 1 indicate that they are relatively few in number. Three respondents did not answer any of the questions (returned a blank questionnaire – a continuous black line). The remaining students provided at least some answers. A slight concentration of missing data can be seen in the final part of the set, where questions on socio-demographic characteristics (independent variables) were coded. Data gaps for individual variables can be determined by comparing the N values from the tables presented (people who answered the question) to the total respondents – the entire sample consisted of 556 people.

Every effort was made to ensure that students did not find it difficult or cumbersome to complete the survey. Table 1 shows the characteristics of the sample structure.

Table 1. Demographic information of respondents

<b>Gender</b>	<b>n</b>	<b>%</b>
Female	291	52.34
Male	256	46.04
Missing data/Prefer not to say/ Other	9	1.62
<b>Total</b>	<b>556</b>	<b>100</b>
<b>Age</b>	<b>Mean</b>	<b>SD</b>
	22.62	3.41
<b>Fields of study</b>	<b>n</b>	<b>Fields of study (aggregation)</b>
Technical	229	Technical (n=229)
Social Studies	110	
Linguistic studies	91	
Humanistic Studies	57	Non-technical (n=313)
Law, Management, Economics	53	
Medical Sciences	2	
<b>Year of study</b>	<b>n</b>	<b>%</b>
1	192	35.04
2	178	32.48
3	97	17.71
4	58	10.58
5	23	4.20

Source: own research

The data obtained were subjected to multivariate analysis using Statistica and the R programming language. In addition to the descriptive statistics, three main (for this research) analytical techniques were used here:

- Exploratory Factor Analysis (Criteria for determining the number of factors: Kaiser criterion and factor rotation: Varimax raw)
- Multiple Linear Regression. To evaluate the resulting regression model, the dataset was split into training and validation sets (split ratio – 0.7) and machine learning techniques (to evaluate the effectiveness of the model on the test data).
- Logistic regression – also with validation based on the training and validation set.

More detailed information on the analyses performed is presented when discussing the results of the study.

### 3. Conducting research and results

The analyses presented below aimed to create a multivariate regression model to determine the impact of distance learning during the pandemic period and the broader pandemic situation on their own assessment of career development after graduation. The indicated dependent variable *Career* was represented in the survey questionnaire in the form of the statement: *The pandemic will limit my career opportunities*. This was measured on a 7-point scale; higher values, for the variable described indicate greater concern about the negative impact of the pandemic. The object of explanation here, therefore, is the prediction of (occupational) risks arising from the fact of the pandemic. Understanding this phenomenon is important because our vision of the future (optimism – pessimism) impinges on our aspirations and, consequently, on the future real course of professional life. Negative assessment of professional opportunities, defining the situation as difficult, aggravated by the pandemic condition, as well as unpredictable and uncertain, can, for example, limit the entrepreneurship of people entering the labor market. Descriptive statistics for the indicated variable (the *Career*), using the gender grouping variable, are as follows:

- Women – mean 4.18, SE 0.10, SD 1.72, n 287
- Men – mean 3.81, SE 0.12, SD 1.84, n 252
- SE – (standard error), SD – (standard deviation)

The summary shows that women (in the study sample) believed more in the negative impact of the pandemic on their career development. The resulting difference was statistically significant – a nonparametric (due to non-normal distributed population) Mann-Whitney U test was conducted:  $U = 31907.00$ ;  $p < 0.05$  (Siegel, 1957: 18). The article attempts to explain the variable in question more broadly, based on a number of variables related to the evaluation of studies, the development of the economy, conditions of the study, and the level of support received under pandemic conditions.

The first area of (independent) variables used in further analysis included the issue of the quality of the education during the pandemic (in a remote learning environment). In order to reduce the number of variables used in the study (survey questionnaire), a factor analysis was conducted. The variables included in this analysis are presented in Table 2.

Table 2. Descriptive statistics of variables used in factor analysis

ID	Variable	N	Mean	Median	Sd
V1	These days, I find it harder to motivate myself to study	547	5.08	*6.00	2.13
V2	Studying online is more interesting than before the pandemic	545	3.34	3.00	2.04
V3	Studies in the current form (online) are more effective than those conducted in the traditional form	546	3.31	3.00	2.07
V4	This form of classes (online classes) suits me	547	4.34	5.00	2.22
V5	I lose a lot in terms of not being able to participate in regular classes	545	4.35	4.00	2.11
V6	Online studies require me to spend more time	547	4.50	5.00	2.21
V7	Relationships with instructors are now more relaxed	546	4.51	5.00	1.84
V8	My mood is worse now than it was before the pandemic	546	4.23	4.00	2.22
V9	My participation in classes is more active now (I report more, discuss)	543	3.33	3.00	2.01
V10	Current classes (lectures, exercises) are conducted at a higher level of content	545	3.24	3.00	1.71
V11	The current form of studying is more stressful for me	545	3.76	4.00	2.24
V12	Relationships with lecturers have become more of a partnership	543	4.10	4.00	1.73

\*Measured on a 7-point scale, where: 1 – definitely no; 7 – definitely yes.

Source: own research

To facilitate the interpretation of the data in Table 2, let us state as an example that most students agree with the statement: I find it harder to motivate myself to study these days (median > 4), and disagree with the statement: Studying online is more interesting than it was before the pandemic (median < 4). In the given summary, the relatively high values of the standard deviation in relation to the averages are noteworthy, which means that the statements presented in the survey questionnaire differentiate the respondents well (clearly). Studying online was not rated by the majority as more effective than those conducted in classrooms and lecture halls (classes are not taught at a higher level), but more students like this form. According to the surveyed young people, online studies required the sacrifice of more time, but the relationship with the teachers was more relaxed. At the same time (unfortunately), according to the surveyed students, remote studies did not motivate them to be more active in the learning process.

Before performing Exploratory Factor Analysis (EFA), a correlation matrix was constructed for the variables described above. After removing missing data, the full correlation matrix was based on 539 cases. The analyzed area initially included one issue (evaluation of the quality of studies during the pandemic – remote teaching), hence the clear correlations between “thematically related” variables. The highest coefficient of determination was  $r^2 = 0.62$ , which for the social sciences should be considered a significant figure.



Table 3. Correlation coefficients among the variables (v1-v12)

Variable	Correlations											
	Casewise deletion of MD N=539											
	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12
V1	1.00											
V2	-0.56	1.00										
V3	-0.60	0.79	1.00									
V4	-0.57	0.74	0.77	1.00								
V5	0.57	-0.67	-0.71	-0.73	1.00							
V6	0.38	-0.34	-0.38	-0.41	0.43	1.00						
V7	-0.36	0.48	0.48	0.51	-0.40	-0.22	1.00					
V8	0.63	-0.54	-0.56	-0.61	0.61	0.47	-0.42	1.00				
V9	-0.47	0.56	0.53	0.53	-0.44	-0.24	0.50	-0.43	1.00			
V10	-0.42	0.61	0.63	0.54	-0.46	-0.25	0.49	-0.40	0.59	1.00		
V11	0.46	-0.44	-0.45	-0.51	0.52	0.46	-0.34	0.61	-0.41	-0.33	1.00	
V12	-0.31	0.40	0.36	0.41	-0.31	-0.17	0.72	-0.33	0.45	0.47	-0.29	1.00

*Note:* All correlation coefficients significant at  $\alpha=0.0001$ . All correlation coefficients are statistically significant at the  $\alpha= .0001$  level, as one can expect with such a large sample. Thus, in assessing the dependence of the analyzed variables, one should be guided primarily by the value of the correlation coefficients indicated in the matrix.

*Source:* own research

In order to determine the appropriate number of factors for the variables v1-v12, factor analysis was used with an assumed number of potential factors = 10. Using the Kaiser criterion (Fabrigar, Wegener, MacCallum & Strahan, 1999: 278), two factors with Eigenvalue of 6.39 (factor 1, % Total Variance 53.25) and 1.33 (factor 2, % Total Variance 11.06) were specified. Adopting the two factors (Extraction method: Principal components and Varimax raw rotation) yielded the following Factor Loadings for the analyzed variables (Table 4).

Table 4. Factor loadings: v1-v12 Factor Loadings (Varimax Raw) Extraction: Principal Components (Marked Loadings Are &gt;0.700000)

ID	Variable	Factor 1	Factor 2
V1	These days I find it harder to motivate myself to study	<b>-0.711260</b>	-0.272344
V2	Studying online is more interesting than before the pandemic	0.650863	0.522025
V3	Studies in the current form (online) are more effective than those conducted in the traditional form	<b>0.702826</b>	0.481257
V4	This form of classes (online classes) suits me	<b>0.727781</b>	0.456353
V5	I lose a lot in terms of not being able to participate in regular classes	<b>-0.783254</b>	-0.290977
V6	Online studies require me to spend more time	-0.699062	0.054081
V7	<u>Relationships with instructors are now more relaxed</u>	0.214034	<b>0.816654</b>
V8	My mood is worse now than it was before the pandemic	<b>-0.780939</b>	-0.228894
V9	<u>My participation in classes is more active now (I report more, discuss)</u>	0.392868	0.644774
V10	<u>Current classes (lectures, exercises) are conducted at a higher level of content</u>	0.375763	0.683503
V11	The current form of studying is more stressful for me	<b>-0.717724</b>	-0.147406
V12	<u>Relationships with lecturers have become more of a partnership</u>	0.093365	<b>0.830029</b>

*Note:* Underlined variables were assigned to the second factor *Source:* own research

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The Factor Loadings assigned to the variables reduce the analyzed variables to two sets. Their substantive interpretation leads to the designation of two areas of analysis:

Study evaluation: Overall study evaluation during the pandemic (distance learning) – factor one. Based on the variables distinguished by factor one: v1, v2, v3, v4, v5, v6, v8, v11, we created a study evaluation index standardized in the range of 1-7. The higher the value, the better (more positive) the evaluation of studying during the pandemic.

Relationships with lecturers: relations with lecturers during the pandemic. We created an index of relations with lecturers aggregating the variables: v7, v9, v10, v12. The index standardized in the range of 1-7. The higher the value, the better (more positive) the evaluation of relations with lecturers during the pandemic (remote teaching).

We used both indices (obtained by recoding and aggregating individual variables) as independent variables for the regression model we created. At this stage of the analysis, it is important to emphasize the separateness of the evaluation of the study process itself (one factor), and the relationship with lecturers (the other factor). Thus, in further empirical studies, the two areas should be (analytically, according to the EFA results) treated independently, as different areas of student evaluation of the learning process during a pandemic period. In addition to the factors indicated, the indices obtained from the aggregation of the variables shown in Table 5 were also included in the regression model.

Table 5. Characteristics of other independent variables – descriptive statistics

Index	Constituent variables	N	Mean	Median	SD
<b>Support</b>	V13. I get the emotional help and support I need from my family	546	5.10	6	1.78
	V14. I have friends with whom I can share my joys and sorrows	546	5.72	6	1.50
	V15. I get involved in the life of my university	544	3.02	3	1.74
<b>Study conditions</b>	V16. I have sufficient equipment (computer, laptop) to participate in classes	551	6.17	7	1.26
	V17. I have a good internet access	546	5.64	6	1.57
	V18. I have suitable housing conditions (quietness, a place to study).	549	5.36	6	1.77
<b>Economy</b>	V19. The pandemic will create more opportunities in my (future) profession	542	3.74	4	1.60
	V20. The pandemic will reduce human labor demand across the economy	546	4.29	4	1.61

*Note:* Measurement of variables V13-20 made on a 7-point scale: 1 – definitely no; 7 – definitely yes.

*Source:* own research

Students received emotional support from family during the learning process and had friends with whom they could share their feelings (median = 6), but rated their involvement in university life as low (median = 3; most students disagreed with the statement about involvement). As for material study conditions (housing and equipment), students rated them well. In the analytically constructed area of Support, in addition to the variables of support received from family (v13) and friends (v14), reference was also made to the support provided by involvement in the life of the organization (university). Emotional involvement was thus treated here as one of the dimensions (sources) of support. The descriptive statistics given indicate a relatively high level of support received from family members and friends with relatively low involvement in the life of the university. Thus, this is an area (v15) that requires more activity on the part of the university itself during remote work, e.g., in terms of involving students in the work of study clubs. The second of the designated areas Conditions of studying

again indicates a relatively positive assessment of this aspect of student life. The housing aspect (v18) is rated the weakest here, slightly worse than access to computer equipment (v16) and the Internet (v17). So, if students need support, it is in this area. In the last of the designated areas, students rated the importance of the pandemic to the development of the economy in a particular sector (v19) as well as the economy as a whole (v20). Three indexes were created from the variables presented. The indexes were standardized for the range 1–7; the higher the value, the better (more positive) the evaluation of each analytical area (support, study conditions, economy).

Finally, the following variables/indices were used for the Multiple linear regression (MLR) model (James, Witten, Hastie & Tibshirani, 2017: 71-101):

Dependent variable: career (career limits, threat to career) (rating of the statement: The pandemic will limit my career opportunities; a higher rating – a greater sense of threat/perceived risk)

Independent variables: initially the model included the following variables - study evaluation, relationship with lecturers, support, study conditions, economy, year of study, and gender (dummy variable). In the course of further analysis this range was limited to: study evaluation, support, economy.

The constructed model helps explain 22,43% of the variance in the dependent variable career (Table 6) and is statistically significant (Table 7).

Table 6. Regression Statistics - model summary - Multiple linear regression (MLR)

<i>Regression Statistics</i>	
Multiple R	0.4736
R Square	0.2243
Adjusted R Square	0.2201
Standard Error	1.5596
Observations	556

Source: own research

Table 7. ANOVA for regression

	df	SS	MS	F	Significance F
Regression	3	388.2439	129.4146	53.2053	3.21E-30
Residual	552	1342.6657	2.4324		
Total	555	1730.9096			

Source: own research

Table 8 shows the unstandardized coefficients along with the P-values indicating the significance of each predictor within the model.

Table 8. The regression coefficients

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	7.478	0.341	21.931	3.82E-77***	6.809	8.148
Study evaluation	-0.390	0.041	-9.537	4.66E-20***	-0.470	-0.310
Support	-0.141	0.056	-2.538	0.011*	-0.250	-0.032
Economy	-0.376	0.061	-6.181	1.24E-9***	-0.495	-0.256

Note: Significance levels: 0.0001 ‘\*\*\*’ 0.001 ‘\*\*’ 0.05 ‘\*’

Source: own research

Table 9 shows the correlation coefficients for the variables presented in Table 8.

Table 9. Correlation coefficients for all statistically significant predictors (variables/indices) included in the regression model (n=556)

	Career	Study evaluation	Support	Economy
Career	1			
Study evaluation	-0.398*	1		
Support	-0.207*	0.249*	1	
Economy	-0.246*	0.017	0.073	1

\* Correlation coefficients significant at  $\alpha=0.05$ . However, due to the large sample size, one should take into consideration mainly the values of correlation coefficients in estimation of dependence.

Source: own research.

The data in Table 8 allow us to formulate the following regression equation:

$$\hat{Y} = 7.48 - 0.39 * \text{evaluation\_studies} - 0.14 * \text{support} - 0.38 * \text{economy}$$

According to this multiple regression equation, concerns about the future course of a career ( $\hat{Y}$ ) decrease with a more positive evaluation of studies, higher levels of support and a better assessment of the future state of the economy.

The structure of the relationships of the variables obtained in the analysis, along with correlation coefficients (r), unstandardized coefficient b and P-value, is shown in Figure 1.

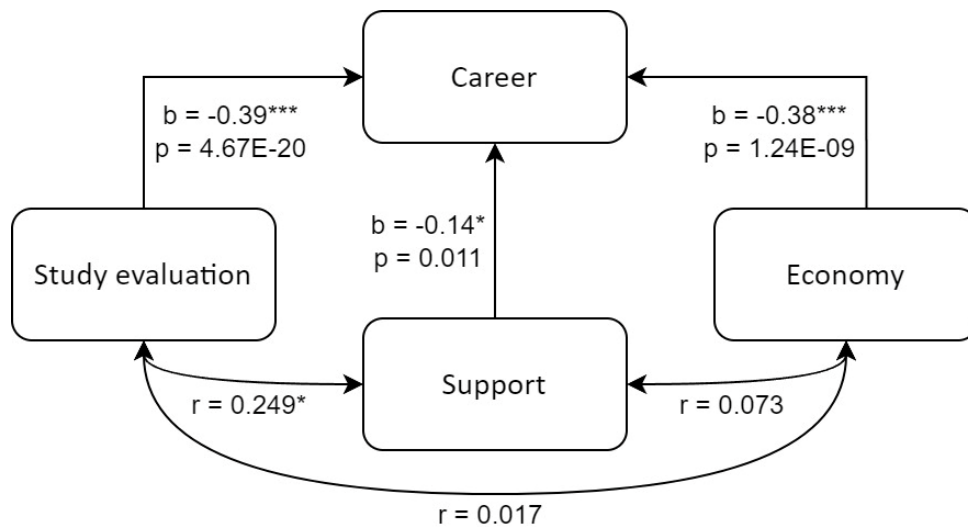


Figure 1. Relationships between variables identified in the regression model and correlation matrix

Note: \*Correlation coefficients (r) significant at  $\alpha= 0.05$  Significance levels for the unstandardized coefficient b: 0.0001 ‘\*\*\*\*’ 0.001 ‘\*\*\*’ 0.01 ‘\*’ Source: own research.

Source: own research

To test the indicated model (based on statistical learning and machine learning, analyses conducted in R), the data was divided into two sets with a split ratio of 0.7, resulting in the following data structure:

- Training set (n=389 - 70% of source data)
- Validation set (n=167 - 30% of source data)

Based on the training set, a regression model (Table 10) analogous to that described in Figure 2 was constructed.

Table 10. Multiple linear regression (MLR) model for training set n=389 (split ratio = 0.7)

Coefficients:				
	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	7.4438	0.39939	18.638	<2.00E-16***
Study evaluation	-0.43346	0.04857	-8.924	<2.00E-16***
Support	-0.14723	0.06675	-2.206	0.028*
Economy	-0.32111	0.06952	-4.619	5.27E-06***

Significance levels: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.54 on 385 degrees of freedom

Multiple R-squared: 0.2462, R: 0.4962, Adjusted R-squared: 0.2403

F-statistic: 41.91 on 3 and 385 DF, p-value: < 2.2e-16

Source: own research

Table 11. Model testing on the validation set (n=167, 30%) - Regression Statistics

MSE	2.600
RMSE	1.613
SEZ	434.245
SST	518.950
R <sup>2</sup>	0.163

Source: own research

The data presented in Table 10 indicate that the model based on the training set had similar efficiency (R-squared: 0.2462) to the model obtained for the full data. The use of the test model for the validation set (data not used in the model development process) indicated its effectiveness at R-squared: 0.163.

The association of the indicated variables within a single model was also tested using logistic regression by recoding the Career variable to create a dichotomous variable with categories:

- 1 (the pandemic will limit my career opportunities),
- 0 (the pandemic will not limit my career opportunities).

The method of recoding: 1,2,3,4 -> 0; 5,6,7 -> 1. The regression model for the constructed dichotomous variable is shown in Table 12.

Table 12. Logistic regression model (The pandemic will limit my career opportunities – 1 yes; 0 no)

Deviance Residuals:					
Min	1Q	Median	3Q	Max	
-1.85	-0.92	-0.62	1.11	2.25	
Coefficients:					
	Estimate		Std. Error	z value	Pr(> z )
	Odds Ratios	Log-Odds Ratios			
(Intercept)	31.24	3.44	0.55	6.29	3.11e-10 ***
Study evaluation	0.73	-0.32	0.06	-5.06	4.25e-07 ***
Support	0.82	-0.19	0.08	-2.41	0.0159 *
Economy	0.57	-0.56	0.1	-5.72	1.02e-08 ***
Significance levels: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1					
(Dispersion parameter for binomial family taken to be 1)					
Null deviance: 705.83 on 541 degrees of freedom					
Residual deviance: 627.76 on 538 degrees of freedom					
AIC: 635.76					
Number of Fisher Scoring iterations: 4					

Note: Std.Error values refer to Log-Odds Ratios

Source: own research

As with the regression analysis, the logistic regression model indicates a significant relationship between the variables used. The values of Odds Ratios (Log-Odds Ratios) indicate that the odds of being in Group 1 (the pandemic will limit my career opportunities) decreases as the values of the independent variables used (Study evaluation, Support, Economy) increase. Thus, the conclusions here are analogous to those presented earlier in interpreting the results of the regression analysis.

Testing of the logistic regression model again ran at a split ratio of 0.7 (analogous to testing the MLR model). Training set 379 observations; validation set 163 observations.

After applying the model built on the training set to the validation set, the following prediction parameter was obtained: Accuracy (0.65). Which is consistent with the Confusion Matrix below (Table 13) (Friedman, Hastie, Tibshirani, 2009: 301).

Table 13. Test data confusion matrix for the logistic regression model

	FALSE	TRUE
<b>0</b>	<u>86</u>	19
<b>1</b>	38	<u>20</u>

Note: Correct (correct) model predictions for new data (validation set) highlighted. Correct classification made in 106 cases, incorrect in 57.

Source: own research

The constructed models (Table 8, 12) were designed to carry out the prediction of the dependent variable, which was the students' assessment of the impact of the pandemic on their future career (the Career variable). The analyses indicated the importance of the students' assessment of their course of study during the pandemic, the level of support they received, and their assessment of the impact of the pandemic on the future development of the economy. Low values for these variables increased the likelihood of a negative assessment of their future work situation.

The indicated independent variables (used in the constructed models) can be divided into two classes. The first is the level of support received by the students and their evaluation of their course of study. This is because these are components of the model that can be directly and deliberately influenced by the position of the university itself. Let us keep in mind that one of the components of the level of support was the institutional support expressed in statement v15: I am involved in the life of my university. Another predictor was concern about the future state of the economy, as it was not directly related to the activities of the university itself during the pandemic, and in this context is not subject to intentional modification. As can be seen in Figure 2, the evaluations of their studies and of the economy were not statistically significantly related ( $r = 0.017$ ). Future assessment of their career prospects was therefore not the result of a more-or-less pessimistic attitude, which would have to be evident in both areas of assessment. What is important from the university's perspective is that the aggregate assessment of the course of study during the pandemic was a significant predictor of the students' assessment of their future career development. The students saw the relationship between how the university performed during the pandemic and their (future) career situation. Assessing the university's adaptation to the pandemic would therefore have a real impact on their future careers.

## Conclusion

The conducted research shows the special role of universities and the study process during the pandemic. This process should be interesting, engaging and effective. Remote learning limits the students' social activity, reducing their social contacts and activities related to university life. It is important not only to try to involve students in additional activities, but also to convince them that the new form of study will properly prepare them for their future careers. The new form of study during the pandemic period not only has to be effective, but must also be recognized as such by the students themselves. Efforts aimed at engaging students in additional activities related to the work of the university help rebuild the damaged social relationships that acted as support networks. Collaborative work by the students (as opposed to overly individualized remote learning) in the presence and with the involvement of others, gives the students the conviction that their choice of field of study is right, and that further involvement is advisable. This addresses the problem of student motivation during remote learning periods.

A factor linking the evaluation of the remote learning process itself with the evaluation of the course of (future) career (professional success) is not necessarily just the evaluation of the effectiveness of online studies. So, it is not just a matter of the fact that effective teaching at home will lower my (the student's) chances in the job market. What may also be relevant here is the conviction that the job of the future will also be a remote job, largely resembling the current form of study. If current teaching is considered problematic (if only in the dimension of motivation deficiencies), one can make an equally negative prediction about the quality of the upcoming career.

The assessment of future career success is also influenced in the broader context of the economy as a whole, such as the future demand for a given (student's) skills. This proves that for some students, the pandemic is a structural factor that transcends the biography of individuals. The pandemic in this sense does not only affect my (the respondent's) life, it is not an individual phenomenon or a source of individual limitations. Indeed, it changes the conditions of the whole game, which will affect the respondent's subsequent fate as a representative of a broader social category. Thus, one can speak here of a new career environment shaped by the pandemic. Lastly, the assessment of a future career (professional success) is also affected by the level of support received. In the constructed regression models,

it can be seen that social support, as in the case of other difficult or new situations, creates a certain psychological safety buffer in this respect. The disappearance of direct relationships with other students and lecturers limits the level of support that flows from participation in the student group. Again, the special role of the university as an institution that involves young people in various forms of activity beyond the process of imparting and verifying knowledge becomes apparent here.

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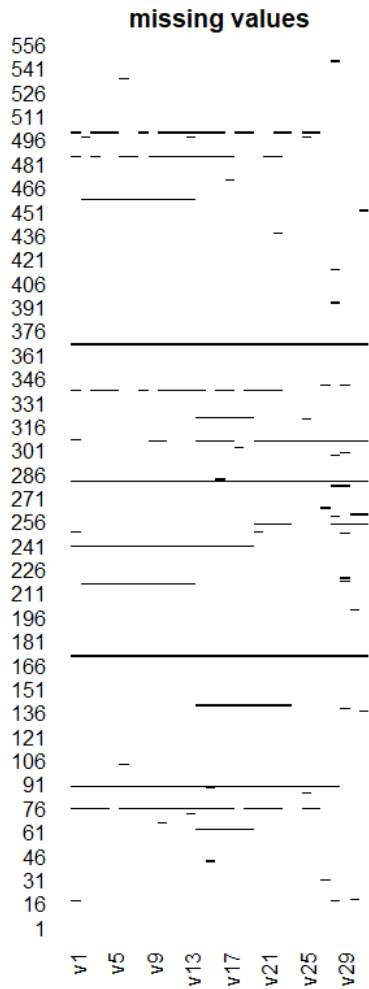
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**Annex**

Figure 1. Missing data in the analyzed dataset



Source: own research