INNOVATION ACTIVITY IN UKRAINE: PROBLEMS, ACHIEVEMENTS AND FURTHER DEVELOPMENT

Abstract

The article is devoted to problems of innovative activity in Ukraine. The current state of innovations is analyzed, the main problems and the prospects of development of innovation sector of economy are highlighted. The main parameters of the innovation sphere are considered - the share of innovative enterprises and the amount of financing of innovation activity and scientific research.

Also, the main sources of innovation financing are considered. The prospects for using foreign investments, venture business and leasing schemes for financing innovations are highlighted. The most perspective sectors for Ukrainian business are selected. The gaps in the state regulation of innovation activity are noted: the lack of tax initiatives, the completeness of the legislative framework, the creation of an information infrastructure for interactions between the business sector, the science and financial sector. Limited public and financial sector resources, absence of tax initiatives explain the current absence of financial mechanisms to encourage the development of innovative enterprises.

Introduction

Innovative development is of paramount importance in the country's economic growth, improving the economic performance of enterprises, establishing business
linkages between science and education and production processes, as well as changing the structure of export and import of the country. That is why the analysis of the dynamics of the indicators of the innovation activity has paid considerable attention from scientists and specialists.

The need for radical transformations in the field of production will necessarily affect the scope of innovation. Thus, if we create a new groundwork for the development of the production and financial sector, then one of the varieties of development is the most innovative transformation. Innovative activities can significantly change not only the technological base of production and assortment of products of domestic enterprises, but also will allow enterprises to reach the international level, not to mention the field of science, for which the regional boundaries do not matter. It is the innovative activity of enterprises that gives pulse to the development of investment attractiveness of separate enterprises and entire industries.

The importance of innovation is recognized by many legal and political documents in Ukraine, including at the highest level. However, the all-embracing consideration of the national innovation system of Ukraine, its various components and relations between them, is left out of the attention of government officials. In society and government institutions, narrow interpretation of innovations is prevalent, emphasizing only technological aspects. Innovation activity of small and medium enterprises as an important factor in economic dynamism remains out of attention. There is not enough consideration of interconnections between subsystems, including between science and business [1]

1 Analysis of Current state at Ukrainian Innovation Sector

If you look at our country in the coordinates of international ratings, then you can see somewhat controversial picture. For example, according to the Global Innovation Rating, compiled by Bloomberg [2], Ukraine is among the 50 leading world countries in terms of innovation development.
According to the World Economic Forum in Davos, Ukraine is among the countries with an average level of innovation (79 position on the factor of innovation and business experience, according to the results of 2012) [3].

Table 1 – Innovation performance indicators due to Global Competitive Index [3]

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<tr>
<td>General innovation performance (overall)</td>
<td>71 / 3,2</td>
<td>93 / 3,0</td>
<td>81 / 3,2</td>
<td>54 / 3,4</td>
<td>52 / 3,4</td>
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<tr>
<td>Capacity for innovation</td>
<td>58 / 3,3</td>
<td>100 / 3,2</td>
<td>82 / 3,6</td>
<td>52 / 4,2</td>
<td>49 / 4,4</td>
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<tr>
<td>Quality of scientific research institutions</td>
<td>64 / 3,7</td>
<td>69 / 3,6</td>
<td>67 / 3,8</td>
<td>43 / 4,2</td>
<td>50 / 4,2</td>
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<tr>
<td>Company spending on R&amp;D</td>
<td>104 / 2,7</td>
<td>112 / 2,7</td>
<td>66 / 3,1</td>
<td>54 / 3,4</td>
<td>68 / 3,3</td>
</tr>
<tr>
<td>University-industry collaboration in R&amp;D</td>
<td>69 / 3,6</td>
<td>77 / 3,4</td>
<td>74 / 3,5</td>
<td>74 / 3,5</td>
<td>57 / 3,5</td>
</tr>
<tr>
<td>Governmental procurement of advanced products</td>
<td>97 / 3,2</td>
<td>118 / 3,0</td>
<td>123 / 2,9</td>
<td>98 / 3,0</td>
<td>82 / 3,1</td>
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<tr>
<td>Availability of scientists and engineers</td>
<td>25 / 4,8</td>
<td>46 / 4,5</td>
<td>48 / 4,3</td>
<td>29 / 4,7</td>
<td>29 / 4,7</td>
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<td>PCT patent applications per mln. Inhabitants</td>
<td>51 / 2,1</td>
<td>52 / 2,9</td>
<td>52 / 3,2</td>
<td>50 / 3,6</td>
<td>49 / 3,9</td>
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It is worth noting that Ukraine is still strong in higher education and skills, putting the country in the 39th place and revealing an untapped opportunity to capitalize on its human resources. Ukraine also ranked low in technological readiness, although it improved in the sub-ranking of ‘availability of latest technologies’ (climbing from 113th to 96th position) [4].

From the standpoint of innovation, the strongest sides in Ukraine are: population coverage by higher education (6th in the world), patent activity (17th place), R&D intensity (39th place), technological capacity of industry (34th place). The only thing that prevents our state from rising above this rating is the total low efficiency of the economy (69th place). The dynamics of ranks of global innovation index for Ukraine and some of her neighboring countries is shown at figure 1 [2].

Attention is drawn to the unevenness and imbalance in the development of various components of innovation and factors of efficiency improvement (Efficiency Enhancers) in Ukraine. For example, everything related to human resources -
education, the availability of skilled personnel, the labor market, patent activity of the population, educational and scientific infrastructure - remains at a consistently high level.

Figure 1. Dynamics of Innovation Global Index Ranks for Ukraine and some of her neighboring countries [2]

However, the institutional and organizational components, including the involvement of companies in innovation processes, competition in the domestic market, regulatory environment, have contributed less to spreading innovations. Thus, despite the fact that society has a significant innovative, intellectual and creative potential, this potential has practically no significant impact on the economy. And economic development continues to be under the inertial scenario and according to the extensive model.

According to the Global Innovation Index of cities 2012-2013, three Ukrainian cities were ranked among the most innovative cities in the world - Kyiv, Lviv, Odessa. They did not enter into the first 100 cities, but they took seats in the middle group together with such world capitals of innovation as Dublin, Tallinn, Salzburg, Delhi. This is, of course, a success, especially when one considers that in previous years Kyiv belonged to cities with a low level of innovation, while the rest of Ukrainian cities did not rate the rating at all.
There were several innovative initiatives in recent years in Ukraine that reflect the growing importance of innovation as a factor in economic growth and competitiveness. However, many legal and political documents remain only at the conceptual level, with insufficiently defined practical policies or guidelines for future use. Effective coordination is one of the main problems in the field of innovation management. Despite the progress made in administrative reforms, the responsibility of key actors in the field of innovation management is not yet clearly defined. Allocated resources often do not match the received power authorizations. There is no coordinating body that establishes horizontal links between enterprises in the field of innovation, although there is vertical coordination (from institutions to ministries and government) [4].

One of the most important indicators of the innovation sphere is the share of innovative enterprises. The dynamics of this indicator in Ukraine is shown at Figure 2. [6]

![Figure 2– Share of innovative firms in Ukraine at 1995-2017](image)

Only 16% of Ukrainian enterprises were innovative at 2017, placing Ukraine at the bottom of the comparator group of EU new member States. However, Ukraine compares much more favourably in terms of the proportion of SMEs innovating in-house, with a higher share than in a number of EU new member States. Innovation
surveys show a lower frequency of innovation among small firms, particularly in comparison to large enterprises. However, this gap is small in the case of Ukraine, with 18.4% of SMEs innovating in-house compared to 21% innovative enterprises at the aggregate level. The main reason of this is that large Ukrainian firms are actually lagging more in terms of frequency of innovations than SMEs. While the cause of this is not clear, it may be related to the delayed process of privatization and/or delayed restructuring.

For comparison, we note that more than 50% of enterprises in the EU (28 countries) carried out innovation activities during 2012-2014. The largest enterprises with more than 250 employees are the most active in this field. 75% of such firms were innovative during 2012-2014 [7].

The majority of Ukrainian firms, like most firms in other countries with economies in transition, operate “behind the technology frontier” [7]. Innovation activities in countries behind the technology frontier, such as Ukraine, focus mainly on the adaptation of machinery, equipment and software. The share of expenditure on machinery, equipment and software in total innovation expenditure in Ukraine is within the normal range for the EU new member States. An equipment-based approach to innovation at the enterprise level leads to a lower level prioritization of knowledge protection, which will be largely in the form of know-how rather than intellectual property (patents).

Importance of the reasons to not innovate and of the barriers to innovation is shown at table 2 [6, 7]. Analyzing the table data, one can conclude that there are common factors that hinder the innovation activity in Ukraine and the EU countries with which the comparison was made. Thus, the majority of surveyed companies believe that there are no significant factors hindering innovation activity: the share of such companies ranged from 71.8% to 87.7%. Thus, less than 20% of surveyed enterprises believe that there are significant factors that reduce innovation activity. However, because only non-innovative enterprises participated in the survey, in this way, about 70-80% of such enterprises can not be considered as significant factors of their own lack of innovations.
Table 2. Importance of the reasons to not innovate and of the barriers to innovation in the enterprises among non-innovative firms at 2014-2016., % [6,7]

<table>
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<th>-enterprises with no compelling reason to innovate</th>
<th>Ukraine</th>
<th>Poland</th>
<th>Romania</th>
<th>Slovak Rep.</th>
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<tr>
<td>Enterprises for which the low market demand was a highly important reason to not innovate</td>
<td>83,0</td>
<td>75,8</td>
<td>87,7</td>
<td>71,8</td>
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<td>Enterprises for which previous innovations were a highly important reason to not innovate</td>
<td>10,2</td>
<td>6,9</td>
<td>9,0</td>
<td>20,6</td>
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<td>Enterprises for which the little market competition was a highly important reason to not innovate</td>
<td>8,7</td>
<td>6,4</td>
<td>5,7</td>
<td>11,7</td>
</tr>
<tr>
<td>Enterprises for which the lack of internal finance was a highly important barrier to innovate</td>
<td>5,9</td>
<td>4,2</td>
<td>3,1</td>
<td>6,9</td>
</tr>
<tr>
<td>Enterprises for which the lack of skilled employees within the enterprise was</td>
<td>17,0</td>
<td>24,2</td>
<td>12,2</td>
<td>19,5</td>
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<td>Enterprises for which too large barriers, including:</td>
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<tr>
<td>Enterprises for which the lack of internal finance was a highly important barrier to innovate</td>
<td>9,7</td>
<td>24,8</td>
<td>5,4</td>
<td>28,3</td>
</tr>
<tr>
<td>Enterprises for which the lack of skilled employees within the enterprise was</td>
<td>2,0</td>
<td>9,8</td>
<td>2,0</td>
<td>10,4</td>
</tr>
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Among the most significant factors, domestic enterprises are called: high costs of innovation, lack of funds within the enterprise, low demand for innovations in the market, negative experience of introducing previous innovations, lack of good ideas or opportunities for innovation.

Regarding to the types of economic activity, during 2014-2016 the highest share of innovative enterprises was at sector of information and telecommunications (22.1%), manufacturing (21.9%), banking and insurance activities (21.7%), architecture and engineering (20.1%). As for innovation activities of Ukrainian enterprises, more than half of enterprises with technological innovations have purchased machinery, equipment and software for the production of new or significantly improved products and services. Almost one-third of the companies engaged in the implementation of new or substantially improved products or processes.

2Funding of innovations in Ukraine

One of the most important problems faced by any enterprise is the problem of attracting investment resources for the innovation activity of the enterprise, and this is
especially relevant in conditions where the depreciation of the main productive assets in many sectors of the Ukrainian economy has reached a critical level. The structure of financing of technological innovations by their sources in 2000-2017 is presented in Fig. 3 [6].

![Diagram showing the structure of funding sources of innovation activity in Ukraine at 2007-2017 years.](image)

Figure 3 – Structure of funding sources of innovation activity in Ukraine at 2007-2017 years. [6]

The most part of innovation funding is their own funds (from 69.3 to 83.9%). Approximately a 10% of the innovation costs of industrial enterprises are from domestic and foreign investors (while the share of financing domestic investors is quite small). It should be noted that the priorities of foreign investors are more in line with the interests of structural adjustment of the Ukrainian economy than the priorities of domestic investors. Ukrainian investments in machine building by their share in the structure of investments (3.0%) in 2010 were in the tenth place, direct foreign investments (FDI) in mechanical engineering with a share of 9.0% were in third place in their structure [6]. The share of state budget financing for the analyzed period did not exceed 3%.

An important source of investment resources is the funds of the banking system. Unfortunately, in spite of the dynamic development, in recent years domestic banking institutions still have insufficient number of services and are financially
weak. Long-term bank loans in funding of innovation activity of enterprises today are practically not used due to the lack of an effective incentive mechanism and, consequently, the lack of activity of banking institutions in their direct involvement in innovation activities. Around 40 percent of entrepreneurs in a Ukrainian study reported difficulties in obtaining financing in general, but this problem seems of especial importance for R&D performing companies, of which 80 percent stated limitations in their innovation activities due to inadequate financing position. Financial resources are usually provided to Ukrainian banks for onlending to SMEs under different programs (sponsored by International Finance Corporation, European Investment Bank, European Bank for Reconstruction and Development) in the areas of priority for the country economic catchup program [4, p. 17]

Ukraine has received a significant volume of foreign direct investments (FDI), but these inflows did not lead to structural changes or technological modernization. For Ukraine the ability to absorb and distribute newest technologies is a key factor in innovation, but the potential of FDI to promote innovation remains at a low level.

In 2017, foreign investors invested $1871.2 million in equity in the Ukrainian economy. From the European Union countries in 2017 Ukraine received $1244 million of foreign direct investment (FDI), and from other countries of the world - $627.2 million. By cumulative result, as of January 1 of 2018, the share capital of non-residents in Ukraine was $39144 million (from the EU countries - $27465.5 million, from other countries - $11678.5 million), which turned out to be 4.3% more than the beginning of the year ($37513.6 million) [6]. In 2017, Ukraine’s economy saw the worst year in foreign direct investment since 2010, the State Statistics Service reports. It attracted only $1.9 billion last year [6].

Most foreign direct investment comes to Ukraine from countries known for being centers for corporate tax avoidance like Cyprus, the Netherlands, and the United Kingdom. This means the investors may well be Ukrainian companies with Ukrainian beneficiaries registered in those jurisdictions. The source countries of Ukraine’s biggest foreign investors are also problematic: Cyprus ($506 million), Russia ($396 million) and the Netherlands ($262.5 million). Many officials and
businesspeople in Ukraine have dozens of firms, registered in offshore tax havens such as Cyprus, and many also still have businesses in Russia. In addition, billions of dollars have been siphoned out of the country, either through offshore companies or pocket banks.

Cyprus is by far the most important direct investor in Ukraine, which points to the presence of “round-tripping” funds previously withdrawn from Ukraine (or perhaps other CIS countries, e.g. Russia), and channeled to Ukraine via Cyprus. The presence of “round tripping” is further supported by looking at Ukraine’s FDI outward stock, where Cyprus commands an impressive share of 92% [8]  

While this “round-tripping” procedure can have different reasons (tax advantages, advanced legal system with better protection, among others) it is clear that such funds don’t constitute genuine FDI flows with all their associated benefits (technical, management and human capital know-how transfers and spill-overs) but rather of domestic investment which is re-routed via an offshore zone.

Figure Ukraine’s inward and outward FDI stock by country, (2014) [8]

The inward stock of FDI declined by about USD 15 bn to USD 63.8 bn (48.4% of GDP) over the year. These adverse developments give rise to a number of concerns, as FDI flows serve a dual purpose: They provide stable, long-term capital inflows that can support the external balance of the country, which is still rather shaky, and add to the country’s overall investment levels, which are under severe
pressure, despite significant reform efforts to improve and deregulate the business and investment climate. [8]

The main factors that negatively affect FDI are the instability of the legal, economic and political nature, the imperfection of the financial and credit and tax system, the low level of development of market infrastructure, high level of economic shadowing, corruption, lack of land market, etc. Together with the negative factors on FDI in Ukraine, there are factors that attract foreign investors, namely: market capacity, low labor costs, favorable geographical location, favorable climatic conditions, etc [8].

Such scheme of funding innovations as leasing in Ukraine has been developing rapidly in recent years, and it is becoming one of the most suitable instruments to support the renovation and replacement of Ukraine's obsolete equipment and industrial machinery. According to official data, approximately 50% of the fixed assets of all enterprises in Ukraine are outdated. Also financial leasing is being actively used in Ukraine.

By 1 January 2007 the total lease portfolio in Ukraine was around USD 800 million, as compared to only USD 400 million by 1 January 2006. Despite rapid increase, the Ukrainian leasing market is still in its infancy. It is estimated that the total value of leasing transactions can exceed USD 1 billion in 2009. 39% of leases was railway transport, 20% of financial leases are long term - 3 to 5 years. Aircraft accounts for the largest share in the leasing contracts' portfolio due to the high cost of such assets. Trucks are the second and passenger cars rank third. Imported equipment accounts for most of the leasing transactions [9]. Many banks consider financial leasing as a form of a loan and leasing companies as direct competitors to banks. Where a foreign manufacturer produces equipment, the lessor is traditionally responsible for importing the equipment into Ukraine and conducting the necessary customs clearance.

Around 50 leasing companies are operating in Ukraine. Although approximately 70% of such transactions are conducted by 10 leading companies. There is a great potential for a regional expansion of leasing in the country.
Currently, there are only six leasing companies that cover local regions in the country through agency networks. In most Ukrainian localities leasing is underdeveloped.

Over 30% of the leasing companies in Ukraine are wholly owned by foreign legal entities and 10% of companies have foreign participation. All the rest are resident companies. The survey showed that 39% of leasing companies are bank-related; this offers them the opportunity to use the credit resources of the bank. But this situation is changing rapidly considering the number of banks that recently launched leasing operations or have indicated to be interested in launching leasing operations. Only 19% of the surveyed companies are affiliated with a vendor or producer. These companies are mainly active in the automotive industry. 26% of the leasing companies indicated that they are concluding sale and lease back transactions. With respect to cross border leasing only 3% indicated that they are involved in such transactions.

So, Ukraine will most likely increase imports of capital equipment and technologies in the near future. Foreign capital will then have to become a major source of financing for Ukrainian investments. Leasing has great potential for becoming the preferred tool of foreign investors and its share in the investment volume will most likely show steady growth in the coming years [9].

One of the effective ways to overcome the lack of funds for the development of innovation activity is venture (or risk) investment, which is realized through venture funds (VF). In developed countries investors-shareholders WF can be corporations, pension funds, insurance companies, private individuals, banks. The main difference between venture funds and other institutional investors lies in the fact that the former provide funds through the acquisition of shares of enterprises that became the object of investment. Most funds are created for a period of 7-10 years, after VF sells all acquired corporate securities and is liquidated and therefore venture funds are interested in high quotations of shares of the recipient enterprise [10].

Ukraine has an emerging venture capital scene, which indicates the presence of entrepreneurial opportunities in the country. While this form of financing caters for the financial needs of only a small fraction of innovative SMEs, it is an important
ingredient of the innovation system. However, the development of the venture capital industry requires the presence of other financial intermediaries and business services, together with a continuous supply of opportunities needing financing [11].

Note that the function of venture capitalists in Ukraine is executed by asset management companies, which, unlike other countries, are created by average investors. But further, the investment business will develop, serving mostly attracted funds. Much of the funding through these funds comes from the European Bank for Reconstruction and Development (excluding the Western NIS Enterprise Fund).

So, innovative companies and SMEs in general face particular difficulties when trying to raise finance, which remains a critical obstacle when starting a business. However, support programmes for SMEs are very limited and there are no public interventions targeting startups. Limited public resources and previous unsuccessful attempts to stimulate innovation by offering financial incentives help explain the current absence of financial mechanisms to encourage the development of innovative enterprises.

3. Perspective sectors for innovations and investment and linkage with R&D

A sector with great potential is information and computer technologies (ICT) – the only sector in Ukraine that is truly integrated in global value chains through ICT outsourcing services. In 2009, Ukraine had the greatest number of IT specialists (18,100) involved in the IT outsourcing and custom software development in the CEE region. With 16,000 IT specialists graduating from Ukrainian universities each year, the country holds the fourth position in the world in terms of number of certified IT specialists, after the USA, India and Russia.

During the last decade Ukraine has been the leading provider of software development and IT outsourcing services in the Central and Eastern European region (excluding Russia). Ukraine is ranked first in the volume of IT outsourcing and software development services provided, in the number of IT specialists working in the industry, and in the number of IT graduates.
Ukraine still boasts the most impressive gap in Europe between GDP per capita in the country and GDP per capita in the software development industry. This could be an important economic incentive for specialists and businessmen to enter the profitable and well-paid market of software development and IT outsourcing services.

The number of tech-intensive companies in the country has exceeded 3000 in 2017, with at least 1000 of them specializing in software development. This implies competition for clients and competition for the best software developers. This competition turns Ukraine’s software outsourcing into an active, thriving market.

Even though the prices have risen significantly since that time, the country can still offer a lot in the way of cost-savings. In 2017, Ukrainian developers charge 40/60% less as compared to their colleagues in the EU and the US, while demonstrating comparable technical skills.

Ukrainian IT-products market is rapidly growing over several past years with annual increase over 25%. It consists of two main parts – IT outsourcing and delivering IT products for the internal market.

Also the sector of aircraft building has a great potential. One of the positive example of cooperation with foreign investors is that "Kharkiv State Aviation Production Enterprise", which is part of the "Ukroboronprom", will receive orders for mass production of aircraft in the amount of $150 million. Such agreements were reached during the leading international exhibition Dubai Airshow 2017. First of all, it is a question of serial production at the facilities of the state enterprise "Kharkiv State Aviation Production Enterprise" of the Ukrainian An-74 in various modifications. In turn, Oriole Capital Group will have the right to invest in the production, upgrading and marketing of these aircraft. A key element of this strategic partnership is the modernization of existing production, the full involvement of all 3000 specialists of the Kharkiv enterprise, as well as a program for the modernization of aircraft and avionics, which will help improve the operational capabilities of the An-74 aircraft. In addition, the Kharkiv State Aviation Production Enterprise will receive orders for the manufacture of spare parts for aircraft, maintenance and pilot training. The agreement provides for the planning and implementation of the project.
within a significant period of time. This means that the "Kharkiv State Aviation Production Enterprise" has received a stable multi-year development plan, which ensures its efficient work, expansion of production facilities, creation of new jobs and increase of profits, and, at the same time, deductions to the budget of Ukraine. In addition, such cooperation is positively developing an economic, political and trade partnership between the United States and Ukraine by ensuring transparency and accountability of the Ukrainian enterprise.

But a sector of R&D has a significant problems, especially in absence of linkages of research firms and production companies.

Ukraine has a long-standing legacy of high-skilled scientists and engineers. In the recent decades, the country’s science and technology base, however, has been on the decline. Domestically, poor governance, weak institutions, and inefficiencies in the allocation of public funds for innovation and research and development (R&D) are among the main contributors to the decline of Ukraine’s science, technology, and innovation (STI) base [3].

At 2017 the total expenditures for the implementation of research and development by the organizations themselves amounted to 13379,3 million UAH. According to preliminary calculations, the share of total expenditures in GDP was 0.45%, including at the expense of the state budget - 0.16%. According to 2016, the share of expenditures on research and development in the GDP of the EU-28 countries averaged 2.03%.

In 2017 21.9% of the total expenditures on R&D were spent on fundamental research, which 92.4% was financed from the budget. The share of applied research expenditures amounted to 23.6%, which was 51.5% financed from the budget and 27.6% at the expense of the enterprises [6]

The volume of funding for R&D and innovation in Ukraine is not sufficient. The share of R&D in the GDP has been decreasing,. Ukraine underperforms in R&D expenditure per worker in relation to its peers. Low R&D intensity is driven by not only the large number of firms that do not perform any formal R&D but also by low
intensity among those that do conduct R&D. This relative underperformance is driven by the low use of foreign technology licenses by Ukrainian firms.

The share of foreign investments in R&D in Ukraine peaked at about 25 percent of gross domestic expenditure on research and development (GERD) in 2010–2013 but has dropped due to the political and economic instability since 2011 and the recent military conflict in the occupied eastern regions. In 2005, this share was 24.8 percent, and in 2014, 19.8 percent.

Low innovation capacity of research organizations and poor incentives to collaboration hinder potential cooperation between science and industry. The interaction between the research sector and industries and within the research sector (between universities and academic institutes) is weak. Lack of information on opportunities of such cooperation, high costs faced by organizations in search for partnerships, lack of commercial orientation among research institutes and universities, and inefficient technology transfer infrastructure are all hindering collaboration opportunities. Ukraine’s state policies aim at closing this gap through different strategies: creation of research infrastructures for joint use by different research organizations, creation of organizations facilitating technology transfer, provision of grants to promote R&D cooperation between universities and research organizations, and establishment of technology parks.

Brain drain of innovation skills remains a problem, and investment in inventiveness is decreasing. Ukraine has a well-developed education system. University enrolment and higher education attainment in Ukraine are high. The Ukrainian research system is weak concerning both scientific and technological outputs as shown by international indicators relating to scientific production (publications and impact factors) and technological production (patents) [12].

R&D infrastructure remains large but with some exceptions is considered outdated. The number of researchers in Ukraine has decreased five times since 1990, while the number of R&D performing organizations has dropped from around 1,400 to around 1,000. Many institutions perform R&D, but most of this R&D does not have a commercial focus, and when it does, it is linked with noncompetitive state-owned
enterprises (SOEs). The number of researchers, however, highlights the strength of human capital in the Ukrainian economy. Some of these researchers had to migrate to western Europe and the United States to continue their research work, but they still constitute an untapped knowledge potential if the right incentives were to be in place.

The focus of Ukrainian universities is on teaching, and not on conducting R&D. In 2015, 664 universities, colleges, and technical schools were active in Ukraine. Per the latest ERAWATCH report on Ukraine (2011), only half of the slightly more than 350 universities performed any kind of R&D in 2011. Around 25 percent of the universities were private universities. The total expenditure on R&D in higher education was less than 7 percent of GERD in 2011. Two-thirds of persons with degrees of candidates of sciences and doctors of sciences are working in the higher education sector. Per the national statistics, they produce almost 78 percent of research papers, but NASU has more publications in internationally recognized journals, which also receive most of the funding. The relatively low absolute financial allocation might not be sufficient to maintain the comprehensive system of education in a country as big as Ukraine.

In addition, university enrolment in Ukraine remains high, with 80 percent of 19- to 25-year-old Ukrainians enrolled in universities, making it a member of the group of five European countries that collectively represent 54 percent of the total tertiary student population in the European higher education area (EHEA). However, at 1.52 percent, only a fraction of students enrolled at advanced research qualification programs in Ukraine as against 2.7 percent in the EHEA, indicating a low interest of the population in pursuing scientific careers.

The Ministry of Economic Development and Trade (MEDT) and the Ministry of Education and Science (MESU) have launched separate innovation strategies. The MESU launched the Law of Ukraine on Scientific and Technical Activities focusing on the R&D sector and establishing the National Council of Ukraine on Science and Technology Development chaired by the Prime Minister (see the following section). The MEDT launched the High-Tech Sector Strategy focusing on the digital sector primarily. In addition, the Law on State Regulation of Technology Transfer envisages
the development of a national network of technology transfer platforms. Thus, Ukraine has created a diversified innovation support infrastructure but its effectiveness remains quite low due to funding problems and lack of support.

Conclusions

Thus, the article reveals the main factors of negative influence on the industrial enterprises’ innovation activity: high share of financing at own expense; insignificant or no participation of domestic investors at all; low activity of the state and directly regions in financing innovation activity of industrial enterprises. But last positive tendencies – significant level of attraction of foreign investments? Vencure funding and private investors.

Innovative companies and SMEs in general face particular difficulties when trying to raise finance, which remains a critical obstacle when starting a business. However, support programmes for SMEs are very limited and there are no public interventions targeting startups. Leasing has great potential for becoming the preferred tool of foreign investors and its share in the investment volume will most likely show steady growth in the coming years.

Limited public resources and previous unsuccessful attempts to stimulate innovation by offering financial incentives help explain the current absence of financial mechanisms to encourage the development of innovative enterprises.

Research institutes and universities often have no commercial orientation. For small and medium-sized enterprises, scientific services in domestic research institutes are rather costly, and rigid frameworks for interaction do not meet their changing needs. A thorough analysis of existing opportunities and programs is needed to develop relevant policy measures to reform the academic sector. Measures aimed at increasing research and development, both in educational and business environments, have clear limitations while the demand for innovation remains low, which, like other transition economies, is a key constraint for Ukraine.
Innovation activity of industrial enterprises requires substantiation of a set of measures of activating innovative processes, taking into account the potential opportunities of the macro- and microlevel of the enterprise. But the main thing in solving these problems is constant, hard work in search, attraction and effective usage of all potentially possible sources of investment of industrial enterprises' innovations and R&D.

References


