What do women want? – role of higher education in shaping female entrepreneurship

Patrícia Becsky-Nagy
Faculty of Economics and Business,
Institute of Accounting and Finance,
University of Debrecen,
Debrecen, Hungary

Balázs Fazekas
(corresponding author)
Faculty of Economics and Business,
Institute of Accounting and Finance,
University of Debrecen,
Debrecen, Hungary
Email:
fazekas.balazs@econ.unideb.hu

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The article examines the differences in entrepreneurial patterns of women and men in higher education and the factors influencing them, using the data from the Global University Entrepreneurial Spirit Students' Survey of 1,881 Hungarian students at the University of Debrecen. We analysed the differences in entrepreneurial self-efficacy, attitudes, subjective norms, perceived behaviour and university background of female and male students in relation to entrepreneurial actions and intentions five years after graduation. The article also examines the role of university background by analysing students' opinions about their entrepreneurial education. Our results suggest a difference in entrepreneurial actions, as the proportion of female students running or trying to run their businesses is lower than that of male students. Finally, female and male students have different needs for university-backed entrepreneurship education, as female students found university support more important in building networks and improving entrepreneurial skills, therefore, targeted educational programmes for women could be effective.

Introduction

Underutilisation of entrepreneurial resources leads to deficiencies in the entrepreneurial ecosystem, which hampers the development of a given region. Spurring entrepreneurship by providing incentives for entrepreneurial potential can increase economic efficiency. In this sense, overcoming the gender gap in entrepreneurship and equalising women's entrepreneurial activity could boost economic performance. Several studies highlight women's lower entrepreneurial activity and investigate factors that lead to a lower propensity to pursue an entrepreneurial career in their case (Jennings–Brush 2013, Ughetto et al. 2020).

The current research focuses on the entrepreneurial patterns of women pursuing their studies in higher education. The main question is whether there are differences in entrepreneurial intentions and actions between male and female students in the short run and what the influencing factors are. Entrepreneurial actions and intentions are examined during the studies of the respondents, right after and five years following their studies. In this post-graduation period, we can assume that the university background plays a more important role than in the later stages of their careers, so among the influencing factors, we emphasise the students' perception of the entrepreneurial education provided by the university. In the case of Hungary, we examined women's entrepreneurial patterns in an economy where the labour market has undergone significant changes over the past decade (Molnár et al. 2024). Using the data of the Global University Entrepreneurial Spirit Students' Survey (GUESSS) we examined the students' entrepreneurial actions and intentions and the factors influencing them by gender based on Hungarian evidence using data from the University of Debrecen. The data was collected in the spring fall of 2021. We compared the overall Hungarian results with the international trends and then analysed the Hungarian market in detail using the survey of the students at the University of Debrecen to answer our research questions. Our sample includes data from 1,889 students at the University of Debrecen (finally, 1,881 respondents were considered), the largest rural university in Hungary, covering all the major fields of higher education representing the Hungarian higher education landscape, as the results of Debrecen were identical to the Hungarian average in terms of entrepreneurial intentions and actions.

We examined students' entrepreneurial actions and post-graduation entrepreneurial intentions using the theoretical framework of Ajzen's (1991) theory of planned behaviour to explore the factors that influence their decisions. It is consistent with the structure of the survey, as questions on entrepreneurial intentions were designed to measure the components described by the theory of planned behaviour. After the literature review, we present the students' entrepreneurial behaviours, and then we analyse the factors influencing their intentions, namely self-efficacy, attitudes, subjective norms, and perceived behaviours.

Since the focus of our article is on the role of universities in shaping students' entrepreneurial behaviour and attitudes, we have supplemented the analysis with factors focusing on their educational background. The socioeconomic institutional environment, of which universities are an integral part, plays an essential role in shaping the entrepreneurial environment (Kézai–Rechnitzer 2023). The aim of this paper is to explore the differences between female and male students[1] in terms of the effect of university courses and environment in order to gain a better understanding

[1] As the focus of our research is on female entrepreneurship, we will use the categories women/female, and man/male categorisation for the students. In our sample, there were eight students who chose the 'other' category as their gender or did not answer this question. Due to their low frequency, they were not included in the analysis.

of how entrepreneurship can be fostered through higher education. We examine students' attitudes, subjective norms, perceived behaviours, and self-efficacy and then use binary logit models to analyse how these factors contribute to entrepreneurial intentions and actions.

Literature review

Entrepreneurship is the result of personal characteristics and the socioeconomic environment. The active role of the entrepreneur in creating innovation and as a catalyst of economic growth and development has been at the centre of entrepreneurship research since Schumpeter (1934), and a layered approach has evolved in the field. This approach has analysed the role of personal characteristics, psychological factors, and social and economic context as an interrelated system, the outcome of which is entrepreneurial activity. Small businesses run by entrepreneurs form the backbone of national economies. They contribute a significant portion of the gross value added and fundamentally determine the resilience, innovation, and competitiveness of the entire economy. For the performance of a national economy to improve, the entrepreneurial sector must particularly enhance its performance (Fenyves et al. 2022). Entrepreneurial skills have a major impact on the ability of businesses to attract capital and access other key resources (Becsky-Nagy 2016). Entrepreneurship itself needs to be analysed in a socioeconomic context in terms of the uncertainties faced by entrepreneurs and also with the uncertainties created by entrepreneurs, the management techniques that enhance entrepreneurial performance and the influencing factors (Yousuf et al. 2019, Yousuf et al. 2022).

Ajzen's (1991) theory of planned behaviour suggests that attitudes towards a given behaviour are good predictors of the actual behaviour. Attitudes, subjective norms, and perceived behaviour are related to the actions; therefore, entrepreneurial intentions can be predicted with the attitudes, norms, and behaviour patterns towards entrepreneurship. The implementation of Ajzen's theory provides the conceptual framework for several studies investigating entrepreneurship, and this theory also provides the theoretical foundation of our paper. In this paper, we analyse the prospects of female entrepreneurship in the context of socioeconomic factors influencing entrepreneurial intentions, more specifically, the role of education in supporting female entrepreneurship.

At a perceptual level, entrepreneurial self-efficacy plays a role in entrepreneurial intentions. Tsai et al. (2014) described self-efficacy as an individual's cognitive appraisal of his/her abilities that are required to manage and control specific situations. There are different approaches to entrepreneurial self-efficacy. Chen et al. (1998) described it as one's confidence to successfully fulfil the entrepreneurial role in the startup process, while other approaches emphasise self-confidence in performing specific entrepreneurial tasks (Baum et al. 2001).

Several studies suggest that there are deficiencies in the female entrepreneurial segment, leading to underutilisation of entrepreneurial capacity. Based on GUESSS data, Dorjnyambuu (2023) found that women were less likely to engage in the entrepreneurial process as potential, nascent and early entrepreneurs. By mobilising female entrepreneurs, the development prospects of a given country or region can be enhanced. Burgess–Tharenou (2002) showed that women can increase efficiency by bringing in new ideas. Hillman et al. (2007) found that female entrepreneurs create added value through a more thorough information search that leads to more efficient decision-making. Kuhn–Villeval (2015) found that women tend to be more collaborative than men.

There is a growing body of literature examining the role of gender in entrepreneurship. Ughetto et al. (2020) and Jennings–Brush (2013) showed that women are generally less likely to pursue an entrepreneurial career. Ughetto et al. (2020) found that the main factor leading to the lower likelihood of women becoming entrepreneurs is biased perceptions that influence their networking possibilities and entrepreneurial intentions. In their studies, Ughetto et al. (2020) found that men have a biased opinion and see women as less competent in business, but at the same time, female entrepreneurs also believe that they do not have the same business attributes as male entrepreneurs. The self-perceptions of women that make them believe they are less able to pursue an entrepreneurial career are that they have fewer skills to start a business and lack self-confidence and competitive personality (Acs et al. 2011, Audretsch et al. 2017). By analysing the entrepreneurial behaviour of women Langowitz–Minniti (2007) and Muñoz-Fernández et al. (2019) found that in addition to the socioeconomic environment, the perceptual factors significantly influence the female entrepreneurship activity. By analysing Hungarian, Czech, Slovak and Polish data Gubik–Farkas (2019) found that attitudes, norms and perceptions play a significant role in entrepreneurial intentions, but according to their results, gender was not significant.

The institutional context plays an important role in analysing gender differences in entrepreneurial behaviour. Within this, the impact of education and universities can be highlighted. In exploring gender differences in entrepreneurial patterns, a key focus of our study is to examine the effect of university background and to assess students' perceptions of entrepreneurship education at university. Shinnar et al. (2014) examined the links between education and entrepreneurship and found that entrepreneurship education is less effective in the case of women. The effect of entrepreneurship education on self-efficacy was significant only for male students, suggesting that the current focus of entrepreneurship education is rather male-oriented and that it should be modified to reach female students. López-Marmolejo–Rodríguez-Caballero (2023) noted the importance of the regulatory system in female economic participation. By analysing students' career choices to become entrepreneurs or employees, Laspita et al. (2023) also highlight that the impact of

entrepreneurship education differs in different social contexts. Muñoz-Fernández et al. (2019) found that the higher education level of women increases the likelihood of participating in businesses. Guerrero–Marozau (2023) analysed the role of education in becoming an entrepreneur and their specifics in post-socialist countries. They showed that informal institutions play an essential role in entrepreneurial dynamics, and they observed differences between market-oriented and former socialist economies. Based on their results, entrepreneurial education increased the likelihood of being an entrepreneur, and in post-socialist economies, the positive entrepreneurial university background increased the likelihood of being a nascent[2] entrepreneur but had a negative influence on being an active entrepreneur. Using Hungarian data, Gubik (2021) found that an entrepreneurial university environment may have a positive impact on entrepreneurial intentions, but she also emphasises that social context and entrepreneurial role models in the family strongly influence entrepreneurial intentions. Her results suggest that entrepreneurial education can support entrepreneurial intentions by providing a better understanding of the business process and by shaping attitudes. By analysing entrepreneurial intentions, Lopez–Alvarez (2019) found that entrepreneurial courses and entrepreneurial university atmosphere have a positive impact, and they identified the latter as the more influential factor. Bartha et al. (2018) also found that entrepreneurship-related courses influenced entrepreneurial motivations. Jáki et al. (2022) noted that digital teaching methods managed to develop entrepreneurship education in the long run, and academic entrepreneurial education should be more cooperative with the practitioners of entrepreneurship (Jáki–Huszák 2023).

Wales et al. (2021) examined the role of institutions in entrepreneurship in different economic contexts. According to their findings, institutions have more influence on the relationship between emotional intelligence and performance in the case of efficiency-driven economies compared to innovation-driven economies. Gil-Soto et al. (2022), using a Spanish sample, found that business cycles impact entrepreneurial intentions in periods of economic growth, entrepreneurial careers become less attractive, and perceived social support and motivation decrease.

Botha et al. (2006) showed that women-specific entrepreneurship programmes improved the participants' entrepreneurial skills. Martínez-Rodríquez et al. (2022) highlighted that improving entrepreneurship education to increase women's self-confidence in their entrepreneurial skills is required to promote female entrepreneurship. Wu et al. (2019) found that women's poor entrepreneurial cognition and less efficient realisation of business and investment opportunities are among the main reasons for the entrepreneurial gender gaps. There are several studies based on the theory that the different socialisation processes of women and men lead

[2] A nascent entrepreneur is a person who commits time and resources to start a new business, starts to operate the new business (Wagner 2006).

to gender differences; therefore, women have unique needs, competencies and values compared to men (Poggesi et al. 2016).

In our research, we use the theoretical framework of Ajzen (1991), who used attitudes, subjective norms and perceived behaviour in order to predict entrepreneurial intentions and actions. We analyse the effects of these factors.

The main question of our research is whether there is a gender gap in entrepreneurship and what factors influence this gap. In the first part of our analysis, we will investigate the differences in entrepreneurial intentions and actions of female and male students right after and five years following their studies. Our first hypothesis connected to the research question focuses on the gender gap. The hypothesis is as follows:

H1: There is a gender gap in entrepreneurial actions and intentions among students right after and five years following their studies based on Hungarian evidence.

After this, we investigate the factors influencing entrepreneurial intentions by analysing entrepreneurial self-efficacy, attitudes, subjective norms and perceived behaviour by gender. We compare female and male students. Building on the literature, our hypotheses are as follows:

H2: There is a difference between female and male students' entrepreneurial attitudes, perceived behaviour and subjective norms based on Hungarian evidence.

To complement the above theory, we examined the students' opinions on the entrepreneurial education provided by their university. Our assumption is that female and male students have different needs regarding their entrepreneurial education; therefore, their views on entrepreneurial education will also be different. In this sense, we formulated the following hypothesis:

H3: Female and male students have different opinions about the quality of university entrepreneurship education based on Hungarian evidence.

Data and methodology

In our research, we use the data from the Global University Entrepreneurial Spirit Students' Survey (GUESSS). The GUESSS research was developed by the University of St. Gallen and the University of Bern to measure the entrepreneurial aspirations of university students and the factors that influence their entrepreneurial decisions. We are using data from the ninth data collection, which was carried out in the spring of 2021. With these data, we build on Hungarian evidence, our sample includes the data from 1,889 students from the University of Debrecen. The majority of the students, 68.9% of the sample, are between 18–26 years old. The field of study is evenly distributed within the sample, with most fields accounting for 7–10% of the sample and only the share for human medicine and health sciences accounting for more than 20%. The sample consists of 644 male and 1,237 female respondents, 8 respondents chose the category 'other' or did not answer the gender question.

As the number of respondents in the third category was negligible compared to the other two groups, we have only compared male and female respondents.

Building on Ajzen's (1991) theory, we examined the attitudes, subjective norms and perceived behaviour to predict entrepreneurial intentions and actions. The first part of the analysis examines the differences in entrepreneurial self-efficacy, attitudes, subjective norms, and perceived behaviour. In the sample, several questions were formulated to test these factors in becoming an entrepreneur. Seven questions are related to self-efficacy, where the self-assessment of the participants was tested with regard to the specific tasks that have to be delivered in a business, such as: *"Identifying new business opportunities", "Creating new products and services", "Managing innovation within a business", "Being a leader and communicator", "Building up a professional network", "Commercializing a new idea or development"* and *"Successfully managing a business"*. Attitudes were tested with five questions asking participants to rate their attitudes towards entrepreneurship. These questions included: *"Being an entrepreneur implies more advantage than disadvantage to me", "A career as entrepreneur is attractive for me", "If I had an opportunity and resources, I would become an entrepreneur", "Being an entrepreneur would entail great satisfaction for me",* and *"I would rather become an entrepreneur"*. Within the subjective norms, we examined the influence of the narrow social environment and the belief in the judgement of parents, friends, and fellow university students. In the area of perceived behaviour, we tested the participants with the following questions: *"I am usually able to protect my personal interests", "When I make plans, I am almost certain to make them work",* and *"I can pretty much determine what will happen in my life"*. To specify the impact of the university on entrepreneurial intentions and actions, we evaluated six questions: "*Students are encouraged to become entrepreneurs", "Courses increased the understanding of the attitudes, values, and motivations of entrepreneurs", "Courses increased the understanding of the actions someone has to take to start a business", "Courses enhanced practical management skills to start a business", "Courses enhanced the ability to develop networks",* and *"Courses enhanced the ability to identify an opportunity"*. Confidence in these skills, attitudes, norms and behaviours were measured using a Likert scale.

The first step was to test for gender differences in the above-mentioned factors using the Mann–Whitney U test on two independent samples. The hypothesis of this test is that the two samples are identical. In our case, this means that there is no difference in the factors between female and male students.

In the following, we examine how the above factors influence entrepreneurial intentions. Students' intention to start a business was measured with the following questions: *"Which career path do you intend to pursue right after completion of your studies?"* and *"Which career path do you intend to pursue 5 years later?"*. The answers were transformed into a dummy variable where the entrepreneurial career path was coded as one and other career choices as 0. We used these dummy variables as dependent variables in our analysis. The selection of the model was driven by the binary categorical nature of the dependent variable. We tested the impact of these factors with a binary logit

model using entrepreneurial intentions as the dependent variables. We specified the logit model using the following equation:

$$\begin{aligned} &logit(entrepreneurial\ intention) \\ &= \beta_0 + \beta_1 Attitude + \beta_2 SubjectiveNorm \\ &+ \beta_3 PercievedBehaviour + \beta_4 SelfEfficacy \\ &+ \beta_5 University + \beta_6 EntrepeneurMother \\ &+ \beta_7 EntrepreneurFather \\ &+ \beta_8 EntrepreneurParents + \beta_9 Birth + \beta_{10} Master \\ &+ \beta_{11} Female + \varepsilon_i \end{aligned}$$

The first three variables are in line with Ajzen's theory. These variables have been supplemented with other variables specific to our research question. Several studies in social sciences and entrepreneurship use self-efficacy as a complementary variable to the planned behaviour controls (Nolan 2023, Povey et al. 2000), and Maheswary–Kha (2022) used self-efficacy in addition to attitudes, subjective norms and perceived behaviour to link entrepreneurial education and intention. Based on this, we used self-efficacy in our model. The specific variable in the model is the respondents' opinion about their entrepreneurial education. This variable is represented by the variable 'University'. This variable is related to our 3rd hypothesis, which suggests that students have different opinions about entrepreneurial education that signal differences in their entrepreneurial patterns.

The independent variables are based on the questions related to the given factor describing entrepreneurial intentions. As the questions in each area are strongly correlated, presenting them would lead to high multicollinearity. To overcome this problem, we used dimension reduction with principal component analysis. In the principal component analysis, we determined the relevant factors by selecting components with eigenvalues greater than 1. In the logit model, we used these factors to represent the attributes in the equation. In the dimension reduction, because the responses to the questions were strongly correlated, we were able to reduce each attribute to a single component that mediated the attribute and explained a large proportion of the variance in the variables.

In order to obtain gender specific estimates of the models of entrepreneurial intentions, we tested the models on separate samples of female and male students. To do this, we ran the principal component analysis for both women and men and included the gender-specific components in the models. In order to control for specific characteristics, we included the entrepreneurial background of the students' parents, and we presented dummy variables describing the entrepreneurial history of the students' mother, father or both parents (MotherEntrepreneur, FatherEntrepreneur, ParentsEntrepreneur). To control for the programme, we included the variable '*Master*', which is a dummy variable that takes the value of 1 if the student is in the Master's programme and 0 if the student is in a Bachelor's or other programme. The variable '*Birth*' describes the year of birth and controls for the age of the student.

Finally, we examined the business activities of those students who are currently pursuing an entrepreneurial career. Questions focusing on these activities are *"Discussed product or business idea with potential customers", "Collect information about markets or competitors", "Written business plan", "Started product/service development", "Started marketing or promotion efforts", "Purchased material, equipment or machinery", "Attempted to obtain external funding", "Applied for a copyright, trademark or patent", "Registered the business",* and *"Sold product or service"*. These questions were used to test the hypothesis that entrepreneurial activities are identical for female and male entrepreneurs.

Results and discussion

Entrepreneurial actions and intentions of Hungarian students in a global comparison by gender

According to the results of the global survey, 17.8% of all students intend to be entrepreneurs immediately after graduation and 32.3% plan to be entrepreneurs five years later. The proportion of intended, emerging, and active entrepreneurs is consistently lower for women than men (Sieger et al. 2021). The Hungarian report shows ambiguous results, as the responses placed in the first category are below the global average (12.5%), while those in the second category are somewhat above the global average (34.4%) (Gubik–Farkas 2022). While there is a global tendency for students to first gain experience as employees and then try their hand at entrepreneurship, this tendency is stronger among Hungarian students.

Table 1 shows the entrepreneurial intentions of students in Hungary and in Debrecen by gender. The distribution of students in Debrecen is similar to the national average, and although the entrepreneurial intentions of female students are slightly higher right after their studies and lower in a 5-year horizon, men's answers are lower. However, the difference is not substantial. We can assume that our sample follows the national characteristics; therefore, we use the Debrecen sample to explore the entrepreneurial actions and intentions, focusing mainly on the influencing factors.

Table 1

The distribution of students regarding their entrepreneurial intentions right after their studies by gender

Gender	Interested in being an entrepreneur (% within the gender category)			
	Hungary		Debrecen	
	right after studies	5 years after graduation	right after studies	5 years after graduation
Male	517 (12.64%)	1,413 (34.55%)	76 (11.80%)	206 (31.99%)
Female	746 (12.47%)	2,058 (34.41%)	158 (12.75%)	422 (34.11%)
Total	1,263 (12.54%)	3,471 (34.47%)	234 (12.44%)	628 (33.39%)

Based on the results of the global survey, 28.4% of all students are nascent entrepreneurs, while 10.8% already own and run their own businesses. According to the global GUESSS report, developing countries had a higher propensity than developed countries (Sieger et al. 2021).

Compared to entrepreneurial intentions, entrepreneurial actions show a gender difference, as female students are less likely to run their businesses or make actual efforts to start their businesses after graduation or in the next five years. Based on the chi-square, there is no significant difference between men and women in terms of trying to start a new business. However, the difference is significant in the case of students who are running their businesses, so female students have similar intentions to start their businesses, but they are less likely to turn this intention into actually running their businesses. In this sense, there seems to be a difference between the entrepreneurial intentions where the gender gap could not be observed. We can conclude from our sample that female students are less likely to turn entrepreneurial intentions into actual entrepreneurial actions. It suggests that there are barriers for female students, as similar intentions lead to lower entrepreneurial action during and after their studies.

Table 2 shows the entrepreneurial actions of students. The proportion of students who are currently trying to start their own business is lower than the world average of 28.4%, and the proportion of the students who are currently running their business is also lower than the world average of 10.8%. The relatively lower rate of entrepreneurial action can be explained by the relative development of the country and by the fact that most students see the primary course of professional action as being long-term employment or gaining experience as an employee before embarking on an entrepreneurial career.

Table 2

The distribution of students regarding their entrepreneurial prospects right after their studies by gender

Gender	Students who (% within the gender category)		Total ratio within the population
	are currently trying to start a business	are currently running a business	
Male	169 (26.24%)	52 (8.07%)	644 (34.48%)
Female	293 (23.69%)	60 (4.85%)	1,237 (65.52%)
Total	462 (24.56%)	112 (5.95%)	1,881 (100.00%)
Chi-square	1.493	7.862	
Significance (two-sided)	0.222	0.005	

On the other hand, the significantly lower rate of female students pursuing an entrepreneurial career during their studies shows that factors hinder their entrepreneurial actions even though they have similar entrepreneurial intentions as

male students. It could be argued that gender-specific factors, such as maternity intentions, could delay women's entrepreneurial action, but this is contradicted by the results. The survey shows that a similar proportion of male and female students are trying to start their own businesses, indicating similar intentions. However, the proportion of women who actually become is already significantly lower. It means that female students are less successful in translating their entrepreneurial intentions into actual entrepreneurial actions. It could be an indication of underused entrepreneurial potential and barriers to entrepreneurship. These factors can be divided into personal and environmental characteristics. These results support *Hypothesis 1*. Although the entrepreneurial intentions are similar between the genders, as the proportion of women and men considering pursuing an entrepreneurial career is not different, there is a difference in entrepreneurial actions.

Our second hypothesis investigated the factors influencing the gender gap. One of the major personal characteristics that can explain the gender gap in actions against similar intentions is the difference in the risk perception and risk aversion. Based on the survey female correspondents associated higher risks to entrepreneurship and at the same time they were more risk averse. This resonates with the results of Noguera et al. (2013), who found that the fear of failure is among the most influential factors of female entrepreneurship.

At the same time the cultural embeddedness of female entrepreneurship is still lag behind. Regarding the ownership structure there is a difference between the preferences of female and male entrepreneurs. While more than 50% of female entrepreneurs have at least one female co-founder, in case of men this ratio is only around 30% suggesting that male entrepreneurs are less willing to start their business with female co-founders. Based on chi-square test the difference is significant. The results are presented in Table 3.

Table 3

The proportion of students planning to start their business with at least one female co-founder by gender, and the relationship between the gender of the student and the co-founder based on the chi-square test

Variable	Total (n=183)	Female (n=117)	Male (n=66)	Significance of chi^2
Have a female co-founder	82 (44.81%)	61 (52.14%)	21 (31.82%)	0.008***
Do not have a female co-founder	101 (55.19%)	56 (47.86%)	45 (68.18%)	

Note: *, ** and *** denote significance at 0.1, 0.05 and 0.01, respectively; at the given significance, we can reject the independence of the variable and gender.

Therefore, even if the entrepreneurial intentions are similar within genders, the less cooperative attitude of male entrepreneurs may be a bottleneck for female entrepreneurial activities. This conclusion is supported by the observation that female students reported significantly higher barriers to networking and considered this

feature a hardship for entrepreneurship. This finding is consistent with the findings of Ughetto et al. (2020), who found that socioeconomic perceptions and limited networking opportunities hinder female entrepreneurship opportunities.

The gender difference is evident not only in entrepreneurial actions but also in business activities. Female entrepreneurs were more active in most aspects, and the difference was significant for discussing the business idea or product with potential customers, starting marketing efforts, and applying for a trademark or patent. It suggests that women are more thorough and versatile in managing their enterprises. The only aspect where male entrepreneurs seemed more active was seeking finance for their businesses.

Table 4

Business activities undertaken by those students who are currently trying to start their own business by gender, and the relationship between gender and business activities based on the chi-square tests

Variable	Total (n=406)	Female (n=261)	Male (n=145)	Significance of chi²
	%			
Discussed product or business ideas with potential customers	17.49	20.69	11.72	0.023**
Collect information about markets or competitors	45.81	43.68	49.66	0.247
Written business plan	16.75	17.24	15.86	0.721
Started product/service development	17.73	17.62	17.93	0.938
Started marketing or promotion efforts	17.24	21.46	9.66	0.003***
Purchased material, equipment or machinery	24.63	24.52	24.83	0.945
Attempted to obtain external funding	9.11	6.90	13.10	0.037**
Applied for a copyright, trademark, or patent	5.42	6.51	3.45	0.065*
Registered the business	7.14	7.28	6.90	0.886
Sold product or service	10.10	11.88	6.90	0.110

Note: *, ** and *** denote significance at 0.1, 0.05 and 0.01, respectively; at the given significance, we can reject the independence of the variable and gender.

Differences in self-efficacy, attitudes, subjective norms, and perceived behaviour between students by gender

This chapter analyses the factors that influence entrepreneurial intentions and actions and the differences between the genders. These factors are related to Ajzen's theory of planned behaviour and the studies related to female entrepreneurship that highlight the role of education in entrepreneurship. Table 5 shows students' responses by gender in relation to the questions measuring their self-efficacy, attitudes and perceived behaviours.

Table 5

Entrepreneurial self-efficacy, attitudes and perceived behaviours of students by gender (1=low competence, 7= high competence), and their relationship with gender based on Mann–Whitney U test

Feature	Female		Male		Total		Significance, Mann–Whitney U test
	n	mean	n	mean	n	mean	
Identifying new business opportunities	916	4.09	452	4.22	1,368	4.13	0.125
Creating new products and services	911	3.87	450	4.09	1,361	3.94	0.019**
Managing innovation within a business	907	3.91	451	4.18	1,358	4.00	0.005***
Being a leader and communicator	907	4.92	450	5.00	1,357	4.94	0.612
Building up a professional network	908	3.61	450	3.88	1,358	3.7	0.008***
Commercializing a new idea or development	907	3.88	452	4.07	1,359	3.94	0.044**
Successfully managing a business	907	4.04	451	4.18	1,358	4.08	0.280
Attitudes							
Being an entrepreneurial implies more advantage than disadvantage to me	916	4.01	453	3.93	1,369	3.99	0.500
A career as entrepreneur is attractive for me	910	4.04	452	3.90	1,362	3.99	0.223
If I had an opportunity and resources, I would become an entrepreneur	909	4.52	452	4.36	1,361	4.47	0.078*
Being an entrepreneur would entail great satisfaction for me	905	4.11	453	3.96	1,358	4.06	0.151
I would rather become an entrepreneur	908	3.94	450	3.86	1,358	3.91	0.492
Subjective norms							
Close family's support of entrepreneurial career	1,236	5.86	643	5.74	1,879	5.82	0.072*
Friends' support of entrepreneurial career	1,233	5.98	641	5.86	1,874	5.94	0.016**
Fellow students' support of entrepreneurial career	1,232	5.45	641	5.43	1,873	5.44	0.633
Perceived behaviour							
I am usually able to protect my own personal interests	916	5.52	452	5.56	1,368	5.53	0.866
When I make plans, I am almost certain to make them work	911	5.24	453	5.06	1,364	5.18	0.012**
I can pretty much determine what will happen in my life	912	5.27	453	5.25	1,365	5.26	0.675

Note: *, ** and *** denote significance at 0.1, 0.05 and 0.01, respectively; at the given significance, we can reject the independence of the variable and gender.

First, we compared the responses by gender and examined the respondents' opinions about their entrepreneurial competence. We compared entrepreneurial self-efficacy by gender using the Mann–Whitney U test. In general, the self-efficacy of women and men does not differ to a high extent, suggesting that the entrepreneurial gender gap is not substantial. There are significant differences in four aspects: creating new products and services, managing innovation, commercialising new ideas or developments, and building professional networks. This last characteristic is

consistent with our previous finding, as men are less likely to have a woman as a co-founder. This finding is also consistent with the findings of the literature.

The other areas where female entrepreneurs feel less confident are innovation and commercialising new ideas. On the other hand, there is no gender difference in respondents' self-assessment of competencies related to managing the business, communication and leadership. These results suggest that female entrepreneurs are less confident in their ability to innovate but, at the same time, would be more comfortable in managerial roles.

We also compared the respondents' answers in terms of entrepreneurial attitudes. It is interesting to note that, in general, the female respondents had more positive attitudes towards entrepreneurship than male respondents, but there is no significant difference in the entrepreneurial attitudes among the students based on gender. The only aspect where the difference was significant was entrepreneurial opportunities and resources, which suggests that women see entrepreneurial opportunities and resources as more of a barrier to starting a new business than men.

Regarding the perceptions of social norms, respondents' responses differed by gender. Again, women were more optimistic about social norms, and they felt more supported by their family and friends in pursuing an entrepreneurial career. Although the difference is slight, female students perceive significantly more support from friends and family, while support from fellow students is identical across gender groups.

Finally, we tested the respondents' perceived behaviour by gender. There is not much difference in perceived entrepreneurial behaviour. There is only one question where the rating differs significantly: women rate their behaviour better than men when it comes to implementing their plans.

Summarising the results of the factors influencing entrepreneurial intentions, we can conclude that there are differences between the characteristics of female and male students, although there is no significant difference between the intentions themselves. Based on their self-assessment, men showed a higher level of confidence in their abilities and willingness to take risks. Women, on the other hand, put more emphasis on the social environment, including the educational background. The difference was most pronounced when it came to networking and identifying business opportunities, which is in line with students' self-efficacy, whereas the women's responses showed a lower self-assessment. On the other hand, managerial self-efficacy was identical for both genders, and the role of university courses was similar. These results support *Hypothesis 2*, which states that there is a difference between female and male students' entrepreneurial attitudes, perceived behaviour, and subjective norms based on Hungarian evidence.

As a final factor, we assessed the students' opinions on the role of the university in shaping entrepreneurial activities and skills. The results are shown in Table 6. Regarding their entrepreneurial education, women were more positive about the

supportive role of the university in entrepreneurship. This reinforces the idea that education plays a more important role in formulating the entrepreneurial attitudes of female students. This result is in line with the theories that emphasise that the different socialisation processes of women and men lead to gender differences, therefore, female students have unique needs, competencies and values compared to men (Poggesi et al. 2016).

Table 6

Characteristics of entrepreneurship education based on the students' evaluation by gender (1=not at all, 7 very much), and the relationship between gender and entrepreneurial atmosphere based on Mann–Whitney U test

Feature	Female		Male		Total		Significance, Mann–Whitney U test
	n	mean	n	mean	n	mean	
Students are encouraged to become entrepreneurs	1,228	3.50	647	3.23	1,875	3.41	0.002***
Courses increased the understanding of the attitudes, values, and motivations of entrepreneurs	1,237	3.76	651	3.54	1,888	3.6	0.024**
Courses increased the understanding of the actions someone has to take to start a business	1,225	3.54	649	3.52	1,874	3.54	0.853
Courses enhanced practical management skills to start a business	1,227	3.37	649	3.37	1,876	3.37	0.869
Courses enhanced the ability to develop networks	1,225	4.58	647	4.24	1,872	4.46	0.000***
Courses enhanced the ability to identify an opportunity	1,223	4.60	647	4.29	1,870	4.49	0.000***

Note: *, ** and *** denote significance at 0.1, 0.05 and 0.01, respectively; at the given significance, we can reject the independence of the variable and gender.

Based on our results, we support *Hypothesis 3,* which states that women and men have different needs in university-backed entrepreneurship education based on Hungarian evidence. For female students, the support of universities in building networks and improving entrepreneurial skills is more important than for men. Female students gave higher ratings to factors related to the social context of entrepreneurship, including support from family and friends. At the same time, they were more appreciative of the university background, as they reported a higher added value of university courses and a more supportive environment. Based on these findings, we can conclude that the influence of the environment, including the university, is more important for female students and therefore, female students could benefit more from targeted programmes.

Entrepreneurial intentions of female and male students and the factors influencing them using logit models

In order to construct a model describing the role of the examined factors (self-efficacy, attitude, social norm, perceived behaviour, and university background), we transformed the related questions into variables using principal component analysis. In this way, we overcame the problem of the high multicollinearity of the questions related to one area. The results of the principal component analysis are presented in Appendix Table A1. The questions related to the factors influencing entrepreneurial intentions could be included in dominant components where the variance of the variables could be explained by a single factor. In order to specify the model by gender, we repeated the principal component analysis by gender. The results of the analysis did not differ significantly between the genders.

Using the components identified by the principal component analysis as explanatory variables, a binary logit model was constructed to examine the entrepreneurial intentions. Table 7 presents the results of the model that examines the entrepreneurial intentions immediately after graduating from university, while the role of education was similar in all models, as the coefficient of the 'University' variable was negative in 5 out of 6 models, and in the 6th specification, its coefficient was close to 0 with a high p-value (0.940). Our results are in line with Gubik–Bartha (2021), who found that there is a relationship between the students' perceptions of the university's entrepreneurial ecosystem and their entrepreneurial intentions. This result suggests that the higher the rating of entrepreneurial education, the lower the likelihood of having actual entrepreneurial intentions. We can conclude that the students who considered an entrepreneurial career were less satisfied with their entrepreneurial education. This result can be explained in two ways. Students considering entrepreneurship may have higher expectations regarding entrepreneurial education, in which case the lower rating comes from the demand side of the education, but at the same time, it is also possible that students planning to start an entrepreneurial career have more specific and more pragmatic needs that the university courses cannot satisfy, in which case the result shows the inadequacy of the programs. Regarding the educational background, we also tested the impact of Master programs through the variable '*Master*', but we found that in our sample, the Master's program did not significantly influence entrepreneurial intentions.

In our model, we also tested the impact of the parents' entrepreneurial background. Based on our results, we can also assume that these factors influence entrepreneurial intentions through the formulation of entrepreneurial attitudes.

Table 8 analyses entrepreneurial intentions on a 5-year horizon. We specified the models for the total sample, for the female and male students. For each specification, we used the principal components accordingly. The independent variables were dummy variables that represented the student's entrepreneurial intentions with a value

of 1 if they intended to start their entrepreneurial career after their studies or in a 5-year horizon. In this way, we specified six models. The first three models describe entrepreneurial intentions immediately after graduation, specified for the total sample of female and male students. Models 4–6 investigate entrepreneurial intentions in a 5-year horizon specified for the total sample and the sub-samples by gender.

One of our main conclusions is that gender does not influence entrepreneurial intentions at the time horizon considered. In the first model specification, including the total sample, we have included the variable '*Female*', which is a dummy variable that takes the value of 1 if the respondent is female. This variable is insignificant in the models, so we can conclude that there was no difference in the entrepreneurial intentions between genders, either right after or five years following their studies.

The explanatory variables had similar coefficients and significance in all model specifications, but there are differences based on gender and time horizon. Out of the factors of attitude, subjective norms and perceived behaviour from Ajzen's (1991) theory, only attitude was significant in our model. In all model specifications, the '*Attitude*' variable was significant with a positive coefficient, meaning that positive entrepreneurial attitudes increased the likelihood of having entrepreneurial intentions. This result is not surprising, but the role of subjective norms and perceived behaviour contradicts the theory. In all models, the '*Subjective norms*' and '*Perceived behaviour*' were not significant, suggesting that these variables do not directly increase the likelihood of choosing an entrepreneurial career. On the other hand, we found it unlikely that these factors have no influence on career choice. It is more likely that these variables have an indirect effect on entrepreneurial intentions, influencing career choice through entrepreneurial attitudes. This is supported by the correlation matrix presented in Appendix Table A2, where attitudes are significantly correlated with these variables.

Self-efficacy had a different effect on entrepreneurial intentions depending on the time horizon and gender. In all cases, the coefficient of the variable was positive, meaning that higher self-efficacy increased entrepreneurial intentions. On the other hand, while self-efficacy proved to be an insignificant variable for immediate entrepreneurial intentions, it increased the likelihood of having entrepreneurial intentions for men at the 5-year horizon. Based on previous studies, we can assume that the impact of the self-efficacy variable is captured by entrepreneurial attitude, therefore, it indirectly impacts entrepreneurial intentions (Gubik−Farkas 2022, Maheshwari−Kha 2022). In other words, entrepreneurial attitude depends on self-efficacy and transmits its impact on entrepreneurial intentions.

Table 7

Results of the binary logit models investigating the entrepreneurial intentions right after the studies for the total, female, and male samples

Variables	Dependent variable – entrepreneur career after studies					
	total (Model 1)		female (Model 2)		male (Model 3)	
	coefficient [SE]	significance	coefficient [SE]	significance	coefficient [SE]	significance
Attitude	2.096 (0.284)	0.000*	2.149 (0.345)	0.000*	2.001 (0.525)	0.000*
Subjective norm	–0.214 (0.161)	0.184	–0.262 (0.186)	0.160	0.026 (0.346)	0.939
Perceived behaviour	–0.044 (0.185)	0.814	0.078 (0.227)	0.730	–0.440 (0.354)	0.214
Self-efficacy	0.102 (0.102)	0.598	0.110 (0.230)	0.631	0.110 (0.377)	0.769
University	–0.241 (0.136)	0.076	–0.300 (0.163)	0.065	0.021 (0.280)	0.940
Mother-entrepreneur	0.737 (0.548)	0.178	0.642 (0.705)	0.363	1.012 (0.912)	0.267
Father-entrepreneur	–0.487 (0.655)	0.457	–0.329 (0.833)	0.693	–1.038 (1.139)	0.362
Both-entrepreneurs	1.065 (0.737)	0.148	0.874 (0.928)	0.346	1.702 (1.310)	0.194
Master	–0.600 (0.434)	0.167	–0.202 (0.458)	0.659	–18.393 (4315.122)	0.997
Birth year	0.000 (0.000)	0.129	0.000 (0.000)	0.144	0.000 (0.001)	0.483
Female	0.240 (0.307)	0.435	–		–	
Constant	–4.064 (0.531)	0.000**	–3.867 (0.528)	0.000**	–3.761 (1.198)	0.002*
N	1,316		883		437	
Cox & Snell R square	0.107		0.121		0.091	
Nagelkerke R square	0.309		0.324		0.315	

Note: *, ** and *** denote the significance of the variable at 0.1, 0.05 and 0.01. For the attitude, subjective norm, perceived behaviour, self-efficacy, and university variables for each model, we used the factors specific to the given sample.

In our model, we also tested the effect of the parents' entrepreneurial background. Based on our results, we can also assume that these factors influence entrepreneurial intentions by shaping entrepreneurial attitudes.

Table 8

Results of the binary logit models examining the entrepreneurial intentions 5 years after graduation for the total, female, and male samples

Variables	Dependent variable – entrepreneur career 5 years after studies					
	total (Model 4)		female (Model 5)		male (Model 6)	
	coefficient [SE]	significance	coefficient [SE]	significance	coefficient [SE]	significance
Attitude	1.717 (0.134)	0.000***	1.825 (0.482)	0.000***	1.550 (0.230)	0.000***
Subjective norm	–0.049 (0.098)	0.617	–0.0188 (0.0119)	0.113	0.245 (0.176)	0.163
Perceived behaviour	–0.079 (0.104)	0.447	–0.012 (0.128)	0.926	–0.187 (0.184)	0.307
Self-efficacy	0.291 (0.119)	0.015**	0.193 (0.145)	0.183	0.502 (0.214)	0.019**
University	–0.188 (0.086)	0.028**	–0.131 (0.104)	0.208	–0.297 (0.158)	0.061*
Mother-entrepreneur	–0.311 (0.388)	0.422	–0.087 (0.482)	0.857	–0.654 (0.666)	0.327
Father-entrepreneur	0.586 (0.457)	0.200	0.288 (0.574)	0.616	1.026 (0.765)	0.180
Both-entrepreneurs	–0.429 (0.505)	0.395	–0.180 (0.630)	0.775	–0.724 (0.860)	0.400
Master	–0.128 (0.220)	0.560	–0.025 (0.258)	0.924	–0.524 0(.447)	0.241
Birth year	0.000 (0.000)	0.216	0.000 (0.000)	0.114	0.000 (0.000)	0.649
Female	0.171 (0.172)	0.320	–		–	
Constant	–2.370 (0.320)	0.000***	–2.323 (0.0329)	0.000***	–1.860 (0.631)	0.003***
N	1,320		883		437	
Cox & Snell R square	0.279		0.290		0.269	
Nagelkerke R square	0.421		0.430		0.420	

Note: *, ** and *** denote the significance of the variable at 0.1, 0.05 and 0.01. For the attitude, subjective norm, perceived behaviour, self-efficacy, and university variables for each model, we used the factors specific to the given sample.

Conclusions

The aim of this article is to explore the differences between female and male students regarding the impact of entrepreneurial education and the environment at universities in order to gain a better understanding of how entrepreneurship can be spurred through higher education. It is a global tendency that students want to gain experience

as employees first and then try their hand at an entrepreneurial career, but this tendency is stronger among Hungarian students.

In our research, we investigated the entrepreneurial actions and intentions of students during their studies, right after their studies and in the following 5-years period and the influencing factors based on Hungarian evidence compared to the global results using the sample of the students of the University of Debrecen representing the Hungarian higher education. In our research, we formulated three hypotheses. Based on our results, although the entrepreneurial intentions are similar between genders, as the proportion of women and men who consider pursuing an entrepreneurial career are not different, there is a difference in entrepreneurial actions during their studies. The proportion of female students who are running or trying to run their business is lower compared to male students. Related to the second hypothesis, we stated that there is a difference between female and male students' entrepreneurial attitudes, perceived behaviour and subjective norms based on Hungarian evidence. Female students have less confidence in their entrepreneurial skills, they are more risk averse, and at the same time, they rely more on their social and educational background. Finally, female and male students have different opinions about the entrepreneurial education at their university based on Hungarian evidence. For women, university support is more important in building networks and improving entrepreneurial skills than for men.

The research question was whether the university environment and courses play a different role in the entrepreneurial behaviour of female students. Based on our sample, we can conclude that female students are less likely to turn entrepreneurial intentions into actual entrepreneurial actions during their studies. At the same time, the less cooperative attitude of male entrepreneurs towards women in businesses could be a bottleneck for female entrepreneurial actions. In connection with self-efficacy, we found that there are significant differences in four aspects: creating new products and services, managing innovation, commercialising new ideas or developments, and building professional networks. Our further research suggested that female entrepreneurs are less confident in their ability to innovate, but at the same time, they would be more comfortable taking on managerial roles. We found that female respondents perceived available entrepreneurial opportunities and resources as more of a barrier to starting a new business than male respondents.

Those students who were considering entrepreneurial careers were less satisfied with the support they received from their university in setting up their enterprises and developing the necessary skills. This could be the symptom of the higher demands of students who are about to start their businesses, but it could also be an indication of the shortcomings of universities in meeting students' needs regarding entrepreneurial skills. We can conclude that although the gender gap in short-term entrepreneurial intentions after graduation and five years following studies is narrowing, according to our results, students have different opinions about their entrepreneurial education

according to gender. In terms of entrepreneurial education, female respondents were more positive about the supportive role of the university in entrepreneurship. This reinforces the idea that education plays a more essential role in shaping female student's entrepreneurial attitudes. Our conclusion is that female-specific entrepreneurship programmes could narrow the gender gap in entrepreneurship.

The conclusions of our study represent the results of Hungary's largest rural university. Widening the scope of research could provide an opportunity to include more cultural and social factors in our analysis. Furthermore, it is a limitation of our study that it examined entrepreneurial intentions and actions in the short term, immediately after graduation and in 5 years. A longitudinal survey of the respondents could provide a more accurate assessment of the relationship between intentions and actions and the dynamics of students' entrepreneurial patterns, including gender specificities.

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Appendix

Table A1

Results of principal component analysis of the entrepreneurial attitudes, subjective norms, perceived behaviour, self-efficacy, and university atmosphere

Component	Total			Initial eigenvalues (% of variance)			Initial eigenvalues (cumulative %)		
	all	women	men	all	women	men	all	women	men
Attitudes (total variance explained)									
1	4.268	4.313	4.165	85.355	86.257	83.308	85.355	86.257	83.308
2	0.310	0.294	0.349	6.166	5.877	6.981	91.554	92.134	90.289
3	0.164	0.153	0.200	3.277	3.057	3.994	94.832	95.191	94.283
4	0.141	0.133	0.160	2.849	2.653	3.194	97.680	97.844	97.477
5	0.116	0.108	0.126	2.320	2.156	2.523	100.000	100.000	100.000
Subjective norms (total variance explained)									
1	2.172	2.182	2.153	72.402	72.725	71.770	72.402	72.725	71.770
2	0.529	0.505	0.574	17.646	16.836	19.125	90.048	89.561	90.895
3	0.299	0.313	0.273	9.952	10.439	9.105	100.000	100.000	100.000
Perceived behaviour (total variance explained)									
1	2.234	2.250	2.207	74.474	75.005	73.569	74.474	75.005	73.569
2	0.430	0.417	0.454	14.320	13.886	15.143	88.794	88.891	88.711
3	0.336	0.333	0.339	11.206	11.109	11.289	100.000	100.000	100.000
Self-efficacy (total variance explained)									
1	4.784	4.868	4.604	68.340	69.539	65.766	68.340	69.539	65.766
2	0.582	0.574	0.608	8.319	8.197	8.690	76.659	77.736	74.456
3	0.491	0.478	0.533	7.007	6.834	7.609	83.666	84.570	82.065
4	0.365	0.333	0.437	5.209	4.755	6.243	88.875	89.325	88.309
5	0.339	0.329	0.340	4.839	4.694	4.860	93.714	94.019	93.169
6	0.244	0.223	0.280	3.481	3.192	3.994	97.195	97.210	97.162
7	0.196	0.195	0.199	2.805	2.790	2.838	100.000	100.000	100.000
University (total variance explained)									
1	3.413	3.472	3.305	68.256	69.438	66.104	68.256	69.438	66.104
2	0.954	0.940	0.969	19.080	18.799	19.388	87.336	88.237	85.491
3	0.259	0.246	0.284	5.176	4.915	5.688	92.512	93.152	91.179
4	0.222	0.213	0.246	4.446	4.266	4.928	96.958	97.418	96.106
5	0.152	0.129	0.195	3.042	2.582	3.894	100.000	100.000	100.000

Table A2

Correlation matrix of the explanatory variables presented in the binary logit models

	Attitude	Subjective norm	Perceived behaviour	Self-efficacy	University
Attitude	1	0.430**	0.224**	0.537**	0.168**
Subjective norm	0.430**	1	0.237**	0.276**	0.178**
Perceived behaviour	0.224**	0.237**	1	0.448**	0.225**
Self-efficacy	0.537**	0.276**	0.448**	1	0.364**
University	0.168**	0.178**	0.225**	0.364**	1
Mother-entrepreneur	0.092**	0.069**	0.029	0.068*	0.028
Father-entrepreneur	0.115**	0.106**	0.087**	0.087**	0.025
Both-entrepreneur	0.075**	0.066**	0.086**	0.055*	0.026
Female	0.030	0.041	0.020	–0.064*	0.055*
Master	–0.047	0.007	0.015	0.009	–0.039
	Mother-entrepreneur	Father-entre-preneur	Both-entre-preneur	Female	Master
Attitude	0.092**	0.115**	0.075**	0.030	–0.047
Subjective norm	0.069**	0.106**	0.066**	0.041	0.007
Perceived behaviour	0.029	0.087**	0.086**	0.020	0.015
Self-efficacy	0.068*	0.087**	0.055*	–0.064*	0.009
University	0.028	0.025	0.026	0.055*	–0.039
Mother-entrepreneur	1	0.418**	–0.177**	–0.001	0.030
Father-entrepreneur	0.418**	1	0.723**	–0.006	0.022
Both-entrepreneur	–0.177**	0.723**	1	0.003	0.022
Female	–0.001	–0.006	0.003	1	0.042
Master	0.030	0.022	0.022	0.042	1

Note: ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

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