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Matselyuh, N.P. and Demyanchuk, G.V.

National University of State Tax Service of Ukraine, Irpin

FINANCING AND STIMULATION OF INNOVATION COMMERCIALIZATION IN UKRAINE: PROBLEMS AND SOLUTIONS

The article deals with the analysis of financial support of R&D commercialization in Ukraine, the crisis in the sphere of implementation of new technologies at the domestic enterprises, and with ways to stimulate the R&D commercialization.

Key words: innovation, innovation commercialization, innovation financing, innovation stimulation, taxation, and profit tax.

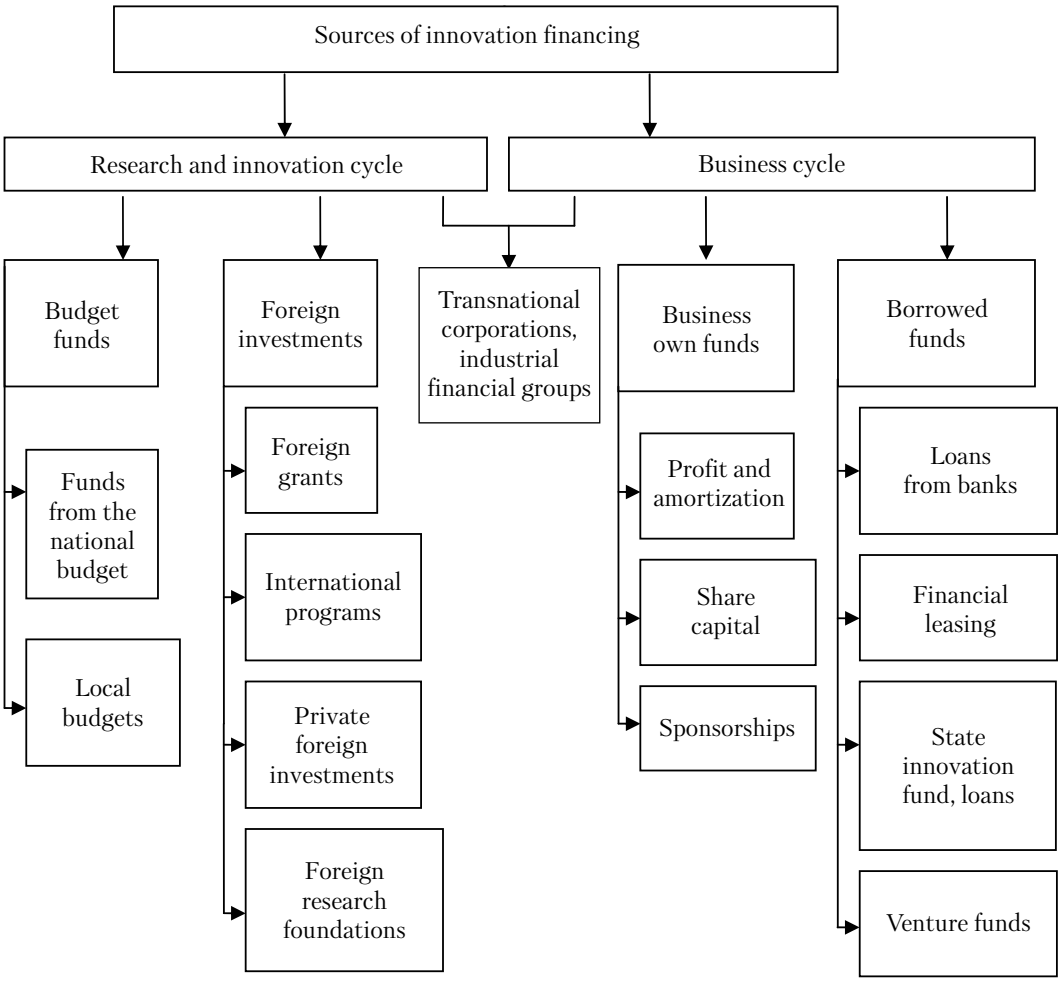
The modernization of economy and its transition to innovative way of development requires substantial financial resources [1—3]. Inasmuch as the innovation is inextricably linked to investments, the search for the most optimal ways and methods for financing and stimulation of innovation is of paramount importance. This task is especially relevant at the final stage of innovation process that is the innovation commercialization[1].

The development and substantiation of algorithm for public funding to stimulate innovation commercialization are relevant for the following reasons: *on the one hand*, it is associated with high risk nature of investments, uncertainty of results, long-term waiting for return from innovation, and weak categorical apparatus that provides formalization of this algorithm in the legislative framework, but, *on the other hand*, it provides an opportunity to invest little funds in the implementation of innovative projects which generate large economic impact and are a major component of economic competitiveness.

[1] Innovation commercialization is the manufacturing application of R&D results as innovative product.

It is known that the innovation process involves four subjects: the state, the inventors, the (domestic and foreign) business, and the consumers. The motivation system for stimulating each of them to facilitate innovation activities should bring the maximum benefit and minimize losses. The state should ensure that all the stakeholders can realize their goals as much as possible: the business to receive a steady income and also extend production; the consumers to use a new product or service that satisfies their needs in full; the state must determine the sharing of rights to intellectual property created at the expense of public funds, protect the interests of the state and the inventors, share the royalties from the invention commercialization, and, consequently, improve competitiveness of the national economy in the global market thereby ensuring sustainable development, high living standards, and welfare of general population.

Many researchers have studied the issues related to financial support and facilitation of innovation commercialization. Among them, there are *V. Novytskyi, A. Kuznetsov, V. Osetskyi, L. Antoniuk, M. Krupka, D. Kokurin, S. Onyshko, A. Lapko, Yu. Ivanov, L. Zotov, O. Holychenko, L. Fedulova*, etc.



Note: the chart is prepared by the authors.

Sources of Innovation Financing in Ukraine

In recent years, in Ukraine, a significant portion of scientific papers have discussed the problems related to the financing and facilitation of the research and innovation cycle using both direct and indirect methods. However, the Ukrainian economists pay insufficient attention to the financing and facilitation of the other cycle of innovation process, the business one.

The commercialization of innovative products is the most difficult process in terms of financial support insofar as it requires large resources from a limited number of funding sources. In the world practice, there are a lot of tools to support innovation commercialization, with the help of which the state performs its functions in this area. Typically, for financing this cycle there are used the business own funds, the bank loans, and the funds from innovation foundations (see Chart).

Indeed, one of the most acute problems of building the innovative economy in many outsider countries, including Ukraine, is a gap between separate stages of innovation process, i.e. between the research, development, and design works and their commercialization. It is caused by the lack of effective mechanism for converting the knowledge into its practical use. This is the main reason for the so-called «*European paradox*» (i.e. a gap between Europe and the USA). Despite the par-

ity between the United States and the EU in the majority of fundamental researches the U.S. share of exports of certain types of high-tech products exceeds 2—10 times that of European countries [4].

The organization of innovative activities in Ukraine is an example of the gap between the creation of innovative product and its commercialization. The analysis of statistical data on R&D activities for the period from 2000 to 2012 has showed a steady increase (6.65 times) in the value of fundamental and applied research, at the 1st stage. However, the value of R&D (2nd stage) for this period grew only 4.85 times. At the end of period, it was 1.15 times higher than that of fundamental and applied research) and virtually came up with it. This ratio indicates that by every four fundamental and applied research works five R&Ds are accounted for. According to international experience, this ratio shows that in Ukraine there are no activities aimed at commercializing innovative technologies, since it is a known fact that for the successful application of technologies the funding of developmental works should exceed more than 10 times that of research ones [5] (Table 1).

The statistical and analytical data on the total innovation-related expenses in the industry show that there is a clear disparity in financing of innovations at the different stages, as about 60% of innovation-related expenses is used for purchasing machinery, equipment, and facilities, 10—15% is assigned to conducting R&D works, and only 3—4% is accounted for by acquiring new technologies (Table 2).

This indicates a low demand for domestic R&D from the industry, for Ukrainian enterprises preferring to use foreign technologies and equipment in order to upgrade their production facilities and to enhance their capacity. At best, they use foreign technology transfer.

This is explained by a distrust of Ukrainian producers in the domestic R&D results, while the foreign firms offer new turnkey technologies and equipment with a reliable guarantee of quality and service. Therefore, in Ukraine, despite an R&D

Table 1

R&D and Engineering Works Done*

	Total. in actual prices	Including				Share of R&D works in GDP
		Fundamental research	Applied research	R&D	Research and engineering services	
	UAH millions					%
2000	1978.4	266.6	436.7	1106.3	168.8	1.16
2001	2275.0	353.3	304.9	1317.2	299.6	1.11
2002	2496.8	424.9	343.6	1386.6	341.7	1.11
2003	3319.8	491.2	429.8	1900.2	498.6	1.24
2004	4112.4	629.7	573.7	2214.0	695.0	1.19
2005	4818.6	902.1	708.9	2406.9	800.7	1.09
2006	5354.6	1141.0	841.5	2741.6	630.5	0.98
2007	6700.7	1504.0	1132.6	3303.1	761.0	0.93
2008	8538.9	1927.4	1545.7	4088.2	977.7	0.90
2009	8653.7	1916.6	1412.0	4215.9	1109.2	0.95
2010	9867.1	2188.4	1617.1	5037.0	1024.6	0.90
2011	10349.9	2205.8	1866.7	4985.9	1291.5	0.79
2012	11252.7	2621.9	2057.7	5369.9	1203.2	0.80

* *Source*: State Statistics Committee, www.ukrstat.gov.ua

potential which is able to create high-tech products, there is a crisis in the innovation commercialization, as the ties between the science and the industry (which were weak as it was) have been virtually lost. In this context, the structure of innovation funding in the industry in recent years is given in Table 3.

As Table shows, the funding of individual stages of innovation process in the industry in 2000–2012 is structured as follows: the proprietary funds have the share of about 71.5%; the foreign investors provide nearly 7.2%.

It should be noted that foreign investment inflow does not always guarantee the introduction of advanced technologies (i.e., there is no direct correlation between innovation and investment). The statistical data have showed that in recent years despite a significant increase in foreign direct investments almost all indicators of innovative activities of industrial enterprises declined [6]. The main source of funding of innovation commercialization is the proprietary funds, while in the West, since the 1990s, the key source of innovation financing has been the venture capital which help to attract hefty costs of large corporations, pension and insurance funds [7]. Therefore, the proprietary funds cannot be considered a major source of innovation financing apparently because of their limited character. Only large enterprises, financial or industrial groups and multinational companies can afford this way of funding.

For this reason, it is necessary to search for alternative sources. As the international experience shows, one of the most effective tools of innovation commercialization is credit investment. However, in Ukraine, there are some obstacles on this path. *Firstly*, these are high risk, low credit investment activities, and long payback period, which restrain the bankers from financing innovative projects. *Secondly*, the borrowers fail to estimate the appropriate amount of loan to finance inno-

Table 2

Total Innovation-Related Expenses of the Industry (2000—2012)

	Share of enterprises dealing with innovations	Total expenses	Including by directions				
			R&D	Cost of external knowledge[1]	Preproduction for application of innovations[2]	Cost of hardware and software[3]	Other expenses
	%	UAH millions					
2000	18.0	1760.1	266.2	72.8	163.9	1074.5	182.7
2001	16.5	1979.4	171.4	125.0	183.8	1249.4	249.8
2002	18.0	3018.3	270.1	149.7	325.2	1865.6	407.7
2003	15.1	3059.8	312.9	95.9	527.3	1873.7	250.0
2004	13.7	4534.6	445.3	143.5	808.5	2717.5	419.8
2005	11.9	5751.6	612.3	243.4	991.7	3149.6	754.6
2006	11.2	6160.0	992.9	159.5	954.7	3489.2	563.7
2007	14.2	10850.9	986.5	328.4	X	7471.1	2064.9
2008	13.0	11994.2	1243.6	421.8	X	7664.8	2664.0
2009	12.8	7949.9	846.7	115.9	X	4974.7	2012.6
2010	13.8	8045.5	996.4	141.6	X	5051.7	1855.8
2011	16.2	14333.9	1079.9	324.7	X	10489.1	2440.2
2012	17.4	11480.6	1196.3	47.0	X	8051.8	2185.5

[1] Till 2007, cost of new technologies; [2] Since 2007, the index is referred to other expenses; [3] Till 2007, cost of machinery and equipment related to innovation application.

vative projects and terms of loan repayment, which causes an increase in the share of budget funds. *Thirdly*, the financial capital of Ukraine's banking system is small and, therefore, it has limited opportunities for lending the innovative activities in the real economy [8]. Recently, the scientific community and the government structures have been actively discussing various proposals on the establishment of financial institutions to fund, to lend, and to insure innovative projects. There is an idea to create an innovative bank whose main function is to provide long-term financing of innovative projects at low interest rates, to carry out transfer and leasing operations etc. However, in Ukraine, not a single commercial investment bank issuing long-term loans has been created so far. Moreover, despite the Presidential Decree XV-41 of 21.01.1993, the state

Table 3

Structure of Innovation Funding in the Industry*

	Total expenses	Including			
		Proprietary funds	State budget	Foreign investors	Other sources
	UAH millions	UAH millions	UAH millions	UAH millions	UAH millions
	% of total	% of total	% of total	% of total	% of total
2000	1757.1	1399.3	7.7	133.1	217.0
	100.0	79.6	0.4	7.6	12.3
2001	1971.4	1654.0	55.8	58.5	203.1
	100.0	83.9	2.8	3.0	10.3
2002	3013.8	2141.8	45.5	264.1	562.4
	100.0	71.1	1.5	8.8	18.7
2003	3059.8	2148.4	93.0	130.0	688.4
	100.0	70.2	3.0	4.2	22.5
2004	4534.6	3501.5	63.4	112.4	857.3
	100.0	77.2	1.4	2.5	18.9
2005	5751.6	5045.4	28.1	157.9	520.2
	100.0	87.7	0.5	2.7	9.0
2006	6160.0	5211.4	114.4	176.2	658.0
	100.0	84.6	1.9	2.9	10.7
2007	10850.9	7999.6	144.8	321.8	2384.7
	100.0	73.7	1.3	3.0	22.0
2008	11994.2	7264.0	336.9	115.4	4277.9
	100.0	60.6	2.8	1.0	35.7
2009	7949.9	5169.4	127.0	1512.9	1140.6
	100.0	65.0	1.6	19.0	14.3
2010	8045.5	4775.2	87.0	2411.4	771.9
	100.0	59.4	1.1	30.0	9.6
2011	14333.9	7585.6	149.2	56.9	6542.2
	100.0	52.9	1.0	0.4	45.6
2012	11480.6	7335.9	224.3	994.8	2925.6
	100.0	63.9	2.0	8.7	25.5

* *Source:* State Statistics Committee, www.ukrstat.gov.ua

bank for reconstruction and economic development still has not been incorporated.

In the context of the innovation commercialization financing it is necessary to pay attention towards the development of venture capital. It is known that in the United States and in Europe venture capital is an important instrument for funding R&D, high-tech development, and support of small and medium business.

In Ukraine, the development of venture investments started with the arrival of foreign venture capital from advanced economies (1992–2001). The second stage is associated with the adoption, in 2001, of the Law of Ukraine on Co-Investing Institutions and is characterized by the development of domestic venture capital funds based on domestic capital and managed by domestic asset management companies. The Law introduced a favorable regime for the operation of venture capital funds, including tax incentives and facilitating administration procedures. However, increased capitalization of venture funds has not resulted in adequate growth in investment inflow to the innovation sector [9]. Among the factors that hinder the development of venture capital in Ukraine, there are as follows: 1) the lack of targeted government policy for attracting domestic capital to venture funds; 2) the lack of clear legislative framework for venture capital; 3) the lack of laws to protect the rights of investors who are not major shareholders; 4) uncertainty and imperfectness of tax legislation and legislation on bankruptcy; 5) underdeveloped conditions for venture investments (e.g., the lack of institutions for professional scientific, engineering, and commercial expertise of innovations, insurance of investments in innovation, and direct information channels connecting the market demand for innovation and the bid of innovative ideas and intermediary services); and 6) the lack of qualified professionals in the field of innovative projects [10]. The Decree of the President of Ukraine of March 25, 2012, implies the development of draft law on the general principles of formation and regulation of venture capital market in Ukraine. The creation of national venture capital firm was discussed during the working group meeting on reforms related to the development of science, engineering, and innovation sector [11], but, as of today, the reform has been suspended because of political crisis.

So, in Ukraine, venture capital is not eager after the financial support of high-tech projects. Not a single venture fund has invested in the development of biotechnology, optical electronics, computers, telecommunications, and so on. Despite the fact that this is just venture capital that is one of the most effective mechanisms for PPP in the high-tech field.

In addition to the aforementioned obstacles on the path towards commercialization of R&D works the development and introduction of an effective mechanism for the transfer of intellectual property created at the expense of public funds to the private business are an extremely important problem. The speed of any process is known to be limited by its slowest stage. In the innovation process this stage is the transformation of intellectual property object into product. To overcome the technical and commercial risks related to adapting the product to the market the government has to protect the rights of business entities in those areas where the market is inefficient (the formation of artificial demand for very promising new products within the framework of large-scale capital-intensive and long-term innovation projects, the development of legislative framework, the creation of institutional infrastructure, the support of business, and the facilitation of innovative product evolution from the fundamental research to the specific commercial product (negotiation of the so-called «death valley» [12] which is commonly referred to as a deep gap between the stages of invention and commercialization).

To combine the priority science with the profitable business the United States that is the world leader in the field of innovation commercialization, has adopted the following legislative acts:

1) The Bayh-Dole Act of 1980; Public Law 96-517 which entitles the universities, small business-

es, and non-profitable organizations with right to patenting of inventions developed at the expense of government funds and encourages the inventors to transfer licenses to the industry for their commercialization within the United States;

2) The Stevenson-Wydler Technology Innovation Act of 1980 that governs the procedure for technology transfer by national institutions and private companies through disseminating information about the results of R&D activities;

3) The Federal Technology Transfer Act, 1986;

4) The National Competitiveness Technology Transfer Act of 1989 which establishes a mechanism for transfer of ownership from the federal and government laboratories (managed by universities and industrial corporations) to the private sector;

5) The Small Business Innovations Research Act which encourages the SMEs to participate in the innovation commercialization;

6) The Cooperative Research Act of 1984 which expands the scope of cooperation between the public institutions and the real economy;

7) The Small Business Technology Transfer Act of 1992 which unifies the mechanisms of technology transfer to the small business [13].

Following the adoption of the above laws the number of U.S. patents increased 10 times. During 2—3 years, 2200 companies were incorporated for commercialization of R&D results and more than 300 thousand jobs were created. Currently, these laws have been properly adapted to local conditions and are used in the majority of advanced economies [14].

Given the critical gap between Ukraine and the leading world countries in the commercialization of technologies, on October 6, 2012, the Verkhovna Rada of Ukraine adopted the Law of Ukraine on the state regulation of activities in the sphere of technology transfer as revised. Pursuant to the Law, the property rights to technologies developed at the expense of the state budget should be transferred to the organizations and developers for their commercialization. It also establishes that the funds gained from the transfer of such technologies should belong to the organizations and developers and be used for the further development of innovations. According to Borys Grinyov, the Full Member of NASU, it is planned to draft the Laws of Ukraine on amendments to the Budget Code (with respect to the establishment of foundation for supporting the priority innovation projects) and on amendments to the Tax Code of Ukraine (in the context of fostering the innovative activities), as well as a set of other initiatives. Time will tell how they influence the R&D commercialization [15].

As the international experience shows, given a low interest of foreign and domestic investors in investing to R&D, as well as the underdeveloped system for attracting borrowings and venture capital for funding the innovative projects [16] and immature mechanism of intellectual property transfer to the private business, one of the most effective tools with the help of which the state can stimulate the R&D commercialization should be fiscal instruments in terms of profit taxation of business entities. Since the main goal of innovation (the 2nd cycle) is to gain profit, the investment and innovation activities can be regulated by providing fiscal relief with respect to profit taxation and depreciation. The vast majority of developed countries stimulate the innovation commercialization through tax relief for corporate profit tax, insofar as the mechanism of its administration is clear, its transparency is doubtless, the level of corruption and bureaucracy is minimal, and the culture and consciousness of taxpayers and officials directly involved in the process are steadily high. As a result, a favorable climate is created for realizing investment and innovative benefits related to profit tax relief in the form of:

- A decrease in standard rate of tax;
- Accelerated depreciation;
- Investment tax relief;
- Investment tax credit;
- Creation of tax-free reserve funds;
- Tax holidays;
- Preferential taxation of dividends on shares of innovative companies;

- Correlation of tax with an increase in innovation-related expenses;
- Reduction of the tax payable by the cost of instruments and equipment transferred to educational institutions, research institutes, etc. [17].

In Ukraine, as *Yu. Ivanov* put it in his work *Tax-Related Aspects of Competitiveness*, the unreasonably large number of privileges and abuses by businesses in their application, as well as imperfect mechanisms of tax regulation and their poor effectiveness have led to their partial or complete failure [18]. However, according to other economists, the abolition of privileges means nothing in itself but only the deprival of tax system of its regulatory functions, and consequently, of opportunities to identify and to stimulate strategic directions of domestic production [19, 20].

Given the realities of present-day Ukraine, the stimulation of innovation commercialization through corporate profit tax relief is not an effective tool, since according to experts the mechanism for administration of this tax is ranked at the top of the most complicated in the tax system of Ukraine. There are a set of problems concerning the collection of corporate profit tax, including:

1) Rapid unification of shady patterns for partial or complete evasion of corporate profit tax;

2) A real opportunity for the taxpayer to reduce tax base by understating gross income, or, alternatively, by overestimating the total costs and depreciation;

3) A simplified taxation system: the taxpayers artificially divide their companies, into the so-called «small businesses» in order to pay a fixed amount of tax (much lower than the full rate, provided their profit does not exceed the established limit).

Implicitly, in the most advanced economies, a key instrument to stimulate innovative development is profit tax due to the well-developed mechanism of its administration and high level of tax culture and consciousness in general. In Ukraine, under the conditions of economic instability, high bureaucracy, and corruption the stimulation of innovations through profit tax relief will not yield the desired fruits.

There are other proposals as to the commercialization and promotion of R&D results. For example, *A. Moldovan* believes that the reduction of corporate tax rate to 16% does not automatically imply that the company will spend released funds for investment into innovation. In his opinion, it would be much more efficiently and less expensive for the budget to apply a tax relief only to the portion of profit reinvested by company and to maintain a high rate of profit tax for that withdrawn from business (for example, as dividends) [21].

Due to the fact that one of the main problems of the Ukrainian economy is a poor provision with equipment, a depreciated hardware, and, consequently, a low productivity, with depreciation not influencing significantly the facilitation of innovations, the economic policy should be aimed at stimulating the innovation growth by transforming the profit tax. Insofar as because of limited financial resources the tax relief cannot apply to all innovative projects, it should be based on the following principles:

1) The tax relief is granted only to the priority sectors (at most, five);

2) For mass innovations the general innovative benefits should be given to all entities engaged in innovative projects, without any exception;

3) The tax relief should be differentiated according to the classification of innovations: in terms of sphere of application (technological, environmental, organizational, operational, management, etc.); in terms of novelty and significance (basic, upgrading, etc.); in terms of scope of application (global (state), regional, and local);

4) The period of eligibility for tax relief must be related to the duration of innovative product (technology) lifecycle or value added;

5) The balanced use of high tax rates with an extensive system of benefits and, conversely, a moderate tax burden with a moderate amount of benefits (i.e. new benefits introduced to stimulate the innovation commercialization) should not destabilize the tax rate and relief system that will be an incentive tool;

6) Unbiased supervision of regulatory bodies over targeted differentiated application and validity term of tax relief, as well as over compliance with eligibility criteria.

These principles should be comprehensively analyzed to develop a mechanism for optimizing taxation of innovation business.

Thus, to accelerate the R&D commercialization the state must put every effort to engage business entities in the innovation process, namely:

- To create transparent lending institutions; to encourage the use of venture capital;
- To develop an effective mechanism for the transfer of intellectual property to private business;
- To promote public-private partnerships;
- To develop an effective mechanism of tax reliefs for the innovative businesses.

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Н.П. Мацелюх, Г.В. Демьянчук

ФИНАНСИРОВАНИЕ И СТИМУЛИРОВАНИЕ КОМЕРЦИАЛИЗАЦИИ ИННОВАЦИЙ В УКРАИНЕ: ПРОБЛЕМЫ И ПУТИ РЕШЕНИЯ

Проведен анализ состояния финансового обеспечения коммерциализации научно-технических разработок в Украине, рассмотрены проблемы кризисного состояния внедрения новых технологий на отечественных предприятиях и предложены пути стимулирования коммерческой реализации научно-технических разработок.

Ключевые слова: инновации, коммерциализация инноваций, финансирование инноваций, стимулирование инноваций, налогообложение, налог на прибыль.

Н.П. Мацелюх, Г.В. Дем'янчук

ФІНАНСУВАННЯ ТА СТИМУЛЮВАННЯ КОМЕРЦІАЛІЗАЦІЇ ІННОВАЦІЙ В УКРАЇНІ: ПРОБЛЕМИ І ШЛЯХИ ВИРІШЕННЯ

Проведено аналіз стану фінансового забезпечення комерціалізації науково-технічних розробок в Україні, розглянуто проблеми кризового стану впровадження нових технологій на вітчизняних підприємства та запропоновано шляхи стимулювання комерціалізації реалізації науково-технічних розробок.

Ключові слова: інновації, комерціалізація інновацій, фінансування інновацій стимулювання інновацій, оподаткування, податок на прибуток.

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