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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 on the support of small businesses. An example of the university unit's activities, 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 innovative development of the country for the period till 2030 is considered and it is proposed to pay more attention to the 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 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 to 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 the promotion of 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 simple creation of favorable conditions prove to be ineffective, that leads to the creation of an entrepreneurial ecosystem approach as a response.

With regard to the concept of innovative 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 the regions of Ukraine [2, c. 241]. Concerning the use of the concept of innovative ecosystem, «in Ukraine we have only a set of close but still quite heterogeneous elements» [2, c. 247].

Recently approved by the Government of Ukraine, the Strategy for entrepreneurial 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 problem of 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, there is 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 emerge in places where scientists and engineers with knowledge, that could be used for entrepreneurship, work. Universities and research institutions, laboratories, which have gained competitive applied results of R&D for innovation, are usually such centers of knowledge. 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. Large firms and universities that may not be directly related to start-ups are important aspects of ecosystems. Entrepreneurial universities are widely regarded as important actors, but C. Mason and R. Brown consider [7, p. 14] that their role has been overstated.

According to E. Stam & B. Spigel [16], entrepreneurial ecosystem approach has some commons with such concepts as clusters, and innovative systems. But 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 technical and market knowledge is necessary, but entrepreneurial ecosystem concepts also highlight knowledge about the entrepreneurial process itself.

The ability to turn scientific knowledge into a commercial product or service that can be competitive on the market is an important aspect of university spin-offs creation [15]. 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 conversion 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 has grown 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 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. M. Kwiek notes [12, p. 258] that in the transition to societies and knowledge economies the role of universities is critical. He also noted: «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 contemporary economy in order to influence society, for survival and development.

Government organizations of leading countries pay attention on measures and studies to support the formation of entrepreneurial ecosystems with the involvement of universities. 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 that 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 innovative practice of knowledge exchange, which is defined as a set of policies and practices that enable 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 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 start-ups, 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 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 activities 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 activities 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 was 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] give the reason to note that 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 start-ups, 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 entrepreneurial ecosystems formation and the HGFs support, as a rule, has been overstated.

3. The third position concerns Ukrainian universities that can participate in the activities of innovative 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 of 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 National Polytechnic University	1459	0,33	4,98
Nat. Tech. Univ. «Kharkiv Polytech. Inst.»	1217	0,15	1,54
Odesa National Polytechnic University	548	0,07	1,02
Zaporizhia National Technical University	473	0,14	6,99
Vinnytsia 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 scientific potential of 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 is essential for innovative system of the country as a whole and also distinguishes 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 of newly created companies, and from this – the formation of entrepreneurial ecosystems in regions.

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

It has turned out that there are 24 such higher educational institutions. According to the calculations, they have only 0,08 articles published in Scopus journals per researcher in FTE, but receive 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 innovative and entrepreneurial ecosystems in the regions.

As is emphasized by the analysis of publications [5], 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 these activities 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 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 the 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» have joined the team of coordinators of business incubator, which aims to develop and support students' business ideas, start-ups and training on 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, the description of implementation of scientific and technological developments.

An exception is the materials of the department [1] of food production designing and machine tools of new generation of Cherkasy State Technological University, 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 activities of small enterprises forms a certain community that benefits from both public and entrepreneurial 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 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 financial measures to stimulate the participation of the universities in the creation of start-ups.

The Ministry of Education and Science of Ukraine has 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 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 innovative infrastructure at higher education institutions, scientific institutions and other subjects of innovative activities;
- providing state support for the creation and efficient functioning of start-up schools, accelerators, and business incubators on the basis of higher educational 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 innovative development mentions some components of knowledge exchange, 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, gives 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 entrepreneurial ecosystems creation and knowledge exchange, which are not just new concepts, but correspond to the current development of policies on the development of science, innovation and entrepreneurship, specify 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 used in the formation of entrepreneurial ecosystems that can contribute to the rapid growth of firms and 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 HGFs creating. The creation of at least viable enterprises that can contribute to the growth of the economy is on the agenda.

At the same time, it is necessary to raise the problem 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.

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

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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 з 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 з малими фірмами сприяє формуванню підприємницької екосистеми.

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

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

Запропоновано звернути більше 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.