KRZYSZTOF B. MATUSIAK

Dilemmas of Technological Strategy and Improvement of Innovativeness of the Polish Economy¹

Introduction

On the turn of centuries innovativeness and entrepreneurship are perceived as a main source of economic growth, competitiveness, efficiency and employment. Development of markets and present international competition is based on a quest for novelty and higher quality. New productive workplaces in up-to date branches of industry become a measure of development. Importance of traditional factors of economic growth, such as land, capital, and natural resources has been diminishing. Prices of raw materials have been falling for years, food overproduction is a problem for all highly industrialised countries, and capital for profitable undertakings is available with no limits at a given price at international markets. Mentioned kinds of resources, which for years have used to be a source of growth of societies' welfare, are being replaced by other factors, comprising for example science, education, entrepreneurship culture, organisational systems, motivation. Mentioned above tendencies determine a growing role of human capital as well as going away from traditional forms of mass production. Apart from traditional industrial regions that suffer from

¹ Presented paper contains main fields of discussion that took place in different sicentific circles in Poland. The Research Team (headed by the Author) from the University of Lodz played an important role in this discussion. Main conclusions and recommendations are presented for example in: K.B. Matusiak, E. Stawasz (red.), Przedsiębiorczość i transfer technologii. Polska perspektywa, Łódź/Żyrardów 1998, and: Instrumenty transferu technologii i pobudzania innowacyjności, Zespół zadaniowy ds. Polityki Strukturalnej, Warszawa 1997.

economic recession and are significant source of economic and political problems, there develop new forms of territorial economic areas joining education, research, technology commercialisation, production and services.

Gaining competitive advantage by particular countries (especially smaller ones) is to a greater and greater degree dependent on speed with which new economic entities enter the market. On the turn of centuries climate for entrepreneurship, self-employment and pro-innovative orientation becomes a base for competition strategy. Creation of this kind of strategies is more and more "locally" determined, however with simultaneous globalisation of the economic and development processes. In such environment countries that dictate speed of economic development undertake different activities that create convenient conditions for setting up new innovative firms as well as development of science and mechanisms transferring its results to the economy. Developing technological interventionism is characterised by diversification of tasks between local, regional, and national structures as well as international ones which are created as a result of integration process. Tasks realised at particular levels are not competitive and are not alternatives for one another. Regional activities defined as a decentralised economic policy focus on issues of activation the endogenous factors of growth, improvement of localisation attractiveness, increase a level of labour force qualifications as well as development of regional entrepreneurship and technology transfer infrastructure. At national level mentioned tasks refer to questions that are perceived as strategic from a viewpoint of the whole country: co-ordination and stimulation of regional activities, systemic regulations as well as problems of stabilisation and economic order. International structures focus on co-ordination of instruments used in particular countries and regions, help for regions delayed in economic development and on strategic activities that need a specified "critical mass". Organisational, regional, institutional, and cultural aspects of innovations are wider and wider taken into account in technological policy. These activities are to strengthen competitiveness, development potential of the economy, structural and modernisational changes and to identify new directions of technological development.

Modern approach to innovations underlines less and less meaning of single event but importance of a complex of events that create new patterns and technologies of production and services. Innovative processes take place in a system of connections that is defined as the innovative system. This system can refer to the whole economy or can have regional or local character. In the first case it is called **the National Innovation System (NIS)**, and **in the second case the Regional Innovation System (RIS)**². The National Innovation System is defined as a network of production and scientific-technical sub-systems, institutional solutions and relationships and connections between them that characterise a level of innovativeness in a given country. Specific features of a country influence elements of this system, such as: historical experiences, value systems or culture. Structure of innovation system, its national or regional specificities, adopted solutions and mechanisms, relations between its parts as well as interactions with environment influence a level of innovativeness and competitiveness of the economy. Effective NIS can increase the efficiency of use of limited resources and, thanks to better organisation and management and more effective combination of imported and domestic/local technology, accelerates progress in its adaptation and diffusion. Innovation systems at the national level are characterised mainly by orientation towards **supply aspect of innovations**. The government and central institutions should mainly emphasise problems of research, science, education, technique, and international co-operation.

Technological policy should not be elaborated only in order to start production of goods and services that would be competitive on a world-wide scale. It should stimulate innovative activity that is essential from the local viewpoint and that can result in improvement of a general situation on a local or regional scale. Technological policy should co-operate in searching new sources and possibilities (so called endogenous potential), in this way co-creating regional innovation system. It is not possible to define exactly a shape of such a system. First of all this is an elastic, regional, socio-economic structure with the widest possible connections, which is able to use local resources and essential attributes, which regulates production processes, products and services adequately to specificity of the local market. Regional innovation system is to a greater degree disposed towards demand aspect of innovations. In practice this means a strong orientation towards creation of new economic entities, support of small and medium-sized enterprises' innovative potential and technology transfer to this sector. New technology-based firms are more and more often perceived as locomotives of economic growth and regional structural changes. Experiences from highly developed countries point to regionalisation of innovative abilities and privatisation of national innovation systems. Countries

² In a regional/local perspective much stronger (than in a case of national level) is underlined a tight connection of innovativeness and entrepreneurship with emphasis on support of entrepreneurship and help in setting up new economic entities independently of technological level. In practice more adequate seems to be a definition of "regional system of innovations and entrepreneurship".

with federal structures or at least those, which decentralised economic centres for the benefit of regions, have gained satisfactory economic results in recent decades, for example Germany, France, and Italy. Drop in competitiveness is identified with centralism in governing the state and the economy, for instance Sweden, Greece or Portugal. Tendencies in development of innovation systems point to a need for decentralisation through creation of strong and competitive regions.

Results of an analysis of existing level of innovativeness of the Polish economy on the turn of centuries show that Poland needs a technological offensive that will make it possible to improve competitiveness and to define a new status of the country in an international division of labour. Undertaken activities to the widest possible range should take into account aspects of integrative efforts and global development tendencies. Further effective entrepreneurship support needs a turn towards innovations and new technologies. Extensive possibilities of new manufacturing firms' creation are being exhausted. So called "transformation rent" was a basis for entrepreneurship wave at the beginning of nineties. Starting a new wave can be a result of bringing closer science and economy as well as efficient national technological offensive. Innovation is a chance for improvement of Poland's and its regions' competitiveness in a perspective of the European integration.

2. Evaluation of the Polish Innovation System

Innovativeness of the Polish economy is relatively low in comparison with countries from the European Union as well as with other technology leaders from all over the world. Such a state of affairs threatens the international competitiveness of the Polish economy and firms, especially in a context of undertaken integrative efforts. Ratio of a share of R&D expenditures in GDP testifies to poor innovativeness of the Polish economy. In Poland in 1996 it amounted to ca 0.76%, while in the EU it exceeds 1.9% GDP³. This means that in Poland R&D expenditures *per capita* amount to ca 35\$ a year while in the countries that are technology leaders they amount to 500-700\$. In total R&D expenditures a level of enterprises' own sources is low - in Poland it amounts to

³ Sweden gained the highest share of R&D expenditures in the middle of nineties (3.6%). Similar situation was in Japan (3.0%) Korea, Switzerland, and Finland (2.8% each), the USA (2.6%) and Germany, France, and Israel (2.3% in each). The lowest share amongst developed countries was in Italy - 1.1%. See: Nauka i technika w 1997 roku, Informacje i opracowania statystyczne, GUS, Warszawa 1999, s. 21.

ca 0.3% GDP and ca 28% of total expenditures. This relation for the EU countries is exactly opposite: 1/3 comes from public sources and 2/3 from enterprises. Moreover, a number of patented Polish inventions have been decreasing lately and a share of high tech industries and new/modernised products in the total sales is very low. All this also betokens the low innovativeness of the Polish economy. Domestic enterprises assign ca 0.5% of sales value for R&D activity, while in highly developed countries this ratio exceeds 3%

Low level of innovativeness of the Polish economy presages weakness of the national and regional innovation systems. These issues should be included into the national and regional technological policy. At present this policy allows realisation of one from a very few (permissible in the EU regulations) forms of public help for enterprises. Implementation of technological policy in highly developed countries fructifies with increase of competitiveness of the economy, change of the structure and creation of workplaces. This area is especially important for Poland in the aspect of future membership in the European Union and connected with this fact liquidation of protective barriers for the Polish economy. Successful implementation of technological policy will be decisive for the position of our country in the world economy in the era of globalisation, while its inefficiency can let slip many years' transformation efforts of the Polish economy and social relinquishments.

Basic defects of the Polish innovation system are as follows:

(1) Lack of documented concept of technological policy joining the innovation policy with particular sectoral policies. This situation means lack of co-ordination and strategic directions of technological development, restructuring and modernisation of the economy:

- domination of basic research in public R&D expenditures⁴;
- low share of economic circles in laying out the policy aims and in decisions concerning allocation of resources;
- lack of meaningful effects of activity of governmental institutions • responsible for support of innovativeness in the economy - the Technique and Technology Agency is at its initial stage of development;
- there is no effective system of support of innovative undertakings in SME sector.

⁴ Poland assigns 34% of total R&D expenditures for basic research (A), 28% for applied research (B), and 38% for development works (C). Analogous proportions in other countries are as follows: Japan: (A) - 15%, (B) - 24%, (C) - 61%; the USA: (A) - 16%, (B) - 21%, (C) - 63%; Germany: (A) - 21%, (B) - 28%, (C) - 51%; France: (A) - 22%, (B) - 29%, (C) - 49%. See: Nauka ... op. cit. s. 26.

(2) Polish system of science and technique steel is subject to legal regulations coming from the seventies and eighties; the same refers to its organisational structure and most of structural features. However, there appeared some changes in management rules and processes as a result of reforms introduced after 1989. There is lack of clear concept of restructuring and privatisation of R&D units and PHARE SCI-TECH or INCO-COPERNICUS programs are not able to cover the whole sector. Act on R&D activity is a legal act with the longest lasting procedure of its preparation. Economic environment of the sector was mainly subject to transformation. Structural features coming from the previous period impede adaptive processes in R&D sector to market rules. This sector only to an insignificant degree has become a beneficent of growth processes that have taken place since 1993 and its ties with the economy have not strengthened significantly. Up till now economic transformation processes have not caused changes aiming at creation of R&D units competitive at the internal (domestic) market with regard to foreign sources of innovations. In the structure of the sector there are still no mechanisms of co-operation, for example in a form of research consortiums. Domestic R&D sector's offer is still unadjusted to needs of the economy in transition, which is a result of wrong structural, organisational, economic, and financial solutions. The Polish R&D sector is visibly crumbled. Large number of independent research units is a cause of their research weakness, and a narrow thematic range makes diversification to different groups of customers impossible. Small units are not able to deal with complicated issues that need a multi-scope approach. There is lack of modern, strong capital and organisational ties between science and technique units and industry. Effectiveness and quality of management in R&D units is low which constitutes a threat for domestic R&D units facing growing competition from foreign enterprises and science-technical institutions.

(3) Low interest of the industry in results of domestic R&D institutions' works. Polish industry still is not innovative enough. Domestic firms assign for R&D less than 1% of sales value, while western firms assign 3-7% on an average. Depreciation of machines, technical equipment and tools amounts to ca 70% in the whole industry (for example 76% in electric-machinery and 79% in machinery industries) and new products and technologies are very insignificant. Already in the eighties mass liquidation of R&D units at a firm level took place, or their shift to purely production activities. Pressure of current problems significantly reduces a horizon of decisions. It is difficult to even think about technology transfer and innovations without a perspective view. However, there are some signals of improvement in this question in the private sector. There is visible change for the better in a field of industrial pattern designing. Strengthening economic stabilisation is the first step towards stimulation of

innovative processes. Enterprises, that perceive their future as more safe, start to underline a need for co-operation with scientists and research laboratories. However, the efficiency of fiscal and financial systemic solutions in a range of shaping the economic entities' demand for results of R&D works is still insufficient. They do not release sufficient motives for creating and patenting inventions, either. System of reliefs, exemptions and subventions is faulty and controversial. At the same time firms often meet rather free interpretation of tax regulations by Tax Offices. Enterprises still use on a large-scale non-innovative ways to improve their financial standing, for example increase of prices or increase of turnover without modernisation of production. There is lack of developed market of financial services. Polish "big" industry, both private and state-owned, directs its still low interest in innovations rather towards foreign sources, mainly in a form of orders for ready technologies.

(4) Regional innovation systems are poorly developed. This refers mainly to different kinds of entrepreneurship and innovation centres - incubators, agencies, loan and capital funds, information, advisory and schooling centres. In Polish reality development of these institutions is at its initial stage. They have to grow strong on a merit of the case as well as in financial, organisational and personnel aspects. From the western countries' experiences it appears that a process of development of regional innovation system is long-drawn, needs a mature regional policy, including financial support from the budget. At the same time dynamic development of the Polish innovation and entrepreneurship centres was dominated by the labour market policy. Help for newly set up firms as a method of self-employment for unemployed was a basis of the labour market policy realised by the Labour and Social Policy Ministry and the National Employment Office. From the active forms of fighting with unemployment comes a large portion of financial sources for development of entrepreneurship and innovation infrastructure, in which, however, innovativeness had to have a very low share. Mentioned connections determine strategies of activity of the centres that committed themselves to help unemployed who want to start their own economic activity. Highly qualified specialists, high schools graduates or scientists, who are a basis of technological entrepreneurship, appear in this group rarely. Co-operation of innovation and entrepreneurship centres with R&D institutions and technology firms, as well as activities in the field of transfer and commercialisation of technologies play secondary role. There are the following causes of such a state of affairs:

 low activity of the Ministry of Economy and the Scientific Research Committee and subordinated governmental agencies in the field of initiating and financing undertakings in the area of transfer and commercialisation of technology;

- growing old area of science and research that was not subject to restructuring is not prepared for co-operation with non-governmental organisations;
- lack of experience, common patterns of activity, and procedures of technology transfer organisation;
- low interest of the SME sector in co-operation with science sector.

Activity of majority of centres is directed towards support of entrepreneurship, without any limits according to a kind of a firm, branch of industry etc. In the effect only 10% of innovation and entrepreneurship centres can be classified as technology units. Existing centres are strongly oriented towards local market and problems, they do not tend to creation of regional and over-regional networks of co-operation. This results mainly from lack of support and co-ordination in the framework of regional economic policy.

(5) Lack of stimulators for setting up small technology-based firms and support of innovative undertakings in the SME sector. This refers both to institutional as well as to financial and organisational solutions. The governmental policy in the area of technology transfer support and stimulation of innovativeness in small and medium - sized enterprises is at the stage of preparation of a concept and implementation of the first pilot programs. This can be an introduction to realisation a complex policy of support for innovative activities in SME. Hitherto existing mechanism of stimulating innovativeness and technology transfer to SME is ineffective. Help for creation and development of small firms operating in the area of advanced technologies is insufficient. There is lack of a system of financial support for new and developing technology-based firms in the form of public and private venture capital funds. This sector of financial market is at its preliminary stage of development. Activity of venture capital funds at the Polish market has not solved and will not solve in the nearest future the problem of financing the innovative undertakings, like it is in the European Union countries, as high risk of such investments reduces significantly supply of capital. Therefore there appears the problem of creation the attractive legal and fiscal conditions that would encourage potential investors to invest in this kind of financial services. At present it is still difficult to observe any organisational activities or even proposals from banks or insurance companies that could assign funds for this activity. They grapple with their own problems of gaining capitals and at the moment are not interested in this new for them form of money location. Another problem that indirectly impedes development of venture capital is insufficient knowledge about this market amongst entrepreneurs looking for capital, as well as amongst persons who influence creation of the economic policy.

(6) Lack of the program of increase the Polish SME competitiveness in the aspect of a near Poland's membership in the European Union. SMEs have

154

become an engine of economic development of the country and a share of this sector in GDP generating and solving the labour market problems is higher and higher. In a situation of coming total repeal of barriers protecting local product or service markets, Poland can not afford loosing the benefits from hitherto development of SME. Hitherto existing programs aiming at increase of technical level of enterprises, financed mainly from "help" funds, refer only to less than promille of operating small and middle-sized enterprises. Help in a range of certification and quality norms' assertion is necessary.

3. Basic Aims and Directions of Technological Policy

The first step towards creation of conditions for improvement of innovativeness of the Polish economy should be working out the inter-sectoral horizontal technological policy. The Minister of Economy and the Chairman of the Scientific Research Committee (SRC) should be responsible for realisation of the policy according to division of competencies. Other ministries - The Ministry of Environment Protection, the Ministry of National Resources and Forestry, the Ministry of Agriculture, the Ministry of Defence and the Ministry of Education should be partners for mentioned two bodies in their activities. Such a solution means division of budgetary financial sources for science and research between different ministries, with a leading role of SRC in the framework of scientific policy. The base of such technological policy should be over-department strategy of technological development of the country. Additionally, it seems to be proper to create a specific centre for co-ordination of innovative activities in a form of advisory committee (attached to the Prime Minister), for example the National Council of Innovation and Technology, that would join people responsible for mentioned tasks: officials from the central administration offices, representatives from the national level agencies and institutions as well as scientists. The basic aim of this body would be defining directions of the governmental technological policy, giving opinions to national initiatives, propagating a need for stimulating innovativeness in the economy. The Committee is assumed to become a national lobby popularising a need for specific paternalistic approach to innovations, technology transfer, and technological and civilising development aspects. American experiences mainly show high usefulness of this kind of bodies also in regional aspect. In practice, in the planned structure of macro-regions, 16 regional committees at the Voivod Offices should be created.

155

The main aim of technological policy should be **improvement of international competitiveness of the Polish economy and domestic firms** as well as increase of a share of new, modernised, and pro-ecological products in total production. This should be supported by **creation of cohesive, modern innovation system both at national and regional levels**. Its basic range of competencies should include: creation of market for innovations, creation of high absorption ability of the economy, "investments in people" and creation of such infrastructure and institutional systems that would stimulate intellectual development and practical application of knowledge (innovations), contributing to creation a permanent competitive advantage. This especially refers to **strengthening the mechanisms of transfer and absorption of modern domestic technologies** and transfer of foreign solutions. The basic tasks in this range are as follows:

- support of development of institutional infrastructure of entrepreneurship and technology transfer, mainly at the regional level;
- deep ownership and quantitative restructuring of scientific units operating on the market of scientific and technological services;
- creation of advantageous conditions for investments in higher risk activity connected with innovation activity;
- system of public orders;
- stimulation of aggregate demand for applied research and development works conducted in the country.

The following issues rank among the basic proposed directions of technological policy and activities aiming at improvement of innovativeness of the Polish economy:

1) Increase of science and research expenditures to the level existing in developed countries, amounting to ca 2% GDP, with simultaneous increase of a share of enterprises in financing applied research. Higher funds may not be used only for increase of wages and purchases; they have to be accompanied with the increase of effectiveness of their use, especially in the area of applied research. Long-drawn negligence in this area resulted in the situation, when immediate increase of science expenditures from 0.87% to 1% GDP will not cause rational absorption of sources. Therefore a postulate for significant increase of a share of these expenditures (to 2% GDP) should be accompanied with a schedule of increase effectiveness of their use.

2) Change in the system of managing public funds for science and research. Financial sources according to settled criteria and science and technology governmental policy should be transferred to a network of agencies responsible for organisation of tenders and programs joining high schools, institutes and enterprises, for control of works and evaluation of results; 3) Creation of technology programs at a regional level as an integrative part of local and regional strategies of development;

4) Deep reconstruction of science and technique area in order to make it alike to structural solutions from the OECD countries, however preserving hitherto achievements of R&D institutes and centres. Structural and ownership changes of the R&D area will need use of hitherto existing privatisation paths. Financial, organisational and institutional mechanisms as well as their legal foundations referring to the following areas will be necessary:

- preservation of existing state-owned industrial institutes acting for the benefit of safety (energetics, defence, agriculture);
- creation of research-development units in a framework of industrial holdings;
- possibilities of R&D units' privatisation for the benefit of their employees as well as facilitation and stimulation of spin-off firms' creation that would act also to domestic R&D units' advantage;
- taking over the R&D units' shares by high schools, other R&D units, large economic corporations and regional organisations:
- creation of research associations uniting SMEs;
- transformation of weaker scientific-research institutions into innovation and entrepreneurship centres, creation of branch Technology Transfer Centres supporting technology transfer to SME⁵.

Improvement of innovativeness and technology transfer mechanisms in Poland needs a radical restructuring of high schools both in the area of education programs as well as creation of modern ties between high schools and industry. Highly educated high schools graduates, prepared to effective activity at the labour market, for example through self-employment, are important "carriers" of modern technologies. High schools should prepare students and postgraduates to modern research and managing a firm. Knowledge in the area of modern technologies and organisation of production, technology assessment, entrepreneurship and technology transfer is especially important. In a framework of new ties between high schools and industry, a key role play financial mechanisms that are interesting both for technology creators and users. Experimental works and implementation studies should accompany research

⁵ Some of existing in Poland branch scientific-research institutes at the moment could be transferred (to their advantage) into technology centres. For years they have lived on renting their assets and on small-tonnage production, while their research activity has played secondary role. Proposed change of this state of affairs would sanify their financial standing and would create new possibilities of activity for ambitious people. In a framework of these changes western experiences of "the SMEs research associations" should be used.

works. However, this needs tight contacts between scientists and industry, use of modern forms of organisation, computer support etc. Examples of such solutions exist in technologically developed countries. They are mainly:

- Stimulating of setting up new technology-based firms (*spin-off*) on a basis of technologies worked out in high schools with participation of research teams. Therefore this is necessary to create a system of organisational and financial support, in the form of *seed-capital* funds, as well as technology parks and centres, which would make it possible to create *spin-off* firms. However, responsibility for creation of this kind of infrastructure should not rest exclusively on high schools' shoulders, as this would be too heavy financial burden for them. It should be created commonly by governmental agencies, local authorities, institutions supporting entrepreneurship and economic growth, banks, and of course high schools;
- Joint programs for industrial leaders and high schools. On one hand, these organisations can facilitate flow of research results from high schools to industry, and, on the other, can influence modernisation of education programs;
- Development of elastic forms of personnel and financial solutions in a framework of so called "purposeful" grants, considering a need for searching wider connections, i.e. between not only two, but more partners both from high schools and industry;
- Commercialisation points (*"science shops"*), where scientists' and students' research projects are offered to industry;
- Organisation of permanent education for engineers, entrepreneurs, SME employees, as well as secondary and high schools' teachers;
- Stimulating creation of local or branch centres for technology diffusion. High schools, local authorities, innovation and entrepreneurship centres etc. should be partners of such organisations.

5) Passing the act on research-development activity, that should contribute to increase of the flexibility of structures, increase of competitive fight for sources at the research-development market, and, on the other hand, to creation of regional research-development initiatives.

6) Passing the act on public increment activity covering activities connected to entrepreneurship support, transfer and commercialisation of technologies.

7) Dissemination of knowledge and effective execution of the intellectual property rights protection. Intellectual property protection policy has an important meaning for safety of economic activity and stability of the economy in the long run. From amongst basic proposals in this area one can distinguish:

- improvement of effectiveness of jurisdiction in the area of intellectual • property protection;
- creation of a system of dissemination and monitoring of patent and sciencetechnical information, creation of data bases with help of the latest techniques;
- education and dissemination of the intellectual property protection problems through changes in education programs at each level of education, organisation of schooling for central administration and local officials, for employees from centres supporting entrepreneurship and technology transfer:
- development of patent and licence advisory centres; •

8)Supporting the development of regional innovation systems. Strengthening regional innovation systems through implementation of modern institutional forms in a range of advisory activity, schooling, information, non-banks loan and guarantee funds, technology and co-operation mediation, incubation of entrepreneurship. Starting initiatives arising from the ranks as well as selforganisation of society in a form of non-governmental organisations initiating transformation of structures and consciousness. Expansion of entrepreneurship and technology transfer infrastructure should be based on new institutions joining enthusiasm with public co-ordination, which is possible in third sector institutions. The first half of the nineties fructified with development of mentioned infrastructure in the area of labour market policy. Effects of "the Program of small entrepreneurship development" and "the Program of local initiatives" encourage for analogous undertaking in the area of technological policy. Strong, once impulse making possible development of a network of innovation centres according to standards existing in highly developed countries is necessary. Large governmental program would enable transfer of knowledge and experiences, integration of human circles, creation of new teams, consolidation of local and regional strategies. New loan from the World Bank, supplemented with "help" sources from the EU would be reasonable. Effectiveness of regional systems needs a defined critical mass, which for a long time can not be assured by market regulations. Activities that initiate inclusion of local and regional institutions into European networks (EBN, BIC, NET, etc.) are necessary. At the same time a national representation of non-governmental organisations operating for the benefit of innovativeness and entrepreneurship is needed. Lobby structure in a form of corporations, foundations and associations will significantly strengthen a national innovation system. Hitherto development of innovation and entrepreneurship centres in Poland confirms western experiences with non-governmental organisations. This organisational-legal form should be preferred while creating

new centres. Simultaneously, further development of infrastructure should on a larger scale result from possibilities, needs, and regional expectations. Reform of administration that is being implemented opens new possibilities in this area. Regions become independent entities that can take pro-innovative initiatives. Therefore understanding these needs and support of local or regional initiatives is the first step towards economic success of a city/town or region. We see a need, with help from the Ministry of Economy and the Scientific Research Committee, of undertaking (together with the Agency of Technique and Technology) wide information-popularising activities in a form of conferences, seminars and meetings for representatives of new local and regional authorities. Their main task would be presentation of latest instruments and forms of regional development support, including institutional solutions concerning entrepreneurship and technology transfer - technology centres and parks, risk funds etc. Creation and development of innovation and entrepreneurship centres, as opposed to the beginning of nineties, to a greater degree should base on national financial resources and experiences. This base should be a financial "construction" including different public and private sources - private-public partnership.

9) Support of informatics and communication infrastructure development. Technical infrastructure (for example tele-informatics networks) fastens processes of innovation diffusion, and at the same time is one of the most important ways of stimulating innovations and technological progress. Polish informatics infrastructure should be comparable with world-wide standards, as well as it should afford possibilities for processing and unconstrained flow of information in world-wide networks. Experiences resulting from creation and activities of scientific networks should enable Poland to gain a partner position in the "world informatics society", which is supposed to rapidly develop in the first decade of the 21st century. In the area of technical solutions the problem is not technology, but costs connected with its exploitation, which can become a barrier for a network services' dissemination on a larger scale. It is necessary to spread basic technical information about the issue of different network technologies.

10) Development of capital market, economic guarantees and insurance is one of the most important factors stimulating the economic entities' propensity to innovate. We notice a need for active investment of public sources (including budgetary and regional sources) in co-creation of national funds of high risk, institutions of guarantees and insurance (as seed capital) in order to reduce risk of innovative activity. It is necessary to create more favourable conditions as

well as fiscal and legal preferences for setting up different kinds of national institutions and programs of financing the preliminary stages of innovative undertakings' development.

11) Investments in human capital, increase of educational potential and propagating entrepreneurship culture. In the range of entrepreneurship and innovation education it seems necessary to strive after preparation of society, especially young generation, for challenges in the area of new technologies, organisation, ways of communication, etc. General and specialistic education referring to entrepreneurship and innovations should be treated as a main source of future generating of pro-innovative attitudes, creation of conducive climate for entrepreneurship and technological changes, but most of all as a source of setting up new innovative firms, including those operating in the area of high technologies. Propagation of entrepreneurship climate at universities and high schools amongst students and academicians (as legal side activity) covers:

- popularisation amongst future graduates an idea of setting up own firms;
- implementation of educational programs concerning entrepreneurship;
- prizes for firms for successful beginning of activity, connected with implementation of innovations;
- wide popularisation in mediums of mass transmission persons from scientific circles who gained a success in business
- creation of possibilities for simultaneous employment at a high school and management a firm (for example a status of scientific-implementatory worker)
- development of infrastructure supporting business at high schools.

Innovation and entrepreneurship centres in co-operation with high schools, educational organisations, etc. can play essential role in this area. We see a need for elaboration of a model of permanent education.

12) Stimulating creation of new high technology entities and development of small and medium-sized innovative firms. Polish "garage" entrepreneurs act, as opposite to their counterparts in highly developed countries, in relative isolation, without necessary financial, organisational and logistic support as well as defined systemic preferences (grants, loans, investment reliefs etc.). Lack of high-risk funds at different stages of financing innovative undertakings is especially severe. Lack of a system of technological entrepreneurship' support strongly reduces setting up and development of new innovative economic entities. It is necessary to use complex legal, organisational, institutional, fiscal, and financial instruments. Basic meaning has supporting creation of a network of national and regional institutions, operating for the benefit of technology transfer to SME in a way of incubators, innovation centres, and technology parks. Financing (from public sources) research and development works as well as technology transfer and implementation for needs of SME can be realised through: (1) research and implementation grants, (2) public orders, (3) programs of financing innovative projects. There is a need of supporting **creation of a wide offer of programs** in the area of education, schooling, information and advisory activity, access to informatics networks etc. aiming at creation of SMEs demand for innovative solutions. Use of these services rendered by different kinds of governmental agencies, regional foundations and associations, innovation and entrepreneurship centres should be, on a defined scale, financially supported from public sources. Amongst activities encouraging SME to implement innovations different kinds of fiscal and financial solutions can also be found:

- system of reliefs and costs subventions of pro-innovative activities carried out by entrepreneurship and innovation support' institutions on the benefit of SME;
- financial incentives for SME aiming at gaining certificates (in a range of quality, safety);
- financing programs of transfer of personnel between SME and scientific institutions (so called innovation assistants).

In this context it seems reasonable to transfer public help from declining branches and enterprises to developing (growing) ones.⁶ It is desirable to support development **of a network of regional, national and international contacts** for needs of innovation and technology transfer to SME through assignment of different kinds of agreements, organisation of innovation fair and exhibitions, training and mutual relations between people, initiation and support of development of firm networks.

13) Immediate preparation and implementation of a program for increase of enterprises' competitiveness (especially SMEs) as well as preparation of this sector to activity in the system of global economy. Increase of competitiveness can not be based any more on use of cheap local labour forces, relatively highly educated, but it has to focus on increase of latest forms of management and organisation. Like in analogous initiatives in the EU countries,

⁶ "Project of small entrepreneurship development", financed by the World Bank was less expensive than budgetary reliefs for Ursus (a tractor company) and Gdansk Shipyard, and it fructified with setting up (within three years) over 3 600 firms and about 19 000 new workplaces; simultaneously it is the base for development of new firms and workplaces. See: K.B. Matusiak, M. Mażewska, T. Niesiołowski, Loklany system wspierania przedsiębiorczości, MPiPS, Warszawa 1998, s. 48-51.

the program should most of all on a common scale facilitate access of SME to modern, pro-ecological technologies that will enable long-term, stable development. Implementation of these technologies in SME will open possibilities for gaining a competitive position, which is especially important in the aspect of suppression of protective barriers for the Polish economy. Lack of suitable governmental activities in this area will constitute a "fault of reinqulishment" and can add to bankruptcy of a big share of SMEs. It will be tantamount to renewed appearance of unemployment problems, which could not be solved with traditional methods, for example facilitation of setting up new firms. Therefore problem of stimulating innovations and technology transfer can become a political problem in the nearest future.

14) Increase of social and political acceptance for science and technique. Consultations and discussions for example with scientists, science users, the parliament, governmental departments, and public opinion can support this. It can be helpful to introduce procedures of defining priorities in science and technique consistent with mentioned consultations, technology assessment procedures, e.g. carrying out research aiming at defining social, cultural, ecological etc. results of implementation of new or increase of a scale of use hitherto implemented technologies.

4. Conclusions

Evaluation of innovativeness of the Polish economy allows for formulation of the following conclusion: Poland needs technological offensive that will enable improvement of competitiveness as well as definition of new position of the country in international division of labour. Activities in the area should most of all aim at acceleration of integration procedures and at global development tendencies. Further effective support of entrepreneurship needs a turn towards innovations and new technologies. Extensive possibilities of new workplaces' creation are being diminishing. The so called "transformation rent" was a basis for entrepreneurship wave at the beginning of nineties. New wave may be the result of tighter ties between science and economy as well as national technological offensive. Innovativeness is a chance for improvement of Poland's and its regions' competitive advantage in a perspective of European integration. Unfortunately, need for innovativeness is still not popular amongst politicians, public officials and entrepreneurs, as well as economists (academicians). Opinions can still be met that innovations are threat for workplaces. These threats as well as Keynsian theories of growth resulted in

present level of unemployment in European Union. Implementation of innovations as well as improvement of technology should become a priority in Poland and should be financed with both domestic as well as EU financial sources. Good example of such a policy may be determination of China or Israel in implementation of strategy of technological development. Effects of those activities are clearly visible on international market.

Activities in this area are costly, they need years of many persons and institutions' engagement, and their results are difficult to evaluate and need special methodological approach. Highly developed countries in this area have always been free with their public sources. As a rule gained results contribute to successful economic development of regions and whole economies. General connection between financial sources spent on technology programs and widely understood economic growth is visible. These tendencies have been growing in recent years. At the same time questions about efficiency of spent money are asked more and more often. The point is not to resign implementation of strategies, but to more effectively spent sources for increase of innovativeness of economies.

164