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ENTREPRENEURIAL ECOSYSTEMS, UNIVERSITIES AND UKRAINIAN INNOVATION POLICY

The article is devoted to the problem of the formation of entrepreneurial ecosystems as a medium of growth of small firms with the participation of universities, as well as aspects of state policy in the field of innovation and small business development. It is shown that domestic universities, as a rule, adhere to the traditional innovative approach of cooperating with entrepreneurship on the basis of technology transfer and obtaining a direct financial result. The provisions of the Strategy for the development of small and medium enterprises and the role of universities in these aspects of state policy remain conceptually uncertain. It is proved that universities in Ukraine are not focused on the formation of entrepreneurial ecosystems and in support of small businesses. An example of the university unit's activity, whose cooperation with small firms contributes to the formation of a business ecosystem, is considered. The possibilities of increasing the role of the universities of the country in the formation of entrepreneurial ecosystems and more productive cooperation with small business are substantiated. The project of the Strategy of innovation development of the country for the period till 2030 is considered and it is proposed to pay more attention to creation of enterprise ecosystems with the participation of universities, and also to introduce the approach of knowledge exchange between universities and business on the basis of positive experience of a number of leading countries.

Keywords: *entrepreneurial ecosystem, university, high growth firm, small business, innovation, technology transfer, knowledge exchange.*

Introduction. Considering the problem of economic growth and increasing the competitiveness of Ukrainian entrepreneurship, particularly in the face of growing competition through the European integration processes, we must note that the support of firms that are capable of rapid growth is of paramount importance. To increase the country's competitiveness, it is essential to effectively use the innovative and entrepreneurial potential of the regions, the study of which allows us to draw conclusions about the features and advantages of the country as a whole. Such studies create an image that will help attract investments in regional economic development, establish mutually beneficial relations in trade and partnership relations.

Over the past decades there has been a shift to growth-oriented enterprise policies and to promote high growth firms (HGFs) [14]. HGFs are considered as the drivers of productivity growth and employment, increase innovation and provide business internationalization. However, existing approaches and the simple creation of favorable conditions prove to be ineffective, that lead to creation of a entrepreneurship ecosystem approach as a response.

With regard to the concept of innovation ecosystems, we should agree with L. Fedulova's remarks that despite the certain achievements of domestic scientists in the development of theoretical positions and recommendations, there is no practical adaptation of innovation policy at the level of regions of Ukraine [2, c. 241]. Concerning the use of the concept of the innovation ecosystem, «in Ukraine we have only a set of close but still quite heterogeneous elements» [2, c. 247]

In the recently approved by the Government of Ukraine, the Strategy for entrepreneurship development [3] indicates that there is no information on the number of clusters in Ukraine, and they play a relatively small role in promoting economic growth. There is a need to implement measures to expand cooperation between entrepreneurs and scientific institutions, in particular on the basis of cluster and technology parks initiatives. The issue of the development of HGFs is associated with the expediency of «creating a support infrastructure for newly created small and medium enterprises and growing enterprises (in particular, incubators and accelerators), helping small and medium-sized enterprises in attracting research and development» [3, p. 32]. The question of the entrepreneurial ecosystems formation is not considered at all. Thus, in our opinion, the positive world experience in these areas in the country has not yet been elaborated, that indicates the relevance of our study.

Regarding the role of universities in the Strategy, they are mentioned only in connection with the lack of funding and the results of their technology transfer offices [3, p. 35]. At the same time, the world experience points out on an essential role that universities play in the formation of entrepreneurial ecosystems [9]. However, it is known that universities are far from always effectively implementing the mission of entrepreneurship supporting [6; 7]. Thus, the need to study the possibility of improving the activities of domestic universities in this direction. According to Guerero et al [8], «we would need more systematic data not only from the developed economies but also in other transitional/emerging economies».

Literature review. There is no uniform or commonly accepted definition of entrepreneurial ecosystems [7, p. 14]. As a rule, the definition represents a community of key entrepreneurial actors, both localized and having relationships, compete and cooperate. Mason and Brown [7, p. 14; 14, p. 5] proposed a definition of entrepreneurial ecosystems as a «set of interconnected entrepreneurial actors, entrepreneurial organizations, institutions and entrepreneurial processes which formally and informally coalesce to connect, mediate and govern the performance within the local entrepreneurial environment».

According to C. Mason and R. Brown [14, p. 13], entrepreneurial ecosystems often emerged in places where working scientists and engineers with knowledge, that could be used for entrepreneurship. Such centers of knowledge are usually universities and research institutions, laboratories, which gained competitive applied results of R&D for innovation. These centers of knowledge are also attractive for talented scientists and engineers, gifted students, creative individuals out of knowledge cluster, who can become future entrepreneurs, managers and developers of new products and services. Important aspects of ecosystems are large firms and universities that may not be directly related to start-ups. Entrepreneurial universities are widely regarded as important actors, but C. Mason and R. Brown consider [7, p. 14] that their role has been over-stated.

According to E. Stam & B. Spigel [16], the entrepreneurial ecosystem approach has some commons with such concepts as clusters, and innovation systems. But the entrepreneurial ecosystem approach differs from cluster approaches by the fact that the entrepreneur, rather than the firm, is the focal point of analysis. The role of knowledge differs for these concepts. For all of them it is necessary technical and market knowledge, but entrepreneurial ecosystems concepts also highlight knowledge about the entrepreneurship process itself.

An important aspect of university spin-offs creation [15] is the ability to turn scientific knowledge into a commercial product or service that can be competitive on the market. For firms created by university scientists, engagement with business is often crucial for building a viable business concept based on R&D results. It is important for the established firm not to lose contact with the university environment, whose scientists can play a crucial role in combining an entrepreneurial firm with research networks, research groups, as well as in a wide scientific community.

As noted by H. Etzkowitz [8, p. 119]: «The first phase of entrepreneurial science refers to the internal organization of research such as the analysis of scientific research organizations as “quasi-firms” and the resource collection system and its legitimations ... The second phase refers to the translation of the results of research into economic goods, i.e. «the capitalization of knowledge». University entrepreneurship is both endogenous and exogenous [8, p. 119]: «It is endogenous in the sense that it is an internal development within academia that emanates from the way that the research university grew up. On the other hand, university-based innovation is in part the result of external influences including military research funding».

An important assumption underlying most of the foreign regional innovation programs is that universities must play a key role in providing human resources and knowledge-information activities for entrepreneurship. However, it should be noted that the role of universities in regional innovation systems and business ecosystems [6, 12, 14] is rated a bit differently. As M. Kwiek notes [12, p. 258] that in the transition to societies and knowledge economies the role of universities is critical. He also noted: «The economic competitiveness of nations and regions is increasingly linked to national and regional knowledge production, including knowledge production in universities [12, p. 244]. ... Higher education and innovation systems are located in and influenced by their national social and economic contexts; they belong to national settings, are funded through national taxes, cooperate with regional companies, and produce graduates with the skills necessary for national economies. The national context is both a burden and a challenge for the higher education and innovation systems.» [12, p. 249].

The League of European Research Universities (LERU) defines societal impact as a university mission, as well as education and research. According to LERU [13, p. 13] entrepreneurship is important for universities in the modern economy in order to influence society, for survival and development.

Measures and studies to support the formation of entrepreneurial ecosystems with the involvement of universities are paid attention of government organizations of leading countries. The European Commission's Entrepreneurship 2020 Action Plan [10] provides support for the start-up of business structures by universities, and the creation of business ecosystems with the participation of universities.

It should be noted there are problems of R&D performance of Ukrainian regional universities, especially regarding the low level of these works funding from industry and entrepreneurship [2, 5].

In the leading countries, the subject of state policy is shifting the concept of technology transfer to a more complete approach, which determines the broad exchange of knowledge between universities and business structures. As S. Hagen [11, p. 113] noted: «The term knowledge transfer is too restrictive in terms of the innovative practice of knowledge exchange, which is defined as a set of policies and practices which enable the efficient and effective exchange and co-creation of knowledge between producers and users».

Uninvestigated parts of general matters defining. The problem is to study the possibilities and obstacles for the entrepreneurial ecosystems formation in the country with the participation of domestic technological universities as centers of entrepreneurs training, research and development for the needs of entrepreneurship, and the creation of firms based on research groups. So, the unexplored component is the readiness of domestic technological universities to ensure the effective formation of entrepreneurial ecosystems in order to support the growing of startups, especially HGFs. It should be expected there are negative economical, organisational and other factors, which interfere the formation of effective regional entrepreneurial ecosystems, in particular those related to R&D performance of domestic regional universities.

The purpose of the article is to study the possibilities and obstacles to form the entrepreneurial ecosystems in order to promote and provide the high-growth firms in Ukraine with the participation of regional state technical and technological universities. We should consider the feasibility to integrate technology activities of state universities research groups with entrepreneurial structures on the basis of the introduction of a two-way exchange of knowledge between institutions and firms.

Basic materials. Research methodology. Our research, in addition to the analysis of scientific publications, contains the processing of scientific and scientific-technical activity data. The state and departmental statistics in Ukraine do not include data on cooperation between individual universities and small and medium-sized enterprises. However, the Ministry of Education and Science of Ukraine annually collects data on the indicators of scientific and scientific-technical activity of universities and scientific institutions, which were used in the monograph [5]. It represented both direct indicators and specific ones, presented per scientist in a full (working) time equivalent (FTE) according to the methodology, which worked out by S. Porev. For a simplified assessment it was assumed that R&D results of state university teachers in the country can be presented in the FTE with a coefficient of 0,5, for graduate students – 0,67; for doctoral students and researchers – with a coefficient of 1. The use of this approach is limited to general statistics, while the performance of individual scientists needs to determine the personal distribution of working time and its tension.

As an example of scientific and scientific-technical performance of universities as the basis for the formation of technological components of entrepreneurial ecosystems in the regions, consider the data in Table 1.

The study of the Strategy of small and medium-sized entrepreneurship development [3] and publications of Ukrainian scientists [2, 5] gave the reason to note, that the entrepreneurial ecosystems approach and the aspects of HGFs forming and promotion have no enough highlights in the domestic research and practice.

Our research, as well as the given data and considerations in our previous monograph [5], give reason to consider the following.

1. A number of foreign authors such as H.Etzkowitz [8], M.Guerrero [9] et al. believe that foreign universities, in particular research and entrepreneurship, are able to play and, in many cases, play an important role in creating startups, spin-offs, forming and supporting entrepreneurial ecosystems, as well as initiating and supporting HGFs.

2. The second position is expressed by R. Brown and C. Mason [6, 7, 14] and a number of other experts who believe that universities are able to promote entrepreneurs training, the creation of scientific and

technological knowledge and the launch of start-ups, but the role of studied by them (foreign) universities in the entrepreneurial ecosystems formation and the HGFs support, as a rule, has been over-stated.

3. The third position concerns Ukrainian universities that can participate in the activities of innovation systems and regional entrepreneurial ecosystems, and today the results of such activities are low due to a variety of general economic, organizational and other reasons [2, 5]. Elucidation of the possibilities to achieve significant positive results requires further research.

Table 1

R&D performance indicators a number of regional technical and technological universities of Ukraine [5]

University	Resear- chers in FTE	Publication in Scopus 26.03.15-4.04.16 per researcher in FTE	R&D grants & contracts per researcher in FTE, UAH, thousand
Lviv Polytechnic national university	1459	0,33	4,98
Nat. tech. univ. «Kharkiv polytech. inst.»	1217	0,15	1,54
Odessa national polytechnic university	548	0,07	1,02
Zaporozhye National Technical univ.	473	0,14	6,99
Vinnitsa national technical university	341	0,17	2,29
Chernihiv national state univ. of technology	281	0,02	1,12
Cherkasy state technological university	268	0,03	0,22
Ternopil Ivan Puluj nat. technical univ.	260	0,03	3,15
Lutsk National Technical University	254	0,24	7,58
Zhytomyr state technological university	173	0,13	2,06

* **Source:** compiled by the authors based on our previous research [5]

It should be noted that the scientific potential of the Ukrainian technical and technological universities and scientific research performance are significantly different, while even for leading universities the indexes of scientific publications in the well-known scientometric systems Web of Science and Scopus remain on average low compared to those of the universities of the European Union [5]. The funding earned by universities in carrying out research and development on the orders of industry and entrepreneurship are essential for the innovation system of the country as a whole and also distinguish leading universities. However, in our study, we will consider, mainly, the possibility of institutions with a small number of researchers to solve the problems of scientific and technological support newly created companies, and from this - the formation of entrepreneurial ecosystems in regions.

Using our preliminary research [5], we chose the state technical and technological universities of the country (which included also machine-building, transport, mining and metallurgy, civil engineering and architecture institutions) located outside the capital, have average personnel scientific potential (from 200 to 500 researchers in FTE), and were published in 2015 in the journals referenced in the Scopus database.

It turned out that there are 24 such higher educational institutions. According to the calculations, there were only 0,08 articles published in Scopus journals per researcher in FTE, but received 6,35 thousand UAH per year from R&D grants and contracts, in particular, with industry and entrepreneurship. So, it can be said that regional technical and technological universities have, on average, low research performance indicators, but have some applied developments that can be useful for start-ups and the formation of innovation and entrepreneurial ecosystems in the regions.

As emphasizes by the analysis of publications [5], the innovative and entrepreneurial potential of many regional technical and technological universities remains inadequately used. There is a lack of state and regional policies, as well as means of stimulating both the development of small business [2] and the attraction of universities to this activity on a mutually beneficial economic basis. One can say that the participation of state universities in the creation of entrepreneurial structures is not encouraged, but scientists of these institutions can participate in the activities of small and medium-sized innovative firms as individuals, which is not reflected in available statistics.

The second part of the study of empirical data is a case study containing an analysis of information on cooperation between chairs of the Cherkasy State Technological University and small and medium enterprises, presented on the university's website [1] as of January 20, 2018.

The task will be to find a confirmation of our assumption that in the conditions of problematic existence of both state universities and private firms, positive results can be provided by parallel activities of them and use of existing benefits such as public financing of research and development, as well as private marketing, production and sales.

The departments of the university are informed about measures to cooperate with other universities and scientific institutions, large business enterprises and foreign partners, and the practice of students at the enterprises of the region. Students of the specialty «International Economics» joined the team of coordinators of the business incubator, which aims to develop and support students' business ideas, startups and training on the modern entrepreneurship. However, the materials of the departments and faculties do not mainly contain information on scientific and technological cooperation with small and medium enterprises, description of implementation of scientific and technological developments.

An exception is the materials of the Cherkassy state technological university department [1] of food production designing and machine tools of the new generation, in which the teachers of the department take part in scientific and practical works of machine-building enterprises. The participation of university scientists in the activity of small enterprises forms a certain community that benefits from both the public and the entrepreneurship sector. University scientists carry out applied developments that are useful for enterprises in the region and can be used to launch small innovative firms.

It should be noted that today the scientific and technological cooperation with small and medium enterprises, as a rule, does not give significant financial results for Ukrainian universities in spite of rare positive examples [5]. There are no state organizational and finance measures to stimulate the participation of the universities in the creation of start-ups.

The Ministry of Education and Science of Ukraine prepared the project «Strategy of innovation development of Ukraine for the period up to 2030» [4]. The purpose of the Strategy is to build the innovation ecosystem of Ukraine in order to ensure the rapid and qualitative transformation of creative ideas into innovative products and services, to increase the level of innovation of the national economy.

Among the main areas of the Strategy are:

- creation of territories with a high concentration of creative specialists by allocating within the settlements zones devoted primarily to the deployment of creative activities, the establishment of appropriate infrastructure there, providing information, analytical and methodological support for the development of innovative culture;
- providing state support for the creation and efficient functioning of elements of innovation infrastructure at higher education institutions, scientific institutions and other subjects of innovation activity;
- providing state support for the creation and efficient functioning of start-up schools, accelerators, and business incubators on the basis of higher education institutions and scientific institutions of the continuous chain.

The establishment of innovative cluster, technology transfer centers, technology platforms, business incubators and accelerators is considered important in order to establish links between innovators and business and government representatives.

Let's draw attention to the fact that the project of the Strategy of innovation development mentions some components of the exchange of knowledge, but there is no definition of its conceptual framework. Modern studies emphasize that in a number of developed countries the idea of technology transfer, created at universities and transferred to entrepreneurship, give a way to a more general concept of knowledge exchange.

According to University Alliance [17], knowledge exchange is a generic term that describes all bipartite processes between scholars and non-academic individuals and groups in order to create cultural, social, economic and research benefits. Evidence has repeatedly shown that the human factor is critical to the potential for perception, knowledge exchange and the impact of research in business. Knowledge exchange is a key element of the impact of scientific research. Every interaction of universities with the wider world, at the international, national and regional levels, helps to broaden knowledge and impart the value of university research.

In our view, the Strategy of innovation development of Ukraine and other regulatory documents should be revisited from the standpoint of modern concepts of the entrepreneurial ecosystems creation and the knowledge exchange, which is not just new concepts, but correspond to the current development of policies on the development of science, innovation and entrepreneurship, specifies the conceptual work taking into account generalizations of the world experience.

Conclusion. Our research highlights the aspect that the positive experience of the advanced countries of the world requires to be studied, adapted to domestic conditions, and to use in the formation of entrepreneurial ecosystems that can contribute to the rapid growth of firms, and to use the concept of knowledge exchange as an approach that generalizes the transfer of technology and knowledge, based on the needs of mutual information counter-traffic between universities and entrepreneurship.

It should be noted that regional technical and technological universities in Ukraine have some scientific potential for the formation of entrepreneurial ecosystems and the creation of small innovative firms. In today's economic and regulatory conditions, there are doubts that entrepreneurial ecosystems with the participation of universities in the country will be able to effectively address the challenges of creating HGFs. On the agenda is to create at least viable enterprises that can contribute to the growth of the economy.

At the same time, it is necessary to raise the question of the transformation of regional technical and technological universities on the basis of ensuring the development of entrepreneurship, achievement of productivity of research and development, corresponding to the indicators of universities of the European Union.

A new result of our study is a certain confirmation on the example of the hypothesis about the feasibility to integrate technology activities of state universities research groups with entrepreneurial structures in a transition economy to use the opportunities of both state provision of research and development, as well as private initiative for their implementation.

Research on modern methods and tools for the formation of business ecosystems with the participation of universities should be continued, as well as work out proposals for the implementation of new concepts of management and knowledge exchange.

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ПІДПРИЄМНИЦЬКІ ЕКОСИСТЕМИ, УНІВЕРСИТЕТИ І УКРАЇНСЬКА ІННОВАЦІЙНА ПОЛІТИКА

Статтю присвячено проблемі формування підприємницьких екосистем як середовищ зростання малих фірм за участі університетів, а також аспектам державної політики у сфері інноваційної діяльності та розвитку малого підприємництва.

За матеріалами наукових публікацій та з багаторічного досвіду авторів показано, що вітчизняні університети, як правило, дотримуються традиційного інноваційного підходу щодо співпраці із підприємництвом на засадах трансферу технологій і отримання прямого фінансового результату.

Розглянуто положення Стратегії розвитку малого і середнього підприємництва і показано, що роль університетів у цих аспектах державної політики залишається концептуально не визначеною.

Доведено, що університети в Україні не орієнтовані на формування підприємницьких екосистем і на підтримку малого підприємництва. Розглянуто приклад діяльності підрозділу університету, співпраця якого із малими фірмами сприяє формуванню підприємницької екосистеми.

Обґрунтовано можливості підвищення ролі університетів країни у формуванні підприємницьких екосистем та більш продуктивної співпраці із малим підприємництвом.

Розглянуто проект Стратегії інноваційного розвитку країни на період до 2030 року.

Запропоновано звернути більш уваги на створення підприємницьких екосистем за участі університетів, а також запровадити підхід щодо обміну знаннями між університетами і підприємництвом на основі позитивного досвіду ряду провідних країн.

Ключові слова: підприємницька екосистема, університет, швидкозростаюча фірма, мале підприємництво, інновація, трансфер технологій, обмін знаннями.