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Weaknesses of entrepreneurship education in science, technology, engineering and mathematics education in developing countries: empirical evidence of Kosovo

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Abstract: Science, technology engineering and mathematics (STEM) students are supposed to be better equipped to use new technologies and to customise them for the local needs. But most STEM students are not 'born for entrepreneurship'. Their low level of entrepreneurship awareness may be due to lack of entrepreneurship education. Determining a way to establish an entrepreneurship education, especially for STEM students, and evaluating its impacts on economic and social change is complex, particularly in developing countries (DCs). Our paper seeks to contribute to this debate by examining the case of Kosovo. The objective is to understand the reasons for the lack of entrepreneurship education for STEM students and to review the current strategy of Kosovo in tackling the entrepreneurship education for STEM students. The paper stresses at least three complementary reasons linked to the entrepreneurial ecosystem, the behaviour of higher education institutions (HEI) and the behaviour of the students.

Keywords: entrepreneurship education; STEM; curricula; Kosovo; developing countries.

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1 Introduction

Nowadays, entrepreneurship is considered as one of the main drivers of economic growth and boosting its innovation (Sexton and Bowman-Upton, 1991; King and Levine, 1993; Davidsson et al., 2002; Acs, 2006; Fritsch, 2011; Sautet, 2013; Prieger et al., 2016; Audretsch, 2018; Ferreira et al., 2018). While entrepreneurship is strongly recommended for the development of a country, the way to foster entrepreneurship or to build the skills of the next generation entrepreneurs is still in debate (Acs et al., 2012; Litan et al., 2008). Policy makers have no 'magic potion' to tackle the two and are asking scholars and consultants for strategies and techniques.

This is particularly true in developing countries (DCs), where the effect of entrepreneurship on economic growth is still in debate (Audretsch et al., 2002; Litan et al., 2008). In fact, most of the entrepreneurs are 'survival' entrepreneurs with lack of skills and creating small businesses with small chance to survive in the future (Naudé, 2011). Moreover, this kind of entrepreneurs is creating 'turbulence' by not letting the good entrepreneurs to establish more efficient firms (Quatraro and Vivarelli, 2014). In contrast to survival entrepreneurs, 'Schumpeterian entrepreneurs' are innovators that are seeking business opportunities with technological change and innovation (Stam and van Stel, 2011; Vivarelli, 2013; Silvestre, 2015). They are using more efficient production methods and are basing their businesses on innovation. With the information and communication technologies (ICT) they also have the capabilities to set 'start-ups' that seek global markets instead of developing businesses only for their home countries. Several success stories are reported worldwide and have led to promotion of startups through public policies.

The entrepreneurship education has been a subject of study in the recent years due to its importance to establish new businesses and develop relevant skills and competences to cope with uncertainty in the business world (Fayolle et al., 2006; Souitaris et al., 2007; Liñán et al., 2011; Zhang et al., 2014; Nabi et al., 2021; Tung et al., 2020; López et al., 2021; Sherkat and Chenari, 2020; Uddin et al., 2022; Wang et al., 2022; Liu et al., Ahmed et al., 2020). Among others entrepreneurship education is considered important to enhance entrepreneurial creativity in the university (Wang et al., 2022). And a successful model of entrepreneurship education in the higher education contributes to altering participants' entrepreneurial intention, develops skills and decreases entrepreneurial impediments (Liu et al., 2021). Additionally, participation in higher education programs is indicated to have positive outcomes for the graduate by developing their skills, expanding knowledge, and offering them the opportunity to approach different business members (Stephens, 2020). A study exploring the correlation between entrepreneurship, unemployment, and education in South Africa, found a significant long run relationship among the variables, especially notable association between education, proxied by school enrolment, and entrepreneurship (Kaseeram and Mahadea, 2018).

To foster entrepreneurship and to increase innovation in the economy, several international development agencies are pushing towards the promotion of entrepreneurship education especially in science, technology engineering and mathematics (STEM). STEM students are supposed to be better equipped to use the new technologies and to customise them for the local needs. But most of STEM students are not 'born for entrepreneurship' and may lack some basic training to develop the required skills. Their low level of entrepreneurship awareness may be due to lack of

entrepreneurship education. Therefore, placing entrepreneurship in STEM curricula and fostering their awareness for entrepreneurship may increase the rate of students that will develop their own business and start-ups.

Determining way to establish an entrepreneurship education, especially for STEM Students, and evaluating its impacts on economic and social change is complex, particularly in DCs. Our paper seeks to contribute to this debate by examining the case of Kosovo. Our objective is to understand the reasons of the lack of entrepreneurship education for STEM students and to review the current strategy of Kosovo in tackling the entrepreneurship education for STEM students. Our analytical part of the paper stresses at least three complementary reasons linked to the entrepreneurial ecosystem, the behaviour of higher education institutions (HEIs) and the behaviour of the students. Our work is based on interviews conducted with most of the key decision makers and directors of HEIs related to STEM in Kosovo. We have also reviewed all the policy documents dedicated to higher education.

Following the work of Fayolle and Gailly (2008), our paper aims to focus on better understanding the way pedagogies, teaching models, contents and support mechanisms impact the entrepreneurial process in S&T environment in Kosovo? We intend to highlight the challenges faced by technocrats in becoming well-trained and successful entrepreneurs. To do so, we examine the degree to which Kosovo's higher education strategy tackles the issue and the level of resources allocated for it. Furthermore, we aim to answer the following questions: how the HEI are implementing the recommendations if any? How are they designing the curricula? What are the expectations of the students? How are these expectations addressed?

Our paper is structured in the following way: Section 2 discusses the higher education system in Kosovo and the challenges pertaining to STEM education. Section 3 surveys the literature and discusses the foundations of education of entrepreneurship in STEM. Section 4 presents our methodology and the interviews. Section 5 discusses the perception of the situation by the administration. Section 6 presents the perception of the situation by the students and our analytical results on surveys to students. Section 7 draws the main conclusions and the political recommendations.

2 Higher education in Kosovo: opportunities and challenges

Kosovo has a population of 1.8 million (http://ask.rks-gov.net/en/kosovo-agency-of-statistics) and it has the youngest population in Europe. 70% of its population is under 35 years old. With an unemployment rate of 25.9% in 2020 (http://ask.rks-gov.net/en/kosovo-agency-of-statistics), it entails a relatively poor rate of economic growth. GDP per capita is US$4,145. The economic growth has not been satisfactory to provide sufficient new job places, especially for women and youth, to reduce the unemployment rate. Overall, economic growth of Kosovo in the last ten years surpassed its neighbours, but it was not enough to create a sustainable economic development (The World Bank in Kosovo, 2021).

Its investment in education in 2018, relative to GDP accounted for 4.5%. Kosovo's public spending on education in 2020 remained unchanged, at 4.7% of GDP. On the other hand, the amount spent per student is quite low and mainly dedicated for salaries and capital expenditures. The quality of education remains unsatisfactory (European Commission, 2021).

Like many transitioning economies, Kosovo has undergone the process of privatisation of its economy. This process has been characterised with many contradictions. In many privatised factories, the owners have built new buildings or transformed the privatised properties into trading centres. Nowadays, the economy of Kosovo has no developed industry, and it entails a young population which is wandering in search for a job. Labour market is characterised with a high unemployment rate, which is predominantly higher among youth, while there is also a lack of required skilled staff to match the needs of the economy. There are numerous structural, multi-sector and interconnected limitations to employment, including stagnant economic and labour demand growth, competence and skill mismatches, as well as excess supply of labour force; all of which have influenced the labour market in recent years.

There are still low levels of foreign direct investment. This is due to the poor infrastructure, delays in privatisation and political uncertainty. It takes time for foreign companies to test and gain credibility as safe countries that offer security to the foreign investors. Furthermore, education sector is quite diverse, as it is comprised of public and private institutions. Curriculum that is offered in both sectors is not based on the labour market demands.

Based on several reports, an important feature of the overall difficult labour market situation are the very unfavourable labour market outcomes for young people. According to Kosovo Strategy for Youth 2019–2023, entrepreneurship is seen as a promising tool for the private sector development, in order to boost employment of youth, and resulting on increasing the economic growth. However, one of the identified barriers for proper entrepreneurship development is inadequate education in entrepreneurship. Consequently, improved education and trainings as instruments that links higher education and business sector are key factors for sustainable and inclusive growth.

So far, investments into education, skills and qualifications have typically been low, in which the impact has reflected into business sector. In general, employment opportunities of young graduates in the private business sector are widely recognised as limited. Since unemployment rate remains high and rising, education, training and internship programs are needed to address the existing skills mismatch. Young people across the country are a major source of human development and at the same time one of the key agents for social, economic and technological change. The format in which the challenges and potentials of young people are addressed by policies, affect the social, economic and the welfare of future generations. Addressing the issue of science and technology entrepreneurship education is key for the future development of the private sector and decreasing of unemployment among youth by generating new jobs and boost competitiveness of the market.

3 Developing entrepreneurship education for STEM students: a literature review

To review the existing literature and to discuss our analytical foundations we divide this section in three subsections answering these two complementary questions:

a What are the new roles of the tertiary education institutions?

b Why DCs need to develop entrepreneurship for STEM students?

c How to develop entrepreneurship for STEM students?

d What are the reasons of the lack of entrepreneurship education in DCs?

3.1 The new roles of tertiary education institutions

Nowadays, the role of university can be manifold. Beside its role to educate new generations, it can have a large impact on development of the society. Its contribution is considered to be relatively large especially on generation of employment and new products and services, through entrepreneurial activities (Horta et al., 2016). The universities should play a major role not only on promoting and facilitating entrepreneurship but also enable transformation into entrepreneurial society (Audretsch, 2014). Along with their entrepreneurial activities, its contribution is quite huge on increasing regional competitiveness, as well (Guerrero et al., 2016).

To this extent, the higher education institutions need to be aware of its new role. Thus, in order to achieve this they need to introduce tools that foster entrepreneurial activities of the universities. The higher education institutions by enforcing new learning tools and techniques that stimulate knowledge, skills and competences might contribute on changing the mindset of students and enable them to become more innovative (Guerrero et al., 2014). To this extent, the higher education institutions need to be aware of its new role. Thus, in order to achieve this they need to introduce tools that foster entrepreneurial activities of the universities. The higher education institutions by enforcing new learning tools and techniques that stimulate knowledge, skills and competences might contribute on changing the mindset of students and enable them to become more innovative (Guerrero et al., 2014).

Since high level of knowledge is concentrated in the universities, the objective should be towards creation of innovation systems, by using the academia knowledge. Many developing countries have started to pay an increased attention to strengthen cooperation among the higher education institutions and business community. A research conducted shows that the connection of the universities with the industry depends so much on quality of the cooperation, rather then the level that the higher education institutions are linked to the firms (Fischer et al., 2017). Those persons having attained previous knowledge on entrepreneurship will have a higher probability to engage themselves in entrepreneurship activities (Braunerhjelm et al., 2016). This way they will be able to better use the opportunities coming from the entrepreneurship.

3.2 Why we need to develop entrepreneurship for STEM students?

There are at least three complementary arguments explaining the reasons behind the need to promote entrepreneurship among STEM Students. Firstly, most of less developed countries are suffering from a ‘growth penalty’ (Audretsch et al., 2002). In other words, a marginal increase in the rate of entrepreneurship in DCs will increase the growth rate. Since the number of entrepreneurs in DCs is suboptimal and these countries need to increase the number of entrepreneurs promoting entrepreneurship especially among qualified population as it becomes fundamental for their economic growth.

Secondly, most of DCs have many self-employed people. Most of entrepreneurs are ‘survival entrepreneurs’ not creating enough values. Several research conducted, starting from the seminar paper of Acs (2006) show that ‘self-employment’ is negatively

correlated with income per capita. Increasing 'self-employment' and survival entrepreneurs has negative impact on economic growth. Since then, it is recommended to promote 'Schumpeterian' and innovators entrepreneurs. Institutions may play an important role to promote entrepreneurship among skilled students and skilled persons. Promoting entrepreneurship education among STEM students has become key policy. Otherwise, the rate of entrepreneurs among these students is too low. The populations of 'potential entrepreneurs' are good candidates to become 'innovators' and 'Schumpeterian' entrepreneurs, accelerating the economic growth of a country and its sustainability.

Thirdly, policy makers need to promote innovation and remove roadblocks to national economic growth by fostering entrepreneurship (Litan et al., 2008). It is well established that increasing the 'R&D capabilities' of a country will decrease the 'growth penalty' due to lack of qualified entrepreneurs (Prieger et al., 2016). In fact, in order to increase the 'R&D capabilities' of a nation we need to build a national innovation system and to coordinate its actors (Lundvall, 1992). In the case of African countries several papers have shown the link between setting the right institutions and increasing the rate of innovation and technology use (Arvanitis and M'henni, 2010).

3.3 How to achieve entrepreneurship for STEM students?

Entrepreneurship education is a focal point in the promotion of entrepreneurship awareness (Fayolle, 2013). It plays an important role in shaping the entrepreneurial intentions, increases the potential to undertake startups and plan their growth strategies. Moreover, by transferring entrepreneurial skills to this audience (Barr et al., 2009; Phan et al., 2009), science and technology entrepreneurship education might raise their awareness about the opportunities and challenges of entrepreneurship to promote technology transfer (Markham et al., 2000).

It will empower them to shape their future by being more entrepreneurial in their activities and careers and imparts preparedness to undertake entrepreneurial challenges. However, and in spite of the face validity of teaching technology entrepreneurship, there has traditionally been only a weak link between the fields of research, entrepreneurship education and technology transfer and commercialisation (Nelson and Monsen, 2014). Prior research suggests that one could gain by drawing more heavily from technology management and the economics and sociology of innovation when formulating explanations for S&T entrepreneurship.

Until recently, in the technology management education literature, traditionally there has been less emphasis on venture creation and entrepreneurial technology-based firms. Consequently, STEM education remains a relatively unexplored topic that offers a variety of opportunities for scholarly inquiry (Kingon et al., 2002).

3.4 The reasons of lack of STEM education in DCs

In the specific context of emergent countries, we propose to focus on the weakness of STEM education in DCs. The literature stresses three main reasons for the weak development of entrepreneurship in STEM education. First is the weak development of entrepreneurship ecosystem. STEM entrepreneurship education is not well developed because the entire ecosystem for entrepreneurship is not in place in these countries.

Incentives for entrepreneurship are not in place and to some extent entrepreneurs are deterred to put in place their plans because they are not expecting to obtain the right returns on their investment. This is the case for countries characterised by corruption, rent-seeking activities and weak governance.

Secondly, weak, and fragile development of higher education system prevents the entrepreneurship education in the STEM education. Most of the DCs have fragile higher education sector. They are facing challenges in matter of 'booming' population of students and they are worried mainly by the quantitative challenges. They extend mainly the higher education where the marginal cost is weak (i.e., social science) and do not put the necessary efforts on the STEM higher education which is considered as costly.

Thirdly, several factors linked to the students' behaviour induce less demand for entrepreneurship lectures, courses and seminars. Students in DCs may have been accustomed to an education system where the private initiative and interactions are absent. They do not possess the good intentions towards entrepreneurship and they are more formatted to be technocrats than entrepreneurs. Since then, the cultural dimension of the behaviour of the students is key for entrepreneurship. Entrepreneurship is widely developed in India, while it is not developed in several countries of Africa.

We propose a model linking these three dimensions, that is explaining the lack of entrepreneurship in STEM education in DCs and applying it to the case of Kosovo.

4 Methodology and data collection

We have run two surveys: one for the students and the other for the 'managers' of the universities. For the managers' survey, we have used open-ended questionnaires. The respondents have answered the questions on their own. Surveys were conducted with the representatives of management (i.e., rector, vice-rectors, deans) of the public HEIs across Kosovo. We have conducted fifteen (15) face-to-face meetings to conduct the interviews. The aim of the survey was to find out if the STEM curricula in developing countries, as is the case of Kosovo, contain some entrepreneurship elements. Some of the addressed questions have taken into account the competences of the EntreComp conceptual model, of the entrepreneurship competence framework. The data has been processed by using text mining technique (Carenini et al., 2011).

In order to strengthen our findings and to better understand the gap between existing curricula and the expectations of the students, we run a second questionnaire for the students in STEM Education. 389 questionnaires were collected among 400 questionnaires distributed. The questionnaire was distributed during the teaching hours and the answers were mandatory. The aim of the questionnaire was to identify if the study programs of science, technology, engineering and mathematics has elements of entrepreneurship education, in the higher public education institutions of Kosovo. It has targeted students at the public universities in Kosovo. Questionnaire comprised of different parts: demographic factors; questions related to the entrepreneurship elements in STEM curricula, if the current study program has provided students with the entrepreneurial skills. We have also aimed at getting an insight from students as what kind of job they would like to work in the future, or if they have a preference to start their own company in the future.

5 STEM entrepreneurship in Kosovo: the perception of the 'administration'

The interviews that we have conducted gave us an important feedback on the challenges faced by Kosovo and how the country needs to tackle them. We divide our findings in three main parts as discussed previously in the analytical part:

1 the weakness of the Kosovar ecosystem for entrepreneurship

2 the weakness of the HEIs

3 weakness of the behaviours of the students within the STEM education.

5.1 An ecosystemic weakness for STEM entrepreneurship education

Kosovo although a small country, it has nine (9) public HEIs, and twenty-one (21) private HEIs. A common feature of most of the private and public HEI is that they offer study programs in the field of law and economics. Two main explanations may be given for such a feature. First and foremost, STEM education needs more resources such as labs, qualified teachers and staff as opposed to social science and art disciplines. Public resources are lacking, and private schools prefer to invest in fields in which the benefit/cost ratio is higher. This leads to a high number of students enrolled in social sciences and little number of students in STEM education. This situation is not optimal for the country since labour market in Kosovo does not need that huge number of graduates in the field of law and economics. As a result, we have a rising number of 'unemployed graduates' in the field of law and economics. Kosovo with a poor rate of economic growth, by offering study programs which are not demanded by the labour market, will further increase the number of unemployed people. Increasing the number of students in STEM education is needed in the near future and most of the interviewed persons agree on this.

Most of the interviewed persons agree that HEIs through their study programs can play a crucial role in the regional development. Suburban and rural areas can significantly improve their living conditions and become more attractive for the population living there. As a young nation, Kosovo needs STEM students to play a key role in the regional development. For the moment, Kosovar students are more involved in the public administration and less in the entrepreneurship dynamics. Few entrepreneurs have followed STEM education and the HEI have increased their awareness about this lack in the last years. However, one needs to mention that Kosovo is also suffering from brain drain. Qualified students with STEM education are leaving Kosovo for the European Union, especially Germany, which offers higher salaries and better living conditions. This dynamic prevents the generation of the new class of entrepreneurs and new knowledge for the entire economy.

It is noticed that cooperation with the labour market for designing study programs is not mentioned to be part of the process, except for the faculties of electrical engineering and mechanical engineering. In the later responses, it is stated that: "a well-established cooperation with the labour market is in place via boards, which do have representatives from the business community". These boards give their opinions with regard to the new study programs or changes in the existing ones. The HEIs that do not have inside their institution such a board, do a market research. This statement is still vague, as there

should be further research conducted on how often the boards meet and give feedback, also the way the market research is conducted.

5.2 HEI weaknesses and entrepreneurship education for STEM students in Kosovo

Our analysis of the interviews has pointed three complementary explanations for the weakness of entrepreneurship education in Kosovo: lack of strategic orientation, the decision-making process for curricula design and students' approach towards the education which is rather 'consumerist' and less pro-active.

5.2.1 Lack of strategic documents and strategic orientation

Until lately, most of the public and private HEIs lacked strategic documents. Their decisions were mostly taken on an ad hoc basis, including the decisions about the offered study programs. After the pressure from the relevant national bodies, now most of the HEIs do have a Strategic Plan varying from three (3) to five (5) years. These strategic documents however, have not focused on entrepreneurship for STEM Students.

5.2.2 A complex decision-making and lack of autonomy of the HEI in matter of curricula design

Proposals for initiating a new study program should come from the Department of the Faculty. If at the faculty council proposal passes then it is further decided by the senate. In some of the cases, the final decision is taken by the university board which gives the approval if the Institution has financial resources to support the program. If the study program passes all the levels within the Institution, then it is sent to the National Accreditation Agency for final decision.

5.2.3 Decision makers perception about entrepreneurship

Entrepreneurship education is mostly taught in social science curricula and not in STEM education. Public HEIs in Kosovo are mainly publicly funded by the government. It is noticed that the faculties, which do have study programs in the technology field, generate a lot of extra funding from the cooperation with the external stakeholders, in comparison to the faculties from the other fields. The current budgetary situation of the public HEIs does not allow them to keep and use surplus. This way the legal framework does not allow to use generated funds from university-business cooperation for the needs of the university. They are all returned to the budget of the Republic of Kosovo. HEI should help the country to meet its societal and scientific needs and to increase economic development of the country. In order to contribute to the development of innovation and science, essential instruments and tools should be established to support HEIs and academic staff to create their own revenues. The funds can be used for entrepreneurship promotion by funding start-ups, incubators or entrepreneurship seminars.

All of the interviewing HEIs, mentioned the fact that entrepreneurship is taught as a course or offered as a study program at the Faculty of Economics, while the faculties in science and technology do not have such a module. Moreover, it is also the National Accreditation Agency that is asking also from other faculties, including faculties offering

study programs in the field of science, to offer modules on entrepreneurship. The interviewed institutions do not have business start-up centres or scientific parks, with the exception of the largest public HEI in the country, which has recently established one. It is in the early stage of the establishment and it is hard to assess its role in increasing the entrepreneurial activities at the university level, including science and technology study fields.

5.3 Learning styles and student's interest do not contribute to entrepreneurship in STEM education

5.3.1 Interactive learning is progressing in STEM education however it is not linked to entrepreneurship

With regard to the interactive methods of teaching and learning, some of the HEIs only claim to use them, but do not give many details. However, the answers of the institutions located in Prishtina, the capital of Kosovo, do claim to use student-centred learning. Moreover, the HEIs located in more suburban areas of the country appear to have less access to training opportunities pertaining to contemporary teaching and learning methods. Learning by doing is included in the study programs of engineering field and is very typical for the University of Applied Sciences. These are very important skills that teach students to reflect on themselves and learn from each other's experience. Case studies are further used as part of teaching activities in the engineering and economics faculties. Internships are also considered as an important part of their curricula, where students are allocated with a certain number of credits. Students work in small groups as part of different seminar work across different types of study programs. Working in teams, will help students to further develop their ideas, and also learn how to cooperate with other peers and also manage different situations.

With regard to the question if the offered study program helps students to identify and seize the opportunities, which is an important skill to develop the entrepreneurial spirit, the HEIs failed to answer clearly and correctly. This would further help students to identify needs and challenges to create opportunities and value. In a complex and dynamic environment, preparing graduates to be creative would help them to be able to give better solutions to difficult situations in the future. In the case of Kosovo, only university of applied sciences has paid attention to such elements, while other institutions are far behind.

Due to the current economic and social situation, which does not generate a lot of jobs yearly, preparing graduates who can envision the future and turn ideas into action seems quite a challenging task for the HEIs that should be addressed in the future. It is also related more to the external factors.

5.3.2 While soft-skills and self-initiative are taught in current STEM education there is no link with entrepreneurship

Most of the engineering study programs teach graduates on how to take self-initiative, which is very important to prepare students to work independently, while preparing them to cope with uncertainty, ambiguity and risks is only partly achieved. However, they do not link these skills with entrepreneurship aims. One plausible recommendation is to link more these 'courses' with entrepreneurship and prepare students for taking initiatives in

order to run new businesses. Moreover, as part of the soft skills, there are only few HEIs that do offer training on career development mainly through specialised centres with a future plan to expand the offer. Professional courses are still in the early phase of their bloom. It means there are only discussions within the HEIs to start offering them, but no concrete action so far.

There are a few extracurricular activities organised for students, which mainly refer to excursions. Other extracurricular activities are not mentioned to be offered as part of the study programs. Students are not aware by the opportunities in the private sector and the possibility of opening new businesses and start-ups.

Encouraging and supporting public universities to be as independent as possible from public financing. Study programs should ensure that their graduates are provided with generic skills which are crucial for the employability aspects. Thus, linking entrepreneurship with professional and technical education can be advantageous in the future. In Kosovo entrepreneurship education terminology seems quite new. Thus, entrepreneurial education needs to be promoted more and integrated into the curricula of the science and technology fields in order to get very best of it. Government should consider investing on educating human resources in the fields which do have potential on generating economic development. In this way, also investment in research and development should be increased.

6 Perceptions of the student of STEM entrepreneurship in Kosovo and empirical results

Several demographic variables of survey respondents are collected, including age, gender, ethnicity, marital and work status, the year of study, and the university that survey respondents attend. Age is a numerical variable. A dummy variable is created for gender (1 = female, 0 = male). There are six categories for ethnicity – Albanian, Serbian, Turkish, Bosnian, Roman and other. Marital status has five categories – married, single, divorced, widowed and other. Level of studies is presented by three items ranging from 1 (bachelor) to 3 (doctorate degree). Employment [employed (1) or not (2)] is included in demographics of participants. The data is collected from four different universities – Hasan Prishtina, Haxhi Zeka, Ukshin Hoti and University of Applied Sciences.

Table 1 summarises the demographics of participants. The mean age is 19 years old. There are 397 males (57.70%) and 291 females (42.30%) in the sample. Of all these students, 675 (98.11%) identified themselves as Albanian. Regarding marital status, a great majority of students are single (98.11%). A total of 13 participants reported being ‘married’, ‘divorced’, ‘widowed’ or as ‘other’. Seventy-four (10.76%) survey respondents are employed and 614 (89.24%) of them are not working. Regarding to the Level of study, 663 (96.23%) of the students are in Bachelor’s program and 24 (3.48%) are in Masters, and 2 (0.29%) of them are in PhD program. Regarding Year of studies, 71.80% of the participants are in their first year, 12.65 % of them are in the second, 11.34% of them are in the third, 4.21% of the participants are in their 4th year or more. As far as the University the participants attend is concerned, 56.46% of the participants were attending Hasan Prishtina, 8.71% of them were attending Haxhi Zeka, 25.40% were attending Ukshin Hoti and 9.43% of them were attending University of Applied Sciences when the survey was conducted.

Table 1 Descriptive statistics of participant demographics

Variables		*Estimated mean*	*Standard deviation*
Age		19	2.63
Variables		*N*	*Percentage*
Gender	Female	291	42.30
	Male	397	57.70
Ethnicity	Albanian	675	98.11
	Other	13	1.89
Marital status	Single	675	98.11
	Other	13	1.89
Level of studies	Bachelor	663	96.23
	Master	24	3.48
	PhD	2	0.29
Year of studies	1	494	71.80
	2	87	12.65
	3	78	11.34
	4 or more	29	4.21
University	Hasan Prishtina	389	56.46
	Haxhi Zeka	60	8.71
	Ukshin Hoti	175	25.40
	University of Applied Sciences	65	9.43
Employment	Employed	74	10.76
	Not working	614	89.24

Table 2 summarises the students' family demographics. Participants have on average three siblings. A majority of survey respondents have two parents (90.38%). As far as the place where the family lives, 330 (49.11%) of the participants' family live in urban area, whereas 342 (50.89%) live in rural area. On average mothers are less educated than fathers. Regarding family income, 16.33% of the participants stated that their family income is less than €250, and 59.08% of them claimed a family income between €250 and €750. 24.59% of survey participants' family income is more than €750. 33.04% of respondents state that at least there is one member in the family who is an entrepreneur, whereas 66.96% of respondents do not have an entrepreneur in the family.

Participants' perceived readiness to start a business is measured by a single question. Participants were asked 'do you think that when graduated you will be prepared well enough to take self-initiative?'. This question is measured with a three-response scale – agree, disagree and undecided.

Table 2 Descriptive statistics of participants' family demographics

Variables		*Estimated mean*	*Standard deviation*
Number of siblings		3	1.49
Variables		*N*	*Percentage*
Family structure	Two parents	620	90.38
	Single parent	66	9.62
Place	Urban	330	49.11
	Rural	342	50.89
Father's education	Primary or less	53	7.82
	Secondary	314	46.31
	Bachelor	186	27.43
	Masters or more	124	18.44
Mother's education	Primary or less	195	28.84
	Secondary	319	47.19
	Bachelor	117	17.31
	Masters or more	45	6.66
Family income (monthly)	Less than €250	89	16.33
	€250 to €750	323	59.08
	More than €750	134	24.59
Family member is an entrepreneur?	Yes	187	33.04
	No	379	66.96

We statistically test the following hypotheses to test the relation between students' intention to be an entrepreneur, demographics of participants and their family demographics.

Hypothesis 1 There is a significant relationship between:

- a the age
- b the gender
- c the level and year of the study of the respondent
- d marital status
- e the university the respondent attends and whether the respondent has an intention to be an entrepreneur.

Hypothesis 2 There is a significant relation between:

- a the place the respondent's family resides
- b father's and mother's education
- c family income
- d whether there is at least one member in the family who is an entrepreneur, and whether the respondent has an intention to be an entrepreneur.

The results can be found in Table 3. The Pearson chi-square test was conducted to assess the relationship between demographics of participants and their intention to be an entrepreneur in the first hypothesis. As Table 3 shows, the relationship between gender and intention to be entrepreneur is statistically significant. They are not independent, whereas the relation between the remaining demographics and the intention to be an entrepreneur is not statistically significant at the 5% level.

Table 3 Pearson chi-square analysis: participants' demographics and intention to be an entrepreneur

	Value	*Asymptotic significance (2-sided)*
Age	3.7200	0.2530
Gender	10.8842	0.0043***
Marital Status	4.2497	0.3733
Level of Studies	4.4358	0.3502
Year of Studies	10.9390	0.2052
University	7.1782	0.3047

Note: ***, **, * represent significance at 1%, 5%, and 10% level, respectively.

Table 4 summarises the results of Hypothesis 2. The results show that the intention to be an entrepreneur depends on the place where family resides at 10% significance level. However, the intention to be an entrepreneur does not depend on father's or mother's education, family income, and the presence of entrepreneurs among the family of the student.

Table 4 Pearson chi-square analysis: participants' family demographics and intention to be an entrepreneur

	Value	*Asymptotic significance (2-sided)*
The place family lives	11.2679	0.0804*
Father's education	9.5581	0.6547
Mother's education	12.0821	0.4391
Family income	12.5465	0.5625
Family member is an entrepreneur	0.8886	0.6413

Note: ***, **, * represent significance at 1%, 5%, and 10% level respectively.

Table 5 shows clearly that the main skills needed for entrepreneurship are not provided by HEI in Kosovo. Except acquisition of the information about legal and commercial aspects, the percentage of students who disagreed is higher for the remaining needed skills. Therefore, the survey results show that there is a *skill gap* in STEM education in Kosovo. Even if the information is a perception of the students and not about the existence of such lectures or courses, it indicates that there is a room for improving the situation by addressing this skill gap. This is particularly true because a large proportion of students would like to set-up their own business after graduation. Table 6 shows that 76% of the students believe that they will be able to run a business on their own initiative after their graduation (question 13). Referring to Table 5, only 16% think that the curricula are developing their skills in terms of creativity and 14% think that this is the

case for teamwork. Those figures indicate clearly that the teaching methodology needs to be changed.

Table 5 Descriptive statistics – the entrepreneurship skills and their acquisition by students in STEM education in Kosovo

My study program has provided me with the following skills:		*Agree*	*Disagree*	*Undecided*	*N*
1	Teamwork	14%	*69%*	18%	643
2	Identify and seize opportunities	13%	*54%*	33%	665
3	Creativity	16%	*57%*	27%	661
4	Imagine the future	11%	*69%*	20%	668
5	Being able to turn ideas into action	16%	*60%*	24%	655
6	Take initiatives	13%	*54%*	34%	651
7	Act responsibly	6%	*80%*	14%	667
8	Coping with risks, uncertainty and ambiguity	12%	*59%*	29%	661
9	Knowledge about a how to start a business	31%	*44%*	25%	663
10	Information about the legal aspects on how to start a business	37%	33%	30%	665
12	Knowledge about commercial aspects of doing business	37%	29%	34%	615
13	Confidence	16%	*62%*	22%	663
14	Risk taking skills	17%	*56%*	27%	661
15	Time management	12%	*73%*	15%	154

Referring to Table 6, 49% of survey respondents think that their study program does not have a content related to entrepreneurship. Besides, more than half of the respondents do not think there is a business start-up centre or a science park at their institutions. Finally, the majority of survey participants did not attend trainings or extra circular activities to develop soft skills that are needed to be an entrepreneur.

In order to better understand the link between the aim of entrepreneurship and current skills development in STEM education, we run Pearson chi-square tests. We test the following hypotheses:

Hypothesis 3 There is a significant relationship between having the study program an entrepreneurship content (courses/lectures) and whether the respondent has an intention to be an entrepreneur.

Hypothesis 4 There is a significant relationship between having a business startup centre or science park at the institution and whether the respondent has an intention to be an entrepreneur.

Hypothesis 5 There is a significant relationship between the study programs that develop creativity skills and whether the respondent has an intention to be an entrepreneur.

Hypothesis 6 There is a significant relationship between a study program that prepares the students well enough to imagine the future and turn ideas into actions and whether the respondent has an intention to be an entrepreneur.

Hypothesis 7 There is a significant relationship between the respondent attending several trainings at their institution, to develop soft skills and whether the respondent has an intention to be an entrepreneur.

Table 6 Descriptive statistics – the entrepreneurship curricula and the intention of entrepreneurship by students

Survey questions		*Yes*	*No*	*Don't know*	*N*
1	Do you think that your faculty cooperates with the labour market for developing study programs?	*39%*	23%	38%	386
2	*Does your study program (courses/lectures) have a content related to entrepreneurship?*	31%	*49%*	20%	383
3	Does your study program include interactive methods of teaching and learning?	*65%*	18%	18%	381
4	Does your study program apply learning by doing approach?	*70%*	22%	8%	384
5	Referring to courses that are taught, do you use case study as part of teaching and learning method?	*60%*	15%	25%	383
6	Did the curriculum incorporate internship as mandatory part of the program?	*56%*	24%	20%	383
7	*Did your institution have business start-up centre/or science park?*	14%	*58%*	28%	379
8	Are you working in small groups for different assignments?	*77%*	16%	7%	385
9	Does your study program prepare you to identify and seize opportunities?	*60%*	19%	21%	381
10	Does your study program help develop creativity skills?	*70%*	19%	11%	383
11	Does your study program prepare you well enough to imagine the future and turn ideas into actions?	*59%*	23%	18%	382
12	Have you attended several trainings at your institution to develop soft skills?	17%	*71%*	12%	380
13	*Do you think that when graduated you will be prepared well-enough to take self-initiative?*	*76%*	7%	18%	384
14.	Does your study program prepare you to cope with uncertainty, ambiguity and risks?	*49%*	24%	27%	382
15.	During your studies, have you attended several extracurricular activities offered in the frame of the study program?	38%	*53%*	9%	384

Table 7 Pearson chi-square analysis: entrepreneurship in STEM education and intention to be an entrepreneur

	Value	*Asymptotic significance (2-sided)*
Study program having entrepreneurship content	3.2308	0.5200
Institution having a business/start up or science park	5.9053	0.2063
Study programs developing creativity skills	39.5845	0.0000***
Study program that prepares the students well enough to imagine the future and turn ideas into actions	50.7916	0.0005***
Respondent's attendance trainings at their institution to develop soft skills	11.7138	0.0196**

Note: ***, **, * represent significance at 1%, 5%, and 10% level, respectively.

Table 7 summarises the test results. The first test indicates that there is no interaction between the aim of entrepreneurship and the fact that current curricula contain course or lectures related to entrepreneurship. From this test one can conclude that current curricula of entrepreneurship have no impact on the intention of becoming entrepreneurs or that there are no entrepreneurship courses at all! Moreover, the second test shows that there is no interaction between the aim of entrepreneurship and the existence of science parks within the universities. Most of the students are not caring about the science parks of the business start-up centres and their intention of becoming entrepreneurs! The values and missions of the business start-up centres, and science parks are not well perceived by the students. However, the third test indicates that there is an interaction between developing creative skills and the intention of entrepreneurship. Descriptive statistics indicates that according to the students 70% of the current programs incorporate creative skills in the curricula. However, as indicated in the Table 5, most of the students do not feel that they have acquired it! This is a channel of improving the situation in Kosovo. The fourth test indicates that there is an interaction between turning ideas in actions and the purpose of entrepreneurship. Descriptive statistics show that 59% of the current programs are preparing students to turn their ideas to actions. The fifth test indicates that there is a significant interaction between developing soft skills and the intention of entrepreneurship after graduation. However, descriptive statistics show that most of the current programs among STEM education are lacking this dimension.

Table 8 summarises results referring to obstacles to be an entrepreneur. The best alternative for not having a business is to start a job that pays a regular salary. Therefore, the items to measure the reasons for getting a job with a salary could be considered as the obstacles to be an entrepreneur. Interestingly, students do not think the economic conditions, uncertainty of owning a business or the lack of is are the reasons to start a business are important to get a job with a salary. The majority of the students do not think they feel more comfortable with a monthly salary as well. The most obvious reason to not to start a business seems the impact of family on students' decision. 60% of students think that their family does not support them to start a business.

Table 8 Descriptive statistics – reasons to get a job with a salary

Get a job with salary, because of...		*Agree*	*Disagree*	*Undecided*	*N*
1	More comfortable to receive monthly salary	12%	*75%*	13%	386
2	Bad economic situation to start a business	10%	*73%*	16%	382
3	Difficult to cope with uncertainty and ambiguity	20%	*52%*	28%	383
4	There are not enough funds to start my own business	18%	*57%*	25%	381
5	Family does not support me to start a business	*60%*	17%	22%	383
6	Own bad experience about a business	39%	28%	33%	380
7	Panic of Failure	35%	37%	28%	382
8	Lack of information about how to start a business	27%	45%	28%	379
9	Lack of information on how to run a business	27%	48%	25%	378
10	To earn a social status	20%	46%	34%	373

Finally, we utilise a hierarchical regression method to test the relationship between intention to be an entrepreneur, family demographics, students' perception of study program and the institution. Each dependent variable was estimated by blocks of variables that were entered hierarchically. First, demographic variables (age, gender, marital status, level of studies, years of study and university) are entered into the equation. The second block includes family demographics, and the third block contains questions related to the students' perception of the study program and institution.

Table 9 Results of hierarchical regression analysis – intentions to be entrepreneur

Variable	*Intention to be entrepreneur*		
	Model 1	*Model 2*	*Model 3*
	Demographic variables		
Age	0.018 (0.238)	0.021 (0.166)	0.015 (0.319)
Gender	0.008 (0.871)	0.013 (0.791)	–0.008 (0.868)
Marital status	–0.124 (0.464)	–0.107 (0.528)	–0.047 (0.774)
Level of studies	–0.198* (0.067)	–0.211* (0.053)	–0.140 (0.186)
Year of studies	–0.021 (0.495)	–0.025 (0.425)	0.005 (0.870)
University	–0.021 (0.356)	–0.023 (0.302)	–0.025 (0.298)

Notes: ***, **, * represent significance at 1%, 5%, and 10% level, respectively.
List-wise deletion is used. Model 1 is composed of only demographics of the participants. Model 2 includes family demographics in addition to demographics of participants. Model 3 includes characteristics of the study program and the institution additionally.

Table 9 Results of hierarchical regression analysis – intentions to be entrepreneur (continued)

Variable	*Intention to be entrepreneur*		
	Model 1	*Model 2*	*Model 3*
Family demographics			
The place family lives	-	–0.061 (0.207)	–0.048 (0.304)
Father's education	-	–0.000 (0.976)	0.011 (0.687)
Mother's education	-	–0.005 (0.876)	–0.005 (0.871)
Family income	-	–0.007 (0.608)	–0.009 (0.507)
Family member is an entrepreneur	-	0.093* (0.078)	0.088* (0.073)
Study program and institution			
Study program having entrepreneurship content	-	-	0.031 (0.560)
Institution having a business/start up or science park	-	-	–0.047 (0.424)
Study programs developing creativity skills	-	-	0.120** (0.041)
Study program that prepares the students well enough to imagine the future and turn ideas into actions	-	-	0.184*** (0.001)
Respondent's attendance trainings at their institution to develop soft skills	-	-	–0.014 (0.802)
N	222	222	222
R^2	0.019	0.042	0.150
ΔR^2	-	0.023	0.108
F	0.68	1.02	5.233***

Notes: ***, **, * represent significance at 1%, 5%, and 10% level, respectively. List-wise deletion is used. Model 1 is composed of only demographics of the participants. Model 2 includes family demographics in addition to demographics of participants. Model 3 includes characteristics of the study program and the institution additionally.

We did not find a significant effect of participants demography on intentions to be entrepreneur. Only the level of studies which has three categories – bachelors, masters, PhD – has a negative impact at 10% significance level. It is expected that the higher the degree the student enrols for, the less motivation the student has, to be an entrepreneur. Referring to family demographics, having a family member being an entrepreneur has a positive impact to have intention to be an entrepreneur. However, the impact is limited as the coefficient is significant at only 10% level. As far as the third block of variables is concerned, perception of student for a study program which develops creativity and prepares the students well enough to imagine the future and turn ideas into actions has a positive and significant impact on students' intentions to be an entrepreneur.

7 Concluding remarks and policy implications

The aim of this paper was to check if the STEM curriculum in a developing country, Kosovo, has features of entrepreneurship. Our main findings based on the analysis of the interviews conducted show that entrepreneurship education is very weak in Kosovo due to three main reasons listed below:

The ecosystem for entrepreneurship in general needs to be strengthened. Due to the large number of study programs, which are producing 'unemployed graduates', National Accreditation Agency has put in its requirements that each study program should have a justification about the rationale of the study program for the labour market. Still, the offered study programs fail to meet the requirements of the labour market. In many strategic documents, Kosovo considers entrepreneurship as very important to boost its economic development. Since STEM has a potential to generate new jobs and increase the economic development, the country should consider that entrepreneurship education becomes integral part of such curricula. As part of promotion and development of the entrepreneurship education in STEM, establishment of the business start-up centres and/or scientific parks can also be considered.

HEIs need to revise the decision-making process in order to better take into account the needs to develop entrepreneurship education for their STEM students. In its current form, the decision-making process is complex and not efficient (centralised). HEI lacks autonomy of decision to build their curricula and to propose new subjects for their students.

Students' attitudes towards education are rather 'consumerist' and less pro-active. It is quite clear, that most of the students attend higher education to obtain a degree. This could be seen by comparing the results of Tables 5 and 6. Most of the students think that they did not acquire skills to be an entrepreneur in their study program, but at the same time, most of the students agree that their lectures have case studies and activities that prosper creativity and teamwork skills. There is a conflict here. Either student do not find case studies and activities helpful enough to have critical skills required to be an entrepreneur or the activities included to the study programs are not designed to enhance skills to be an entrepreneur. In both cases, students and the faculty are required to be proactive and should demand and propose such courses, which would help to get relevant skills and survive in the labour market. Therefore, the educators should emphasise the importance of higher education and design in-class activities that prosper skills required to be entrepreneurs.

Referring to hierarchical regression analysis, our results indicate that there is room for improvement STEM education for entrepreneurship, since students' perception about the study program and the institution has an impact on their intentions to be an entrepreneur. First of all, based on our results, we find that participants' and their family demographics do not account for a significant variance in explaining students' intention to be an entrepreneur. Although family demographics do not account for a significant amount of the variance in explaining students' intention to be entrepreneur, our results indicate that having an entrepreneur family member is positively associated with the intention to be an entrepreneur. This impact is significant at 10% level. The third block of variables, study program and institution, explains a significance variance in predicting students' intention to be an entrepreneur. The students who perceive their study program helps to develop critical thinking skills think that they are well enough prepared to take the self-initiative.

Students' perception of a study program that prepares the students well enough to imagine the future and turn ideas into actions is also significant for predicting their intentions to be an entrepreneur. Therefore, educators and higher education institutions can focus on study programs and/or extracurricular activities that could prosper required skills to be entrepreneurs.

There are several approaches that could be followed by HEIs in Kosovo to enhance entrepreneurship among STEM students based on the related literature. First of all, skill development could be encouraged by extracurricular activities. As Besterfield-Sacre et al. (2016) stated engineering students' previous exposure to entrepreneurship is less than business students' in their first entrepreneurship classes. Therefore, HEIs in Kosovo could market more extracurricular activities for STEM students to practice these skills. Pittaway et al. (2015) emphasised the importance of co-curricular activities on entrepreneurial learning and skill development. For example, business plan, or business model competitions could be introduced to the entire university with incentives provided to STEM students by their faculty. Cross disciplinary collaboration among faculty of different disciplines in curriculum development, and also in extracurricular activities could be essential for STEM students to collaborate with business students on these projects and eliminate the exposure gap between business students and STEM students.

Our work needs to be extended in three ways: first, we seek to increase the sample of the questionnaire for the students and have around 800 to 1,000 answers in order to better assess our findings. This will strengthen our conclusions about students' attitudes and reflect better to what an extent the student's attitude are key in explaining the lack of STEM education for entrepreneurship. Second, it could be good idea to understand why there are gender differences in intention to be entrepreneurs. New research also be conducted on the reasons why the majority of respondents think that the main obstacle to start to a business is the lack of family support. Third, an econometric model could be constructed to understand the interactions between the variables. A simultaneous equation model will be conducted in the near future. Fourth, we will finalise the survey for the HEIs and discuss in depth their 'expected strategic plans' in order to challenge the STEM entrepreneurship education in the next few years. We will extend our investigation to HEI teachers who are keys in this process. Teachers and researchers may give the example to their students in matter of entrepreneurship and a potential explanation on how the lack of HEI teacher entrepreneurs has a direct impact of STEM students.

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