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SOCIAL AND ECONOMIC EFFICIENCY OF ACADEMIC TECHNOPARKS IN UKRAINE



The socio-economic performance of technology parks established within the framework of the NAS of Ukraine in 2000–2014 has been analyzed. The prospects and expediency of their operation in the next decade have been discussed.

Keywords: efficiency, fiscal efficiency, economic efficiency, social efficiency, technological parks, the NAS of Ukraine, and innovations.

The innovative way of development during the transition from the industrial economy to the economy of knowledge based on continuous technological evolution, design and implementation of hi-tech products generating a high added value has become a dominating factor of the economic growth, which ensures the further evolution of the society.

Being dependent on raw resources Ukraine's national economy is very sensitive to the fluctuations of demand for exports (metallurgical, chemical, and agricultural products, etc.) on the world markets. The price quotations and demand in the crisis years have a major impact on the economic situation of both the entire industries and the individual businesses. Unfortunately, because of a turbulent path towards the formation of Ukraine as an independent state, fight between various political forces, unpatriotic policy of local oligarchs and a protracted political crisis the country has still been significantly behind the global processes of economic and technological development. The share of Ukraine's high-tech products in the world market is quite meager and does not meet its scientific potential. Therefore, it is necessary to reorient Ukraine's industry to-

wards manufacturing products with high added value and to make a technological breakthrough through the innovation activities.

The world experience shows that in the advanced economies, the key elements of innovation infrastructure driving the innovations are the technology parks and similar vehicles. The scientists, developers, and users of innovations join their efforts, which leads to a rapid increase in the number of technological parks in the advanced economies and emerging markets. As Chinese leader Deng Xiaoping put it, the technological parks were the best innovation ever established in China.

It is a well-known fact that the innovation activity in any and all countries is associated with increased investments in developing the innovations, as well as with significant cost and high risks when placing the innovative products on the market. Therefore, the government should implement a set of measures for different types of supporting the innovation and innovative structures, including the technological parks. The experts have counted over 300 kinds of support in the advanced economies and emerging markets.

The US President has declared *the American Competitiveness Initiative* involving the allocation of USD 50 billion for research from the US budget and USD 86 billion as tax exemptions, in

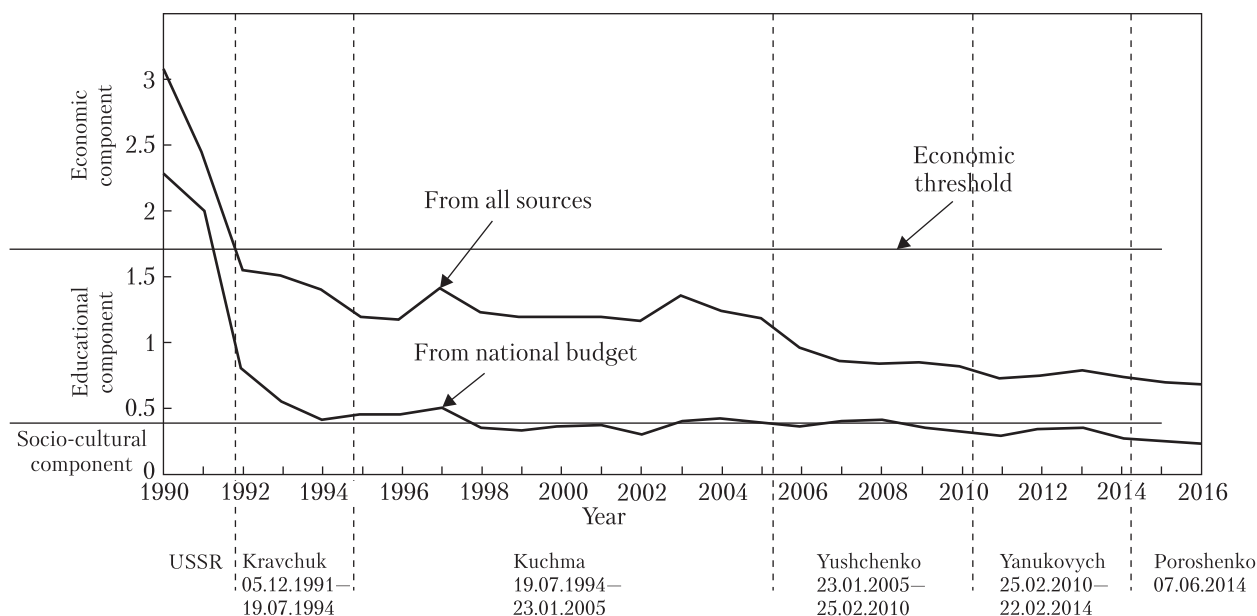


Fig. 1. Share of R&D in the GDP of Ukraine

2007–2016. That's a good example for Ukraine's political leaders with their pro-Western orientation! President Obama stated that public funding of science and innovation was a contribution to the future of the United States, not an act of charity. He expects that in the future, the American innovative system will ensure a return of 2 USD per every dollar of federal support.

In Ukraine, science and innovation have been proclaimed as key strategic components of the national ideology for socio-economic development and a pillar of the national security. However, besides the national ideology, there is also the government policy that is real government actions aimed at ensuring the implementation of key provisions of national ideology. In fact, the government policy in the sphere of science and engineering is antithetical to the national ideology. Although the legislation foresees 1.7% of GDP as a benchmark for budgetary funding of science, for many years, including 2016, the government has been assigning much less (Fig. 1).

The systemic weaknesses and potential threats in the field of science, technology, and innovation were pointed out during parliamentary hearings

«The National Innovation System of Ukraine: the Challenges of Formation and Implementation» (20.06.07). It was stated that the negative phenomena in the sphere of science, technology, and innovation were going to become irreversible and threatened the technological and economic security of Ukraine, which required urgent actions from both the top officials and the executive bodies at all levels. Similar conclusions were made at the hearings in 2008, 2009, and in 2014.

One of the «bridges» between the science and the industry, which drives the innovations in the absence of industrial science that has been actually destroyed in recent years, should be the technological parks. The framework for the establishment and functioning of technological parks was provided by the Law of Ukraine on Special Regime of Innovation Activities of Technological Parks adopted in July 1999 upon the initiative of the National Academy of Sciences of Ukraine. The first three parks were established by leading research institutions of the NAS of Ukraine: the Paton Electric Welding Institute, the Institute for Single Crystals, and the Lashkaryov Institute of Semiconductor Physics. Later, more 13 parks were

launched, including 3 academic ones. Table shows the technical and economic indicators of the technological parks of Ukraine, including the academic ones and the largest of them that is the Technological Park of the Paton Electric Welding Institute.

More than 98 per cent of sales of innovative products account for three academic technological parks created on the basis of the leading institutions of NAS of Ukraine.

The average growth rate of technological parks innovation products in 2001–2006 amounted to above 50 per cent (5–7 times higher than in average in the industry).

The table technological parks performance was recorded in the departmental statistical reporting of the Ministry of Education and Science of Ukraine. Monitoring of these indicators was annually held both by this Ministry and Ministry of Finance of Ukraine, as well as tax and customs authorities that supervised the implementation of each project.

In Ukraine, for the period of 2001–2014, support of technological parks from the state amounted to UAH 510 million while UAH 1033 million was transferred to the budget, i.e. almost UAH 2 per UAH 1 of government support (EWI technology park figure being UAH 4.41).

Model of «wall-free technological park» or according to the international terminology «virtual

technology park» implemented in Ukraine, in opinion of leading experts of international economic and financial organizations (including the World Bank and Economic Commission of European Council) met the current trends of technological park development. The high economic efficiency of this model allows it to achieve the performance exceeding that of traditional parks.

The developed countries that understand the role of technological parks, at the state level, take care of special regimes to promote their activities.

These are the government funding, tax and customs exemptions, loans on favorable terms, target funding of individual innovative products, public demand for innovation products and so on. Most of technological parks funding is provided by state: 62 per cent in Great Britain, 78 per cent in Germany, 74 per cent in France, nearly 70 per cent in Netherlands and almost 100 per cent in Belgium. In case of such support from government the technological parks can create new jobs, develop highly profitable businesses and fill the national markets with high tech products, contribute to the presence of competitive products of these countries in the world markets of goods and services.

In Ukraine, the government has not spent a penny of expenditure part of the budget for creation and state support of technological parks.

Technical and Economic Indices of Ukraine's Technological Parks in 2000–2014

Index	Ukraine's technological parks	Academic technological parks	EWI technological park
Technological park projects approved	120	90	21
Revenues from innovative products, UAH million	12 654	12 427	8 538
Including exports	2007	1810.1	939.5
Imports, UAH million	1859	1500	604.7
Total taxes and duties accrued, UAH million	1543	1468.1	833.2
Including those paid to the national budget	1033	1007.1	679.1
Target grants-in-aid, UAH million	510	561.0	154.1
Budget balance, UAH million	523	446.1	525
New jobs created, units	3 564	2 908	1762
Investments, UAH million	531	519.5	54.4
Loans, UAH million	3 502	3 309.6	1 416
Funding from the national budget, UAH million	51	50	17.4

They themselves have earned money due to a special regime for their innovation activities approved by the law, and added UAH 1 007.1 million to revenue part of the national budget.

INNOVATIVE PROJECTS OF TECHNOLOGICAL PARKS

All projects meet legally approved innovation priorities of specific technological parks, scientific specialization of the founding institutes and include, as a rule, all stages of innovation cycle beginning from applied research and development to production and release of innovative products to the market. The projects have the necessary degree of patent protection in the countries which are the potential consumers of these products.

As an example one can cite a number of basic projects carried out by the leading technological parks of Ukraine:

+ IMC technological park:

- *modern medical gamma-camera;*
- *highly sensitive detectors of single crystals of X-ray introsopes;*
- *diagnostic medical test kits;*
- *super modern film antibacterial nanomaterials;*

+ SCI technological park:

- *domestic energy-saving (including LED) light sources;*

+ EWI technological park (these projects are described in more detail since the authors participated in their implementation):

- *High-frequency welding of soft human tissue.*

American experts have called this project «a breakthrough in surgery of XXI century». The work was patented in Ukraine, China, the USA, Germany, Australia and received State Award of Ukraine in Science and Technology. Today, more than 130 thousand patients have been successfully operated in Ukraine, without any serious postoperative complications;

- *Technologies and machines for butt contact welding of high-strength rails.*

The work has been protected by 48 patents of leading countries of the world. The authors of the

work were awarded with the State Prize of Ukraine. Mass production of rail welding machines which are widely used in construction of high-speed railways has been organized. Only in China, in recent years 11 thousand kilometers of roads have been laid (in the coming years this figure will double), and more than 5 thousand kilometers in Ukraine. The total economic effect has amounted to more than UAH 2.6 billion;

- *Duplex-process of high-quality welding flux melting*

The process is unique in the world. It allows to replace 50 per cent of imported raw materials by domestic steel slag waste (70 per cent of production is exported);

- *Modern energy-saving equipment for arc welding.*

Over 75 per cent of the equipment is exported.

Implementation of innovative projects in special tax regime allowed the participants of technological parks to provide the following:

- + accelerate the creation of innovations and their market entry;
- + create the competitive manufacturing innovative products, constantly increase volumes of production and transfer of funds to the budget and extra-budgetary funds;
- + increase the export potential of the national economy and reduce its dependence on imported high-tech products;
- + provide a positive foreign trade balance for their technological parks.

Consequently, participants of technological parks sustained such option to strengthen the economy, when there has been the development of products with high added value, as well as increase in wages and tax base, and not stagnation and rising tax burden. In addition, it was expected that all this would raise the standard of living of project executors and their customers.

The results of the technological parks for the previous period convincingly proved that the Ukrainian model of technological parks was a highly effective measure that could significantly accelerate the development and production of globally competitive products of high technological structures, and the Law of Ukraine «On Special Regime (Conditions)

of Innovation Activities of Technological Parks» in its original form was one of the most efficient economic laws of independent Ukraine.

DYNAMICS OF TECHNOLOGICAL PARKS INDICATORS

Annual output of innovative products (Fig. 2) for the projects of industrial parks within the special regime increased 16.7 times (from UAH 0.18 billion, in 2001, to UAH 2.6 billion, in 2007). The average rate of increase in output was about 50 per cent.

In the 2000–2014, a positive balance of foreign trade activities of technological parks was UAH 148 million (Import: UAH 1 859 million; Export: UAH 2007 million). The budget balance of technological parks (the difference between deductions to the budget and all kinds of state support) was UAH + 523 million (payments to the budget: UAH 1033 million; all kinds of state support: UAH 510 million).

These diagrams show our dynamic performance of technological parks of Ukraine and academic technoparks (whose share is more than 98 per cent).

Unfortunately, sectorial statistical reporting of the Ukrainian technological parks is limited only by a period of performance of the innovation project, i.e. by five years, and ignores further results of their work. As a result, tax revenues to the budget and extra-budgetary funds from sales of products developed during innovative projects and products received outside of the special regime for each project are not counted, although these revenues are primary results of innovation activities of technological parks. Fig. 3 shows the sales volume of EWI Technopark in 2000–2010, both under special tax regime and after its completion, i.e. full transfer to the budget and off-budget funds of all taxes and charges, given the fact that the average fiscal load in those years amounted to 35 per cent. During this period, the state budget received from the technological park more than UAH 2.05 billion that had not been taken into account in the departmental reporting. The final budget balance

of EWI technological park over the years was UAH 2.58 billion (see, Fig. 4). Additional socio-economic effect is achieved at the expense of creation of new jobs. There appeared 1.76 thousand new jobs due to the projects of EWI technological park. Given the fact that the creation of a workplace requires in average UAH 50 thousand, an additional effect of technological park activities made up about UAH 100 million. This figure was achieved without additional funding.

In addition, in 2000–2010, the wages paid for the implementation of projects of the EWI technological park amounted to over UAH 2.8 billion (higher than the industry average), due to which the state received additional income in the form of tax on personal income tax, sales distribution network, payment for various services, and so on.

Beginning from 2005, the technological parks performance began to decline and in 2010–2014 came to nothing. The main reasons for this situation are as follows:

- ✦ government failure to comply with the current legislation, and constant changes in legislation, which led to a deterioration in working conditions of technological parks. And all this took place despite the presence of articles of law on technological parks prohibiting such changes;
- ✦ blocking the adoption of innovative projects in 2005–2010 (Fig. 5). However, starting from 2010, after the entry into force of new International Revenue Code, because of the reduction of benefits any project has not been accepted.
- ✦ starting from 2005, the state support of technological parks projects (Fig. 6) began to decline dramatically and, currently, has practically come to zero. State support of innovative projects within technological parks significantly (1.5–2 times) accelerates their implementation. Otherwise, projects deadlines will grow and implementation of many projects will be impossible.

The result of these major and several additional factors was a significant slowdown of innovation potential through the implementation of new innovative projects (the so-called innovation chain)

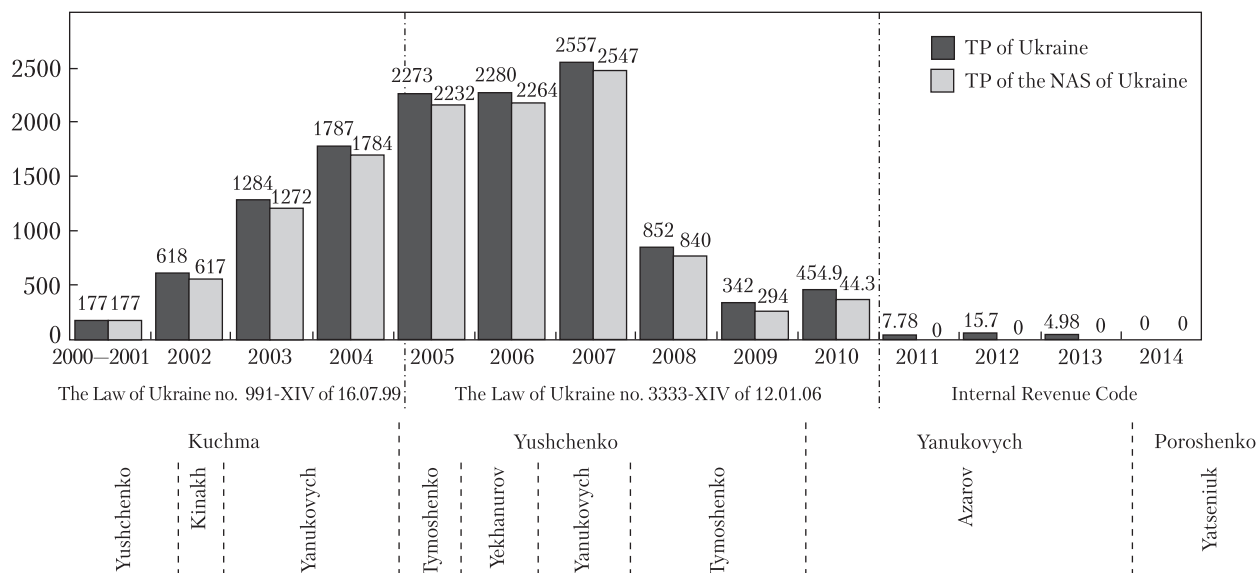


Fig. 2. Annual sales, UAH million

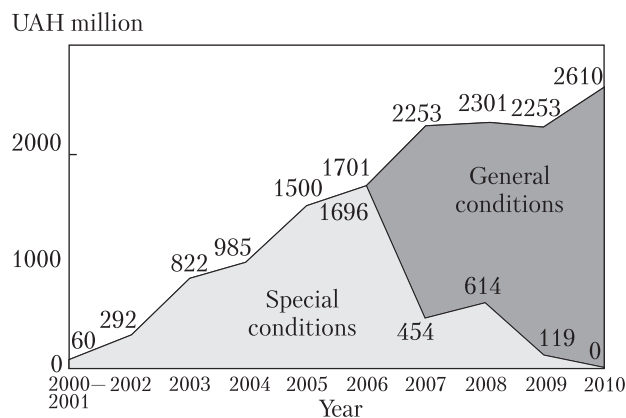


Fig. 3. Sales of innovative products, UAH million per year

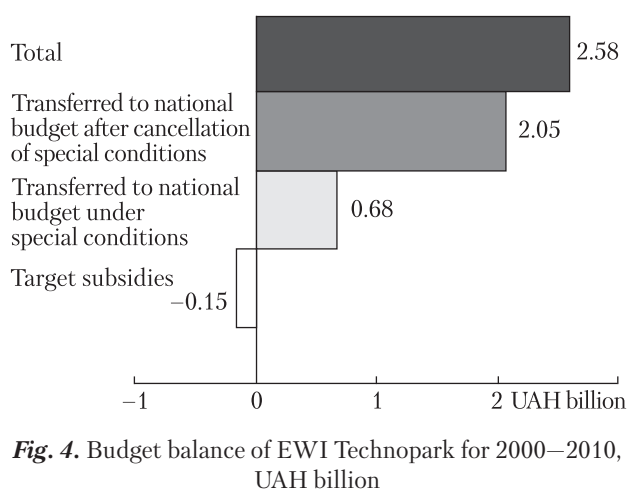


Fig. 4. Budget balance of EWI Technopark for 2000–2010, UAH billion

and increase of the taxable base instead of tax burden. The dynamics of economic indicators of technological parks shows that short-term (2005–2007) inertial growth of budget revenues later was replaced with their steep decline (Fig. 7).

According to our estimates, for the last five years the budget has lost more than UAH 1.5 billion. Supply of technological parks products to foreign markets reduced and came to naught (Fig.8).

The technological parks which occupied a significant share in the innovative products of indus-

try, (approximately 10 per cent) lost their dynamics and in 2014 their share brought to naught.

As a whole, there appeared 2908 new jobs (Fig. 10) and beginning from 2005, this figure went down sharply. The results of the leading domestic technological parks in 2000–2004 show that the law on technological parks in its original form (Law number 991-XIV of July 16, 1999) due to economically sound organizational forms and mechanisms to encourage innovation was one of the most successful economic laws of independent Ukraine.

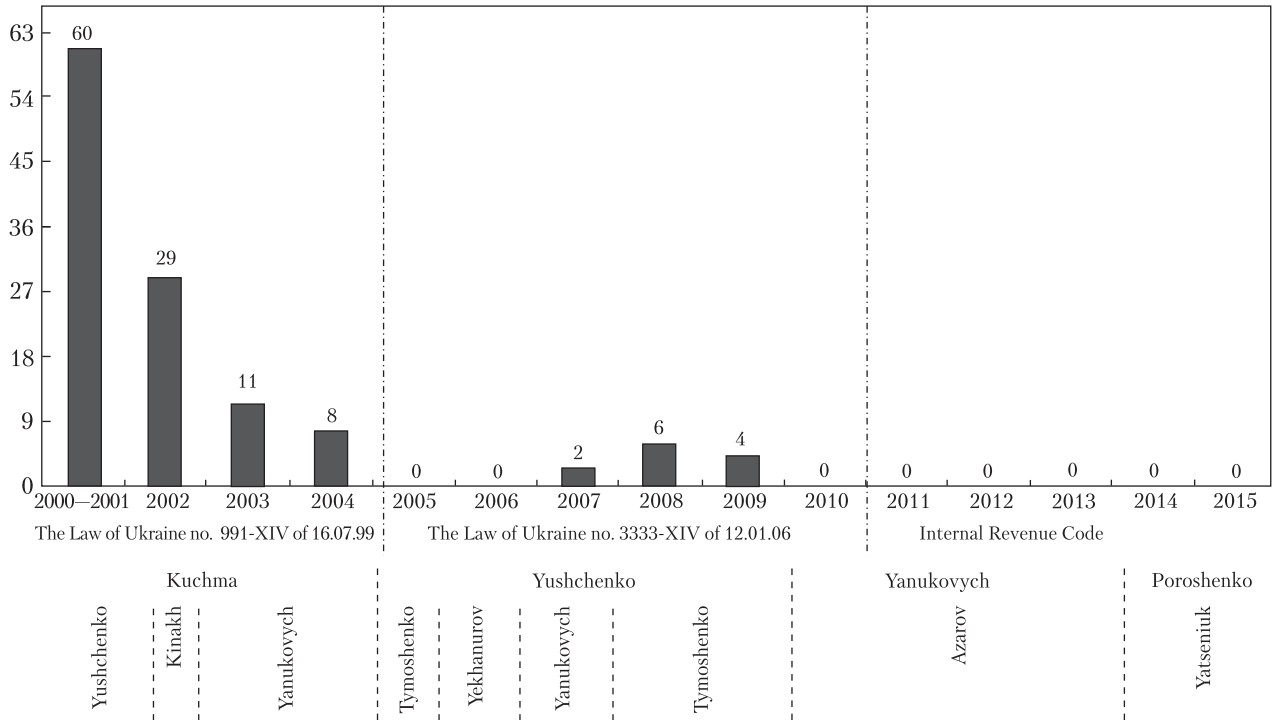


Fig. 5. Technopark projects accepted, units

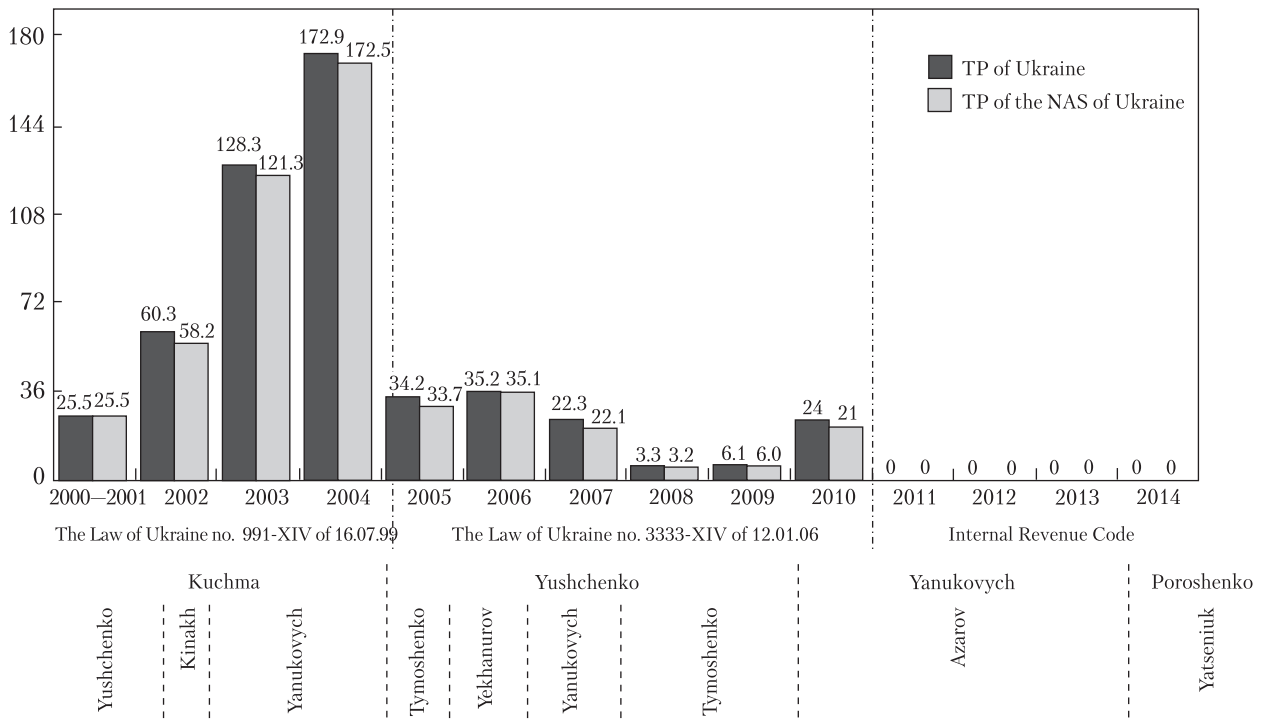


Fig. 6. Government support of technological parks

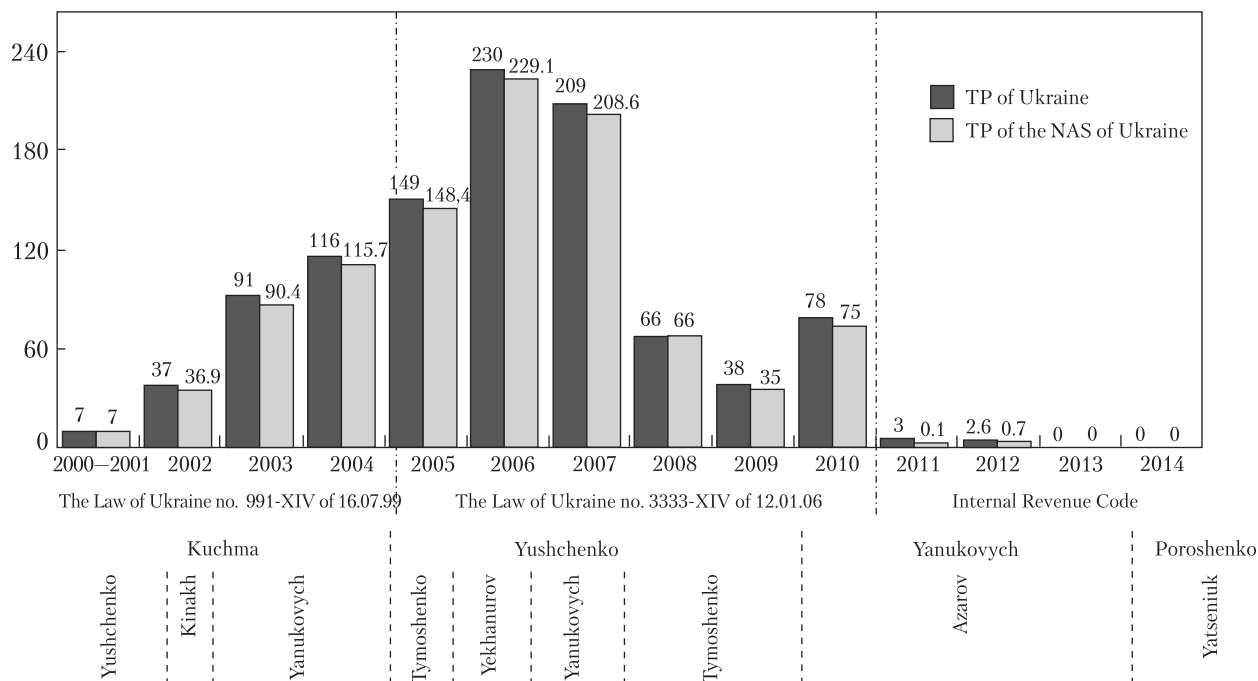


Fig. 7. Payments to the budget, UAH million

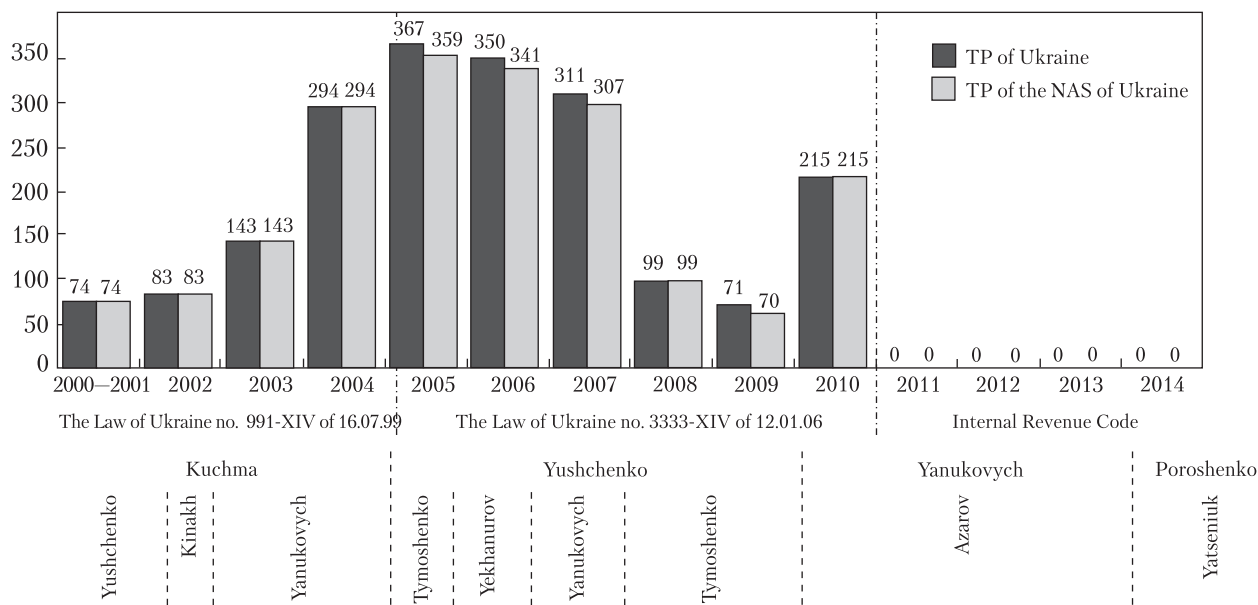


Fig. 8. Export of technopark products, UAH million

Social and Economic Efficiency of Academic Technoparks in Ukraine

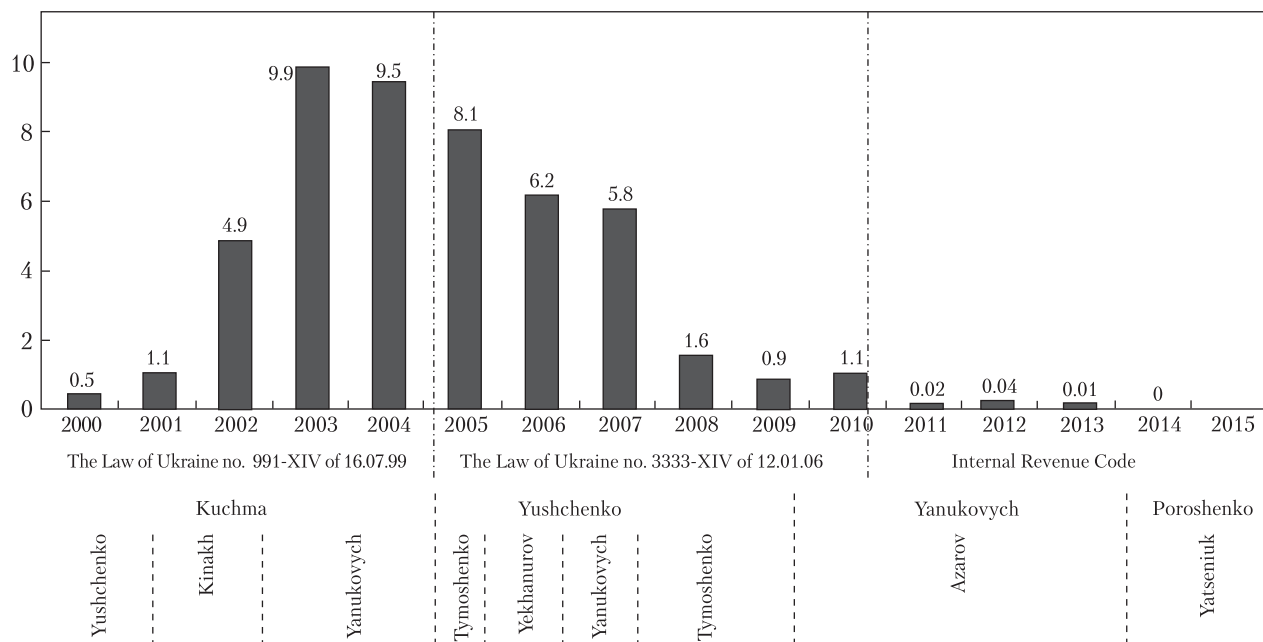


Fig. 9. Share of technopark products in the innovative products of industry, per cent

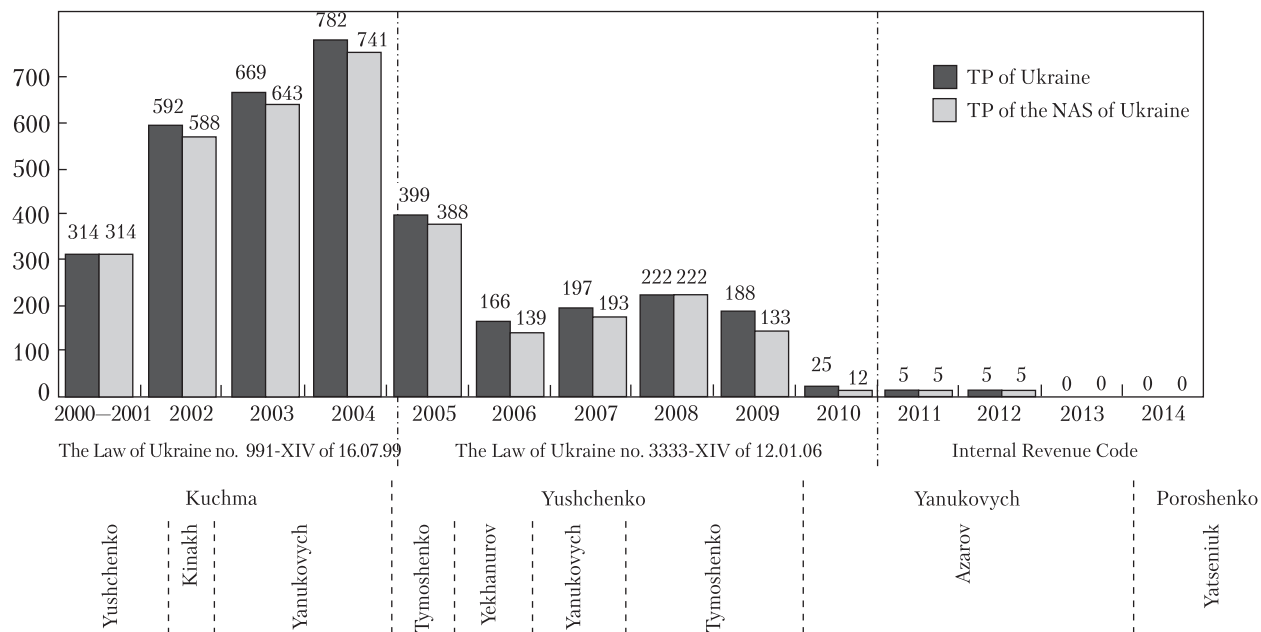


Fig. 10. New jobs created, units

The analysis of the above data suggests that in the short history of domestic technological parks one can see two phases: 1) the phase of intensive growth of all indicators without exception (2000–2005); 2) the phase of their rapid decline (2005–2014.). The only exception in the second period was a slight, but still noticeable increase in the overall rate of sales of products designed by the technological parks, which showed the reliability of created productions and stable demand for their products.

CONCLUSIONS

Conceptual framework underlying the establishment and functioning of the Ukrainian technological parks have been reviewed and approved by the US experts of Loyola College (Baltimore, USA) in 2000 and experts of the World Bank in 2004, which noted that the Ukrainian model of technological parks, although different from those in other countries, however, takes into account the interests of the state and provides a large-scale promotion of innovations and close connection between science and production.

During the next World Bank meetings in Kyiv, in 2007 and in April, 2008, the World Bank experts, after hearing a report on the results of the EWI technological park, confirmed its positive assessment of the Ukrainian technological park model. The results of Ukrainian innovation technological parks were also approved by the German Society for Technological Cooperation (2009).

Analytical materials prepared by the Institute of Economics and Forecasting (NASU) for parliamentary hearings (2014), clearly stated that «creation of new and support of the existing technological parks were the priorities of improving the efficiency of scientific and technological potential of the country».

The above facts and figures that characterize the performance of the Ukrainian technological parks established on the basis of institutes of the NAS of Ukraine confirm the view of leading foreign and domestic experts and managers of in-

dustrial enterprises that the Ukrainian model of technological parks contributes to budget revenues that satisfy both operational and future needs. Therefore, it is necessary to take drastic measures to restore operation of technological parks, improve the regulatory and legal regulation of their activities, that is, as soon as possible to restore the establishment and operation of technological parks that successfully operated in 2000–2004.

A new draft *Law on technological parks*, prepared in 2015 by the Ministry of Education and Science of Ukraine has partially solved the problem. Besides, drafting of the bill was delayed, at least, for two years. Currently, the Cabinet of Ministers has submitted the draft to the Parliament, but there it may be lost in a huge number of necessary and urgent laws.

The need to analyze in detail the work of Ukrainian technological parks, their advantages and disadvantages, identify ways of further development and relations with the state should be included in the measures to be carried out without waiting for the new law. It should be noted that the problems of technological parks is the result of neglect by the government of science, technology and innovation sphere. Unfortunately, this analysis has not yet been done.

P.S. Ancient Chinese philosopher Confucius said, «One, who does not care about his future, soon meets with trouble». There are truths that are eternal. If Ukraine had rejected the recommendation of its first president «science can wait» as an inadmissible joke, perhaps, today we would have not got «genocide of science», or, as our Western colleagues say, «innocide» instead of innovation. And the current Prime Minister would have understood that the government policy, which he holds is diametrically opposite to the state ideology proclaimed by all the Presidents of Ukraine on the way to Europe that increases its science funding from the current 2.3 to 3 per cent of GDP, in 2020, and is developing a comprehensive innovation support system.

Place of the country which steadily reduces funding of science is not in Europe, but among the former colonies. By the way, according to the Bloomberg innovation rating, the neighbors of Ukraine today are Latvia, Bulgaria, and Malta, whereas by the Global Innovation Index Ukraine is rated 63 close to Bahrain, Jordan, and Argentine.

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СОЦІАЛЬНА ТА ЕКОНОМІЧНА
ЕФЕКТИВНІСТЬ ДІЯЛЬНОСТІ
АКАДЕМІЧНИХ ТЕХНОПАРКІВ УКРАЇНИ

В статті проаналізовано соціально-економічні результати діяльності в 2000–2014 рр. технопарків, створених на базі НАН України. Розглянуто можливість і доцільність їх діяльності в наступному десятилітті

Ключеві слова: бюджетна ефективність, економічна ефективність, соціальна ефективність, технопарки НАН України, інновації.

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СОЦИАЛЬНАЯ И ЭКОНОМИЧЕСКАЯ
ЭФФЕКТИВНОСТЬ ДЕЯТЕЛЬНОСТИ
АКАДЕМИЧЕСКИХ ТЕХНОПАРКОВ
УКРАИНЫ

В статье проанализированы социально-экономические результаты деятельности в 2000-2014 годах технопарков, созданных на базе НАН Украины. Рассмотрены возможности и целесообразность их деятельности в следующем десятилетии.

Ключевые слова: бюджетная эффективность, экономическая эффективность, социальная эффективность, технопарки НАН Украины, инновации.

Received 25.01.16