

Challenges to Science and Technology Development Policy in the European Integration Policy*

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ABSTRACT. This article focuses on present-day aspects of Ukraine's science and technology development policy in light of international phenomena and integration realities observed across the European continent. The author examines unique traits and practical challenges characterizing an expansion of Ukraine – EU scientific and technological cooperation with the aim of improving the efficiency of Ukraine's national economy and optimizing its international dimension. Special attention is paid to problems of adapting Ukraine's technological policy to European standards, and relevant specific proposals are formulated.

The article maintains that today's advances in information technology and the openness of national economies as a system-determinant factor of models of international cooperation broaden the scope of information technologies. Since telecommunications and other hi-tech sectors are vibrantly evolving not only in highly industrialized states but also in East European and other emerging market economies, a key challenge for Ukraine appears to be lending better efficiency and productivity to its national policy of introducing information technologies into its socio-economic sphere.

The article provides insight into the international experience of the creation of techno-parks and demonstrates the necessity of applying such innovation techniques of economic development to Ukraine.

KEYWORDS. innovations, information, science and technology advancement, technologies, European integration, export,

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import, trade, technopolis, standardization, metrology, telecommunications, open economy, international cooperation, R&D, environment.

Ukraine's attitude towards a variety of international economic associations and cooperative, integration processes, in particular in science and technology, predetermines its ability to address present-day internal development problems and is an integral component of the country's foreign strategy. In this respect, special attention is paid to assessing scientific and technological aspects of cooperation along individual geographical vectors of Ukraine's foreign economic orientation of which the European vector is the most important one. It may be argued that integration with the European economic community is not only an important geographical direction of an open economy advancement for Ukraine, but also represents a system-forming tool that boosts its integration into the global economy and is a factor in realizing its technological potential.

The issue of foreign integration is not that simple, however. It is obvious that a mere desire or reluctance of a certain country (like Ukraine, in particular) to accede to certain international associations is by far not enough to have this or that integration project implemented or not implemented. It is at the same time essential that the variability of the situation be taken into account, as well as the risk of overestimating not only its own priorities but also those of its likely cooperation partners.

Ukraine's European integration as a «conventional reality»

International economic activity in Europe over the past decades features intensive processes of «European construction» launched immediately after World War II. On the one hand, this entity comprises a powerful bloc of nations that has been playing an

important role in the international labor distribution system, while on the other it signifies the gradual formation and expansion of a single market-based social and technological environment. And finally, internationalization, having achieved a certain level of prominence, acquires features of unified economic mechanism that has taken on the typical persona of a national economy, with this especially being viewed as an optimal situation for developing cooperative projects in hi-tech production sectors.

Since the introduction of the Euro in 2002, European integration has gained a new, more advanced quality and currently is an important factor of international economic relations. At the pan-European level the common monetary unit avoids considerable costs associated with currencies conversion and implies an annual gain of US\$40 to 50 billion. The Euro will further reduce inflation, interest rates, taxes, lessen the transaction costs for businesses, stabilize the financial sector, minimize currency risks, downsize overheads for servicing operations, and promote the acceleration and depreciation of inter-currency transfers. Of no lesser importance, the introduction of the Euro may reduce unemployment and increase production outputs, thereby improving the conditions for interaction in the high-tech sector.

Not only does European integration contribute to the acceleration of the EU member-states economic development and their increased significance in international trade, financial and currency relations, but it also plays the role of the gravitational center of geopolitical interests for many countries including Ukraine.

Back in the 1990s, EU experts used to apply a specific geopolitical formula comprising concentric circles whereby Europe's «inner circle» consisted of the EU member-states, and further on – based on the principle of distance from Brussels – countries affiliated with the European Free Trade Association, ex-Soviet satellites in Europe, and finally, the former Soviet republics including Ukraine. Clearly, like any simplified formula, this model is conditional to a degree and has been adjusted on a number

of occasions to accommodate specific circumstances. However, the core idea underlying the concentric circles model remains relevant.

Opportunities for Ukraine-EU cooperation must be identified based on trends of regional integration at the front lines, which has been a key tool of transformations in Europe and combined the philosophy and function of transformations as its feature. For Ukraine, such an integration appears to be a main challenge which, for obvious geographical and historical reasons, will inevitably affect the interests of hi-tech sectors in the national economy.

Ukraine's acquisition of a fully-fledged partner status in continental technological projects depends on the most basic model for realizing interests in the global arena: actively participating in the life of the international community. This is particularly relevant in light of Ukraine's governmental economic development programs that predict by 2010 about 65 – 70 per cent of Ukraine's trade turnover will be taken up by the «far abroad»¹ as a result of the growing diversification of world trade, while in this context relations with the EU are viewed as a baseline orientation in the refocus of geo-strategy.

The EU is composed of powerful economies featuring high standards of living and technological advances. However, skeptical assessments of the potential for Ukraine-EU cooperation are misplaced. Allegations to the effect that «Europe is not interested in a powerful Ukraine preferring to have it as a an appendix supplying raw materials» cannot be justified with arguments that rest on a profound analysis of global cooperation and integration trends.

The problem of furthering cooperation with the EU is not only confined to the liberalization of bilateral trade relations. It also includes such factors as systemic, technological compatibility and requires a set of purpose-oriented measures. Most significant in this respect is the establishment of a technological environment compatible with the EU which is conditional on the emergence in Ukraine of

¹ Governmental portal — <http://www.kmu.gov.ua>.

an efficient market playing-field and the attraction of European micro-economic agents to its industrial complex by creating a favorable climate for investment and business, reciprocal warranties, and insurance for business activity and capitals invested in Ukraine. Another substantial challenge is the harmonization of a standards system and adapting Ukraine's metrology to respective EU's regulators.

A key task now is to identify concrete and practical avenues for cooperation, of which technology is one priority.

Cooperation with the EU in the field of technology: the contemporary profile and tendencies

The current profile of international cooperation is marked by an intensive exchange of hi-tech goods, the so-called «invisible trade» in technological services. According to common international classification, goods are considered hi-tech items if their share of R&D costs is at least 3.5 per cent; if this index varies in the range of 3.5-8.5 per cent, goods are referred to «high quality technology», goods with the share of R&D costs over 8.5 % in their value are regarded as «top-quality technology.»²

Often the science-technological factor in development may not be used to the maximum effectiveness in Europe due to the limits imposed by national borders. A whole series of West European programs like *Arian*, *Eurorobot*, *Eurobio* and others are aimed at mitigating these impediments.

International cooperation, in particular interaction with the EU in the science-technology field, plays an important role in shaping a modern open economic system. Such cooperation fosters:

- more efficient national production;
- more intense R&D in national production due to technological specialization and attraction of ex-

²See also I. Dumoulain, *Mezhdunarodnaya trgovlia uslugamy* [International Trade in Services] (Moscow: Ekonomika, 2003), p. 315; Yu. Yakovets, *Globalizatsia i vzaimodeistvie tsivilizatsiy* [Globalization and Civilizations Interaction] (Moscow: Ekonomika, 2003), p. 411.

ternal technologies in the form of goods, know-how, etc.;

- a rise in well-being, where possible technological advancement also addressing social problems;
- improvement to the environment due to the introduction of energy-saving and less material-intensive technologies, use of alternative energy sources and materials and more functional chemical, biological and ceramic substances.

Scientific-technological factors of development that have a universal impact on modern, open economic systems may be expressed in particular ways depending on the uniqueness of each country. A country encumbered with serious financial limitations faces objective difficulties with conducting broad-scale fundamental research that underpin applications for boosting industrial development. Such research also predetermines the nature of contemporary technological advancement associated with the diversification of demand for and production of goods, and enable scientific and production specialization. In addition, countries that advanced conspicuously in this regard have a fairly good likelihood of continuing along existing channels toward vibrant development. For Ukraine, which is perfectly positioned to be included in such a list, this implies an opportunity to hasten the painful process of offsetting a crisis and to reject a hopeless model of catching up that otherwise dooms the nation to stagnation and obsolescence for a long while.

Thus, an impressive potential for expanding volumes and optimizing the mechanical structure of international economic activity may be realized, although subject to the availability of a better technological, industrial, export policy set against a comprehensive development of those sectors whose level of sophistication and advancement underlie Ukraine's competitive advantages. Such sectors, in the first instance, include rocket and space technologies, aircraft building, shipbuilding, individual machine-building industries, power engineering equipment, non-ferrous metallurgy, chemical and biochemical technologies, innovations in electric weld-

ing, telecommunications, radio-electronics, low temperature physics, nuclear physics.

Examples of priority areas of cooperation – both real and potential ones – based on Ukraine's technological research achievements include international programs of sea-based rocket and space centres Sea Launch and Globalstar where Ukrainian-made rockets Zenith and Cyclone are used. The Sea Launch project is especially illustrative of how Ukrainian producers may be engaged successfully in technologically sophisticated national and international projects. In this case we are talking about Ukraine's design bureau «Pivdenne» and the plant «Pivdenmash» and its major international partners: Russia's «Energiya», US Boeing and Norwegian Kvarner Maritime which subsequently withdrew from the project. The production of new state-of-the-art aircraft like the Antonov-70, Antonov-38, Antonov-140, and the construction and repair of a diverse array of vehicles is very promising as well. For several years now, a number of institutions under the auspices of the National Academy of Sciences have been cooperating with US-based Pratt and Whitney in an effort to develop innovative technologies for the repair of aircraft turbines. As a whole, academic institutions annually fulfill from 300 to 350 contracts awarded by virtually all leading economies including the US, Germany, China and Japan.³

Adjusting Ukraine's standards in technological policy to European norms and principles

The dynamic development of the economic potential of science and technology may only occur if the government plays an active role in regulation and motivation. Financial and organizational support for

³See also V. Semynozhenko, *Formuvannya ta realizatsiya derzhavnoyi naukovo-tekhnolohichnoi polityky: priorityty i shlyakhy zabezpechennya* [Development and Implementation of the State's Science and Technology Innovation Policy: Priorities and Approaches to Pursuing It] and *Utverzhennya innovatsiynoi modeli rozvytku ekonomiky Ukrainy* [Instilling Innovative Models of Ukraine's Economic Development], *materialy naukovo-praktychnoi konferentsii*, [materials of a scientific and practical conference] (Kyiv: NTUU «KPI», 2003), pp. 57-61.

this process as well as the establishment of an adequate legal framework is also vital.

The most serious objective problems is represented precisely by financial support due to the lack of funding resources in the country. It is not surprising that over the past decade government expenditures earmarked for science considerably lagged behind levels recorded in leading economies. The budget of Ukraine provides for just 1.7 per cent of GDP for science needs, which does not come close to meeting the real demand. In contrast, the EU is now looking into achieving a level of 3 per cent of GDP for science and technology development. However, it has become apparent that attaining even 2 per cent is quite difficult and these challenges are particularly conspicuous in comparison with similar levels recorded in the US (2.76 per cent) and Japan (3.12 per cent).⁴

Financial and organizational support for science (and this is also globally manifested) sometimes is offered in the form of systemic measures, e.g. the creation of specialized budgetary and non-budgetary institutions charged with funding, lending and insuring the implementation of research and technology projects (this has been recently described by some foreign researchers⁵ and Ukrainian scientists⁶). The same is also true for taxation and other financial incentives to pursue innovative activities at both the national and regional levels. It may even be argued that a support system for the production of science and technology in Western Europe is as a rule inherently integrated in national projects and programs that promote research and development and practical implementation of innovations. What makes them very special is an effective and uninterrupted «science – production – consumption» interface.

A good understanding of Ukrainian economic development and a model for its cooperation with the EU are related to an appreciation of the technological

⁴ *Economic and Social Research. Working Paper Series: Globalization, Markets and Social Policy*, Washington, D.C., 2004.

⁵ A. Tatarkin, A. Sukhovey, *Kliuchi k mirovomu rynku [The Keys to the Global Market]* (Moscow: Ekonomika, 2002), p. 231.

⁶ A. Galchinsky, V. Heyets, A. Kinakh, V. Semynozhenko, *Innovatsiyna stratehiya ukrayinskikh reform [Innovative Strategy of Ukrainian Reforms]* (Kyiv: Znannia Ukrayiny Publishers, 2002), p. 326.

uniqueness of progress. In natural and substantive terms, progressive technologies upgrade national production due to more intensive uses of different types of ceramics, fibers, polymers (e.g. construction plastics, ceramic engines and parts that replace metal ones, fiber-optic communication in lieu of traditional metal cables), enhancing the productivity of animals and plants, etc. The role of information products is enhanced in light of their impact on changes in socio-economic relations.

In this connection, an advanced, material-saving and energy-saving manner of business is associated with the development of such production sectors as laser technology, state-of-the-art communications, biotechnology (gene and cell engineering), new materials production and new industrial technologies inventions like sputtering, powder metallurgy, welding, etc., use of alternative and renewable energy sources, IT and microelectronics. Production activities in technological parks – technopolises – are principally based on new models of resource consumption.

The nature of modern social and economic development of individual countries and of civilization as a whole as well as the character of international competition in goods and services markets make it evident that today's growth in intellectual potential and technological innovations is becoming an indispensable component of economic development. In light of these considerations, a science and technology component of the economic internationalization process may be viewed not only from the point of view of business interests, but also in a broader context with respect to its nature, social impacts and long-term trends. In other words, strategic avenues for the advancement of science and technology and certain trends of technological development may fall outside the control of macroeconomic market players whose policies rely on a quick feedback strategy, a toolbox for investment repayments and maximization of profits due to the accelerated rate in the turnover of funds and working capitals

In the macroeconomic sense one key criteria of a country's innovations activity and long-term competi-

tiveness is the number of patents registered in areas considered to be significant by the criteria of the global market. Accordingly, in the 1990s of the twentieth century and at the beginning of the twenty-first century the best performances were recorded by Switzerland, Sweden and Germany: the numbers of patents registered in these countries exceeded similar statistics in the US and Japan.

Objective complications and an increased danger in a large number of production processes in the post-Chernobyl era leaves no doubt about the necessity of creating a more effective and comprehensive technological control system, of principal changes in the perceptions of the nature and format of competitive practices and cooperation among individuals in general. An inadequate perception of the «technology challenge» of the past period has a very high potential for resulting in disastrous global consequences.

Technological advancement is not simply an integral component of humankind's overall progress. It precedes institutional changes and forces economic agents to adjust their relations in the national market and in the global economic environment accordingly.

What then is technology, in terms of a driving force of progress, a subject and prevailing substance of modern economic relations? In essence technology is knowledge which may be used for the production of goods and services or scientific techniques to achieve practical goals of business.

The share of IT media goods emerging as direct or intermediate products of applied research and development efforts is continuously growing. In the «invisible trade» sector, both in Europe and the world, technologies transfer has become a powerful system-determinant factor, shaping the leading trends of the international economic activity of those countries who are leading the advancement of the world's science and technology.

International economic activity that involves technological development embodies the movement of technological development, the transfer of technology at the international level in one form or another. In-

ternational technologies transfer is the movement of scientific and technological achievements – R&D solutions, systematic expertise and production experience on a commercial or non-profit basis across national borders (customs borders) with the expectation of better resources processing, an improvement in the efficacy of production and maximizing profit, including such stages and types of production activity as industrial application, management, marketing and the like.

IT as a determinant factor of an international cooperation model

For Ukraine, which is aspiring to be more firmly established in the world market, it is vital to remember that an IT segment remains the most vibrant and increasingly more important of all world market sectors. It includes various forms of business activities. Such activities predominately provide a boom in informational development and also the diversification of computer and communication technologies. In addition, on the one hand information may serve as an object of macroeconomic policy, of purpose-oriented international cooperation, while on the other hand, it is a benchmark for reassessing systemic approaches in the regulation of relations at the national level and by supranational structures concerning social reproduction.

Within the IT market breakdown, 53 per cent accounts for telecommunications, and the next years are expected to see a further boom in this sector. Additional incentives will be found in brand new means of communication such as third generation cell telephony and the resulting further expansion of the internet. In addition to these trends, Ukraine must pay special attention to the role played by European countries on the global IT market that together account for a third of this market.

A more detailed country-specific analysis shows that in the list of major hi-tech producers which is dominated by the largest EU members, the Netherlands recently has enlarged its share significantly, while over the next few years 40 per cent of Spain's GDP,

as some analysis suggests, will directly depend on the computerization of its economy and the ability of the nation to adjust to the new requirements of an information-dependent society. Of special interest for Ukraine is a project envisaging the subsidization of personal computer purchases in the amount of about 200 Euros to Spaniards who can prove that they have an internet connection.

However, telecommunication and other hi-tech sectors are intensively growing not only in industrialized countries but also in East European and other emerging economies. According to Robert Fleming & Co., a London investment bank, market capitalization of 950 of the largest companies in these countries approximately totals US\$1.9 trillion, of which 31 per cent of the capital goes to the hi-tech and telecommunication businesses (versus 5 per cent ten years ago).

However, despite this trend, US global domination in the electronics and IT development sectors is beyond any question (at the turn of the decade, of 100 leading electronics companies, US businesses accounted for about 50 per cent).

Scientific and information-related aspects of the current stage of economic development have long ago caused intensive activity among numerous Western agencies involved in publishing newsletters, press releases, the dissemination of information over the radio and TV, etc. Nevertheless, special attention ought to be paid to a multi-component electronic information network, the creation and development of which is due to the efforts of national governments, business entities, and international organizations. For instance, the Euro-Info network with 200 centers in EU member-states and outside of the EU was established with the involvement of the Commission of European Communities. Another well-known organization is Business Cooperation Network (BC - NET), launched in Western Europe in 1986 and uniting a number of European and North American countries. The most active participants are companies searching for foreign partners, especially from non BC - NET member-states.

Especially fast growth rates are recorded in the development of e-commerce — since the start of the century, sales in this sector have doubled annually. This suggests that another important avenue for state policy towards Ukraine's economic integration into the international cooperation on labor is to put in place a branching network of foreign trade data covering general economic aspects.

Obviously, the prime goals of developing a long-term foreign trade system in Ukraine are closely linked to the possibility of most tightly integrating into the European information environment. In this respect, even the most complete national data base will be unable to meet the needs of the labor distribution system shaping up in the twenty first century as long as it fails to provide access to the entirety of commercial and technical information across the whole of Europe and the globe. Thus, the most natural target to this end is a better interface with existing information systems, data bases and a more active use of the internet.

However, this does not rule out, but on the contrary lends higher currency to the creation of a single national information system since the search for possible partners in Ukraine appears to be an effective driving force for future cooperation. This system must be universal both in terms of coverage of different sectors and in terms of the scope of incorporation of a variety of technological means — not only electronic exchange channels but also the availability of hardcopies of promotional and advertising materials, telephony capabilities, etc.

The creation of a single national system is a matter of special interest of producers, especially small and medium-size businesses that, in contrast to huge corporations, have limited access to international contacts. This, among other things, necessitates the utmost simplification and depreciation of access to the system.

As the legal and regulatory framework of Ukraine evolves, the task of publishing in a timely manner materials describing new legislation, particularly ones pertaining to foreign trade, as well as special brochures explaining Ukraine's export potential, its

capacity for participating in sectoral or regional cooperative projects, and its potential investors becomes of increasingly higher relevance.

The challenge of establishing a modern foreign trade information dissemination service is associated with the need to improve performance in another effort aimed at building and publicizing awareness — the participation of Ukrainian producers in international trade shows, exhibitions, fairs and the like. In order to foster these types of promotional activities both in Ukraine and abroad and to improve their feedback, the government must create favorable and even preferential conditions for small and medium businesses to partake in them, even, in cases of special importance, by covering their expenses associated with such participation from the state budget.

Technopolises in the open economy development strategy

Technopolises, also called technoparks, serve as an example of a structure utilizing the most advanced achievements in leading technological, export-oriented sectors, known for the most economical use of materials and power resources, and to a degree being a prototype of future production and social relations.

A technopolis is a zonal science and production compound, a conglomerate of scientific, research, educational and design institutions, production and other facilities featuring a highly-developed, vibrant and flexible supply, consumption and communication system and infrastructure established for the purpose of creating the most favorable conditions for high-tech, socially-relevant, competitive and environmentally-friendly production and professional training.

No wonder that in open economic systems such an arrangement tends to play an increasingly more important role in determining the profile of modern economic activity.

What distinguishes technopolises from traditional production concentration models is a higher degree of reliance on science and lower material and energy-intensity of production focused exclusively at new types of technologically-advanced products.

As the experience of industrialized countries suggests, universal principles underlie the creation, development and administration of technopolises. Challenges faced by developing countries or emerging economies tasked with systemic transformations of their economic frameworks appear to be much more complex. Such nations have difficulties with making sizeable investments and developing the broadest possible networks of such formations and a full accounting of the whole complex of country-specific circumstances is required.

Technopolises have become quite common in all leading industrialized states, while for economies in transition they represent a prerequisite for accelerated production and rise in competitiveness.

The Economic and Social Policy Strategy for 2000 – 2004, «Ukraine: Advancement into the Twenty-First Century,» reflects the international experience of the establishment and functioning of technopolises and of the target-oriented science and technology policy as a whole as well as the fundamental assumption that it is only the active utilization of the most progressive approaches to socio-economic development that may lead to quality improvements in production and consumption patterns. This opinion was also advocated by a number of Ukrainian researchers. In part, V. Semynozhenko referred to the timeliness and advisability of drawing up a National Program of Ukraine's Innovative Development which would, among other things, provide for:

- the prioritization of the post-industrial model of innovative development;
- identifying a role and practical tools for each individual region's participation in innovation development;
- the orientation of regions towards the support and furthering of the existing innovative arrangements and formation of new ones, putting in place

comprehensive regional systems of incentives and support innovative growth – technopolises⁷.

Indeed, accomplishing these tasks requires the most thorough approach, profound feasibility studies, analytical peer reviews and a clear vision of the essence of economic phenomena and their implied functionalities.

Science parks may pursue such goals as technological upgrades or the restructuring of industry within a target region, promoting the development of local enterprises, assisting multiple companies in gaining a better economic standing which will underpin improvements in competition.

A modern developed nation may boast several dozen technoparks, while in the US their number at different stages of development is nearing two hundred. Indeed, the US is the cradle of technopolises, since the largest technopark – the Silicone Valley – was established in 1951 in Stanford University, California.

Since the late 1970s the UK has expended a great deal of effort at establishing technopolises, while France and Germany are pursuing ambitious programs.

Ukraine has taken the first steps towards the creation of technopolises. However, in the context of Ukraine's international economic priorities, the following target functions and imperatives for furthering specialized technological zones may be identified:

1. Technoparks have the potential for acting as catalysts of economic development of some of its segments, especially the ones that make the greatest impact on the pace of technological advancement. In essence, they power the economy, they boost export since the effects of support to and acceleration of technological development of individual territories and sectors include the formation of a totally new system of economic performance measurements, the emergence of new incentives and targets in the com-

⁷ See also V. Semynozhenko, *Formuvannya ta realizatsiya derzhavnoyi naukovo-tekhnolohichnoi polityky: priorityty i shlyakhy zabezpechennya* [Development and Implementation of the State's Science and Technology Innovation Policy: Priorities and Approaches to Pursuing It] and *Utverdzhennya innovatsiynoi modeli rozvytku ekonomiky Ukrainy* [Instilling Innovative Models of Ukraine's Economic Development], materialy naukovo-praktychnoi konferentsii, [materials of a scientific and practical conference] (Kyiv: NTUU «KPI», 2003), pp. 57–61.

petitive struggle both domestically and internationally for the remaining segments of the national economy.

2. Technoparks are an important driver of socio-economic growth in individual regions, of a better zoning of the nation's production potential. Science and industrial parks allow for the swifter advancement of economically-backward regions, loosen the industrial load of urban centers, and create new jobs in peripheral areas with a surplus of labor. Hence, technological parks may help optimize the export specialization structure of certain regions in Ukraine. After all, a major proportion of export shipments originate from the Donetsk and Kryvyi Rih regions whereas West Ukrainian areas with a highly-educated and skilful workforce have very limited export-oriented production.

3. Technoparks as territorial and sectoral units of the economy are capable of ensuring a more dynamic rise in national production and commodity enrichment of the market. Due to the stiffening of international competition, technologically-advanced projects become an indispensable and unavoidable condition for production in a given country in general. This is of special currency for Ukraine which, due to strong pressure from foreign rivals, has been experiencing a tendency towards simplifying its production profile.

4. Technoparks also facilitate an improved quality of staff training since they enable a consistent and comprehensive combination of learning with advanced applied research and production. R&D parks also may be used for quality improvement training, for professional upgrades and retraining of specialists, and the specialized placements of foreign nationals. Against the background of an outflow of a skilled workforce from Ukraine, technoparks with their highly profitable expert-reliant production may create a pool of expertise represented by highly educated professionals thereby countering their immigration.

5. Technoparks create a new quality and improved efficiency of socio-economic development. It implies a dynamic form of combining science and production

where the duration of the «science – development – production» cycle is shortened and scientific developments are more intensively incorporated in market mechanisms. As a result, fundamental science is funded to the extent that there is feedback from applied developments, thereby creating a reasonable balance between the today's and tomorrow's components of science.

Therefore, in parallel with the establishment of modern post-industrial formations in the West and in Europe, the expansion of high-tech production networks in Ukraine may characterize its evolution towards the world's best practices and standards, and power its further integration into Europe.

6. Technoparks may be regarded as a direct tool for improving conditions of international trade along all of its major avenues, and of key indices of Ukraine's open economy as they represent a powerful lever of raising the national economy's competitiveness in the global market, a source of hard currency inflow, the deepening of technological cycles of production in the country's own territory, and the optimization of foreign trade and predominantly of export.

While devising Ukraine's long-term strategy of forming a network of technopolises, one must take into account specific features characterizing today's diversified and dynamic markets. In the first instance this implies further specification and functional selectivity of consumers' demands that brings about the emergence of new market sectors. Because of the effects of these factors, companies must increase the speed of their response to meet fluctuating demand while new entrants face better opportunities to get established in the market. Given that technopolises essentially specialize in the production of brand new goods using the most advanced inputs and materials, they seem to be most compatible with modern trends in the evolution of the market and henceforth should be by all means considered as an essential factor of competition.

In light of the fact that hi-tech production safeguards the high quality and international competitiveness of a product, technopolises do not only

ensure an optimized territorial distribution of production, its more effective organization and diversification. In the broader sense of geography and in the context of international economic relations, they become a powerful factor in deepening the distribution of international labor as well as the specialization and evolution of new types of high-end production.

Ukraine's European integration policy in light of science and technology progress

One of the effects of further advances in science and technology is that in a traditional «free entrepreneurship vs. government intervention» balance, the latter tends to win increasingly more frequently. After all, it is at the state level that priorities of macroeconomic reproduction mechanisms may be identified with better accuracy. Ultimately, this is targeted at ensuring an adequate centralized determination of macroeconomic targets, improvement in the capacity of national competitiveness, labor productivity, resource conservation, costs and working time efficiency. Furthermore, the relevance of certain tools and activities from the list of state governance priorities only emerges when it approaches not-for-profit or extraordinarily sizeable research, design and implementation projects.

The productive mechanisms and forms of such a policy include the identification at the state level of R&D priorities and implementation of necessary organizational measures, coordination of scientific research, mobilization of resources, compensation of a part of costs in the event of too lengthy technological cycles, regulation of patents and licenses, furthering cooperation, foreign investment promotion, etc.

Drawing up a science and technology development strategy as part of the overall foreign economic policy of Ukraine requires the maximum possible reliance on international experience that allows the usage of available and tested best practices and techniques.

The degree of centralization of the regulation of science and technology also vary from country to country. For instance, in the UK which is an example of decentralization, rigid state planning of technology policy is non-existent, whereas in France state-planning plays a fairly important role and provides for the annual identification of its pursuance priorities.

It would be fair to argue that a targeted policy in the sphere of science and technology has already crossed national borders and has become a vital component of tactics and strategies of a number of the most influential international organizations such as the OECD, EU (especially the European Commission), UNESCO, etc.

Addressing a vital geopolitical challenge of European integration requires the development and demonstration to West European partners of specific achievements that enable Ukraine's participation in the scientific and technological programs of the Community that would be of interest to it.

Such joint efforts include a regional R&D cooperative program «Eureka» and its individual projects; «Eurocom» (new generations of telecom and control systems), «Euromatic» (design and setting up of electronic and IT instruments), «Euromat» (development of new synthetic materials, polymers), «Euro-rail» (speed railroad lines construction). The European Strategic Program for Research in Information Technologies (ESPRIT), Basic Research in Industrial Technologies (BRITE), Strategic Program of Technologies Innovations and Transfer (SPRINT) and Research and Development of Advanced Technologies for Europe (RACE) remain open for cooperation⁸.

There are good grounds to expect a high interest in Ukraine's economic potential. The European countries', companies' and corporations' strife for a highly-competitive European economic formation may to a considerable extent rely on and benefit from Ukraine's capacity in the aero-space, aircraft-building, ship-building, welding and other industries.

⁸ Official European Union portal, http://www.europa.eu.int/index_en.htm.

Cooperation is quite promising in health care, environmental and clean production technologies, professional training (ERASMUS and COMMET projects) and science cooperation (SCIENCE).

In light of the above and taking into account the Ukrainian economy's sectoral and territorial profile, one may argue that vital aims of organizational regulation of science and technology aspects of foreign economic policy at the macro-level include the following:

- Identification of the place and role of science and technology policy leverages in the national strategy as part of the regulation of an open economy;
- Identification of priority and interim goals and instruments of influence on science and technology facets of international cooperation involving Ukrainian counterparts;
- Comprehensive support to domestic R&D efforts, support to business entities requiring technical upgrade of export-oriented production (first and foremost electronic, electro-technical, aviation, transport, instrument- and machine-building, chemical and petrochemical, agro-industrial and some others);
- Active mobilization of Western best practices and experience, elaborate patent and licensing policy, assistance to key economic players in acquisition of foreign scientific developments and in creation joint international structures capable of fostering Ukraine's technological advancement;
- Promotion of import rationalization in terms of absolute and relative increase of hi-tech products share in its export breakdown;
- Putting in place an effective and advanced science and technology infrastructure;
- Enabling Ukraine's level participation in international arrangements to be commensurate with the acceleration of its technological advancement.

Standardization as a factor and precondition of the optimization of EU cooperation

Standardization policy is one of the most essential factors and prerequisites of Ukraine's integration into the global economy and an effective tool in the pursuit of successful international trade. As a whole, world practice suggests that the key is to reach agreements on reciprocal recognition of products compliance certificates, and harmonization of standards among countries, and comprehensive cooperation between statistical agencies of trading partners.

Standardization and certification systems perform an important function of uniting Ukrainian economic parameters with international standards which are aimed at optimizing specialized production, export operations, protection from an inflow of poor quality imports which in most cases competes with domestically-made products.

The following principles determine the essence of the state standardization policy:

- Allowing access for individuals and legal entities to development standards and securing their free choice of standards to apply to their products or supplies unless otherwise required by law;
- Openness and transparency of procedures for drafting and applying standards while taking into account the interests of all stakeholders, and raising the competitiveness of domestic production;
- Accessibility of standards and information about the standards for users;
- Standards consistency with the law;
- Adaptation to latest technological achievements taking into account the state of the national economy;
- Priority of direct introduction of international and regional standards in Ukraine;
- Observance of international and European rules and procedures governing standardization;
- Participation in international and regional standardization.

The Law of Ukraine «On Foreign Economic Activity» allows the import into Ukraine of only those goods which, according to their technical, pharmacological, sanitary, phyto-sanitary, veterinary and environmental characteristics, meet the minimum requirements of respective standards and requirements that apply in Ukraine, while if relevant standards do not exist in Ukraine, relevant international standards or standards operating in countries as major exporters of the good in question apply.⁹

International experience also prompts the priority of implementing integration-oriented activities in the field of standardization. Complying technological parameters of Ukraine's national economy and patterns of its international specialization with those adopted in the EU and in CIS member-states is of special relevance for Ukraine in this regard.

The government has a very important function in uniting the international economic activity regime and specifically international trade rules. In particular, import-export regulation is unviable without a commodity classifier which provides grounds for applying an international trade tariff and non-tariff regulation levers, goods customs clearance and maintaining international trade statistics.

A key international priority in developing certification and metrological regulation optimization technologies involves the harmonization of quality and production standards criteria of Ukraine with similar parameters adopted in the EU, which is why the European Commission's policy in standardization sphere deserves special attention.

An important benchmark for developing the EU's common standardization strategy was an approval in 1985 of the (then) European Community Action Plan towards a common internal market formation. According to this document, products distributed in the EU market are subject to identical requirements with respect to their quality characteristics. On 7 May 1985 the so-called New Approach to Technical Harmonization and Standards (OJ 85/C136/1), a document containing unified requirements to harmonization and

⁹ Official site of the Parliament of Ukraine, <http://www.rada.kiev.ua>.

compliance of quality features with general principles, was approved. In fact, the New Approach introduced a new legal and regulatory framework at the Union level. The document codifies rights and competencies of relevant EU bodies and their interaction with external organizations charged with standardization responsibilities. The New Approach makes a special emphasis on standards being a key component of the common market. In this respect they may make an entire difference in improving trade conditions and in unifying business and production environments.¹⁰

In institutional terms, the «architecture» of standardization and metrological regulation was as follows: the European Commission and competent authorities of the European Free Trade Association, by issuing special directives, set key criteria related to people's health, safety and to the state of environment. The same authorities, as well as the European Standardization Committee, European Electrotechnical Standardization Committee and European Institute for Telecommunications Standardization, European Environmental Protection Bureau and other agencies set auxiliary quality and technical requirements (issuing special mandates and permits). However, the so-called «unharmonized zone,» which was not covered by common regulation and remains only nationally regulated, is still an outstanding issue. Its existence is associated not only with technical complications due to the effect of a variety of technical specifications featured by diverse products. It also ensues from objective historical and cultural, geographic and climatic distinctions of countries and national standards may be both stiffer and more liberal than common ones.

Compliance with quality standards is attested to by marking with a «CE Mark» (or just «CE») which in itself is not a top-quality symbol but rather stands for a good's conformity with applicable directives and other regulating instruments. The oversight of adherence to the marking rules is the responsibility of competent authorities of an importing country.

¹⁰ Official legislation portal of the European Union, <http://europa.eu.int/eur-lex/en/>.

Conclusions

The movement of technologies is an important component of international economic relations and a powerful driver for activating international cooperation. This dimension of economic life features the highest degree of dynamism which explains the growth of its specific share in the spectrum of forms of nations and businesses interaction, as well as the growth in its functional indicators.

Countries seeking to occupy a decent place in the international distribution of labor will inevitably have to draw up science and technology development programs as well as programs envisaging the promotion and assistance to advanced types of production, fundamental and applied sciences.

One of the major ways of providing organizational support to hi-tech production and applied science is science and technological parks, the so-called tech-nopolises, that serve as an effective source of modern technologies that create a powerful impetus to business development and generate additional revenues for the budget.

The emergence of a new technological dimension of international cooperation makes research and development not only the preconditions for an exchange of hi-tech goods and the consolidation of production efforts in economic reproduction processes which they precede. Increasingly scientific achievements commonly become a subject of international economic activity – whether bilateral or multilateral – aimed at exploration and the use of natural phenomena and new types of production. This is a result of not only a purely mechanical alteration of developmental priorities, the emergence of new needs, an expansion of the international market to cover new technological levels, but also ensues from an inherent blending of science and production.

At the same time, however, what is now referred to as EU integration ambition raises quite a bit of uncertainty. The EU is desperately lagging behind the US as far as economic growth rates are concerned. In most of the EU countries, the economic

stagnation is not only durable, but signifies a structural crisis. Suffice it to recall a situation in the most powerful European economy, Germany, where GDP growth has been for many years balancing in the range of 0 to 2 percent. This is quite typical of the «old Europe» with slight variations from country to country. Furthermore, anti-economic quotas system grow increasingly stiffer, primarily in agri-business, as well as a series of other regulatory actions which does not lend to any expectations of a rise in the bloc's efficacy and improvement in its competitiveness.

Now, another ten members have been admitted. The economies of Poland, the Czech Republic, and Hungary that absorbed quite a bit of EU investment appear to be in an acceptable state. But is there not a chance that Eastern Europe will eventually turn into a «European village»? And are the chronic economic predicaments in Greece – a EU old-timer – not worrying? Is there not a danger of Ukraine's agriculture collapsing? Are other sectors in a much safer position?

Let us hope that these questions will shortly become the focus of our scholarly community's attention.

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