Changes in the Innovation Activity of Transnational Corporations. Implications for Poland

Under the pressure of globalization forces innovativeness has been coming into prominence as one of key determinants underlying international competitiveness of enterprises. It also concerns transnational corporations (TNCs) which make the leading group of globally competing enterprises. Although most of TNCs conduct their businesses for many years in so-called traditional sectors, nevertheless the present technological revolution offers them many new achievements and opportunities. Like all enterprises, transnationals have been taking advantage of break-through information and communication technologies (ICTs), and other new technologies (advanced materials, biotechnologies, etc) which are applied to create new or modernized products, production processes and business infrastructure. Firms also introduce innovative methods of management and organization, and adjust foreign expansion. At the same time TNCs do change their cross-border innovation activity to make it more effective and significant for creating sustainable competitive advantages.

Changes in the innovation activity are of crucial importance not only for TNCs themselves but also for many other firms which compete or cooperate with them all around the world. Subsequently it also implies some impacts for many countries hosting TNCs’ research centers and foreign subsidiaries which tap to their resources, expand international production and set up linkages with local firms.

To portray problems which emerge on the international arena the following structure of article is accepted. First there will be presented a set of features and trends in the evolving TNCs’ innovation activity which lead to increasing external orientation of the corporate innovativeness. The second section will be devoted to identifying changes in the organization of TNCs’ innovation activity which result in the expansion of corporate R+D and innovation networks, and new roles of foreign subsidiaries and research centers. Characteristics of corporate R+D centers located in Poland will be added. The third section investigates conditions, structures and trends in the innovation activity which make reasons for TNCs’ research and innovation involvement in Poland. In the fourth section there will be discussed general implications of the TNCs’ innovation activity for Polish firms and the economy, at the present stage of their R+D and technological capabilities. And finally an attempt is made to answer a question, whether the discussed changes in TNCs’ innovativeness will be favorable for Poland under the new emerging conditions.

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Characteristics and changes in the TNCs’ innovation activity

The basic fact about the world innovation activity is that for many years a predominant position has been taken by TNCs (Dunning 1993: p. 288–301). Actually it is a group of firms originating mainly from the developed Triad countries, so their innovation activity is concentrated there as well. The TNCs’ innovativeness is strongly linked to their international business – its motives, conditions, forms, effects – and therefore it results in some specific features which distinguish it from the innovation activity of other enterprises.

The following specific features of the TNCs’ innovation activity should be taken into consideration. Firstly, innovation process is conducted on a large scale. It means large R+D expenditures, many R+D centers and thousands of researchers, several dozens of subsidiaries implementing and upgrading innovations. Secondly, innovation activity is of a collective character what means involvement of many corporate units and researchers in particular projects, which are quite often supported by independent entities. Thirdly, complexity of corporate innovativeness consists in growing number of crucial, interdependent and specialized actions or inputs into the innovation process which are brought in by its participants. Fourthly, geographical dispersion of the TNCs’ innovation activity is due to a relocation of corporate R+D centers as well as outsourcing and offshoring some research tasks to other countries. Fifthly, the need of integrating and coordinating innovative actions and tasks of many diverse units and entities by TNCs’ regional or global headquarters. Sixthly, the possibility of multiple use and improvement of innovations by numerous subsidiaries in the home and many host countries, thus spreading the innovation process across borders of countries. Seventhly, diversified ownership structure of the innovation networks as far as they include both capital-dependent units (corporate centers, subsidiaries, joint ventures) and independent entities – mostly other firms and centers – as partners, subcontractors, etc. Eighthly, implementing a “bundle” of radical innovations – based on ICTs and other new technologies - implies a deep “creative destruction” in all domains of firms’ activity which is a very difficult and hard process in very large organizations like most of TNCs.

Research activity of TNCs has become a crucial problem to many firms and the world economy. TNCs strain to obtain more and more important (radical) R+D results, to make the research activity more efficient and competitive while less costly and risky at the same time. That is why for the last ten years the R+D activity of TNCs has been changing considerably what implies adjustments in corporate organizations, strategies and foreign expansion.

Increasing internationalization of the TNCs’ research activity is a salient feature and a crucial trend in the corporate innovativeness nowadays. It stems from changing conditions both inside TNCs and outside them, in the global environment. The internal conditions include among others: reconfiguration of value-added chains and their organizational structures, focus on activity based on core competencies, ICT implementation improving intra-firm information systems and cross-
border communication as well as increased business process outsourcing (also in R+D function) and offshoring to other countries. The external conditions relate to the globalization process – beyond a crisis period - which spurs hyper-competition, more liberal trade and investment policies, flows of foreign direct investment (FDI), growth of technologically advanced resources and capabilities etc. In the process of internationalizing R+D activity led by TNCs the following trends have emerged (World Investment Report 2005, p. 101–104):

• Evolution of motives underlying internationalization of R+D what results from mitigation of market-seeking motives (adaptation of technology to particular needs of sales markets) while intensification of efficiency-seeking motives (reduction of R+D costs) and strategic motives (access to foreign pools of knowledge and high skills).

• Increasing specialization (within the entire R+D function) of TNCs’ research centers, where basic and core-competence research is still concentrated close to headquarters in home countries while product development and testing is quite often relocated abroad to well-endowed and/or low-cost countries.

• Growing inflows of foreign direct investment to R+D sectors in countries endowed with technologically advanced resources and capabilities where TNCs set up research centers and transfer some R+D tasks to corporate foreign subsidiaries.

• Increasing significance of the East Asian countries – first of all China and India - as locations for R+D activity offshored by TNCs from the developed countries.

• Increasing role of international cooperation and technological alliances which bring about benefits to companies because of sharing costs and risks, accelerating R+D process, increasing R+D specialization, learning new methods firm partners etc.

• Activation of TNCs’ global search for available R+D results, business information and knowledge, innovations applied by other firms etc., in order to integrate them into own innovation process for making it more efficient.

The above trends point out not only intensification of the cross-border R+D activity but also its deeper specialization, wider cooperation and reorientation to new destinations outside the developed countries. In fact, the R+D activity becomes more and more interdependent with foreign expansion of TNCs (Castellani, Zanfei 2006, p. 24). On one hand, research results and innovations underlay creating international competitive advantages what makes a basic condition for any form of foreign expansion of firms. On the other hand, foreign expansion offers to firms many opportunities of intensifying R+D activity at the result of accessing more information and knowledge as well as watching new technologies and innovations used by other firms abroad. Thus a knowledge pool of TNCs can be increased owing to their engagement in foreign operations what further stimulates foreign expansion of corporations.

The internationalization is linked to another crucial trend which is decentralization of the TNCs’ innovation activity (Birkinshaw, Hood 2001, p. 134). It means that the innovation process expands beyond TNCs’ headquarters and is at least partly transferred to other units of corporate organization, main-
ly to foreign centers and subsidiaries (therefore it can happen that the TNCs’ innovation process is both decentralized and internationalized as well). The decentralization has spurred under two kinds of specific motives. Demand-oriented motives induce foreign subsidiaries to adapt technologies – transferred from the headquarter – to the requirements on the market of a host country. In favorable conditions adaptation can pass subsequently to a stage of significantly improving or creating new technologies and implementing own innovations in foreign affiliates. Supply-oriented motives have become important for parent TNCs which act under the pressure of enlarging innovation pool needed for expansion on the global market. Foreign subsidiaries with advanced R+D capabilities and developed local linkages can contribute much to corporate pool of innovations. As far as they are embedded in different national environments (including science and technology, economy, society and culture), it is quite possible to encounter new knowledge, technologies, innovations generated by other firms or R+D centers abroad.

Therefore the innovation activity led by TNCs becomes more and more complex what results from the inclusion of various participants: corporate units (foreign subsidiaries and research centers) and independent entities (firms, centers, researchers) from many countries. All of them form a cross-border, integrated innovation system which is organized and managed by a corporate headquarter. At the same time the participants’ “innovation input” is internalized in the TNC’s organization. The participation of various units and entities in the integrated innovation system of TNCs is presented at the Chart 1.

![Chart 1. The model of complex integration of TNCs' innovation activity](image_url)

**Notice:**
- TNC HQ – a headquarter of TNC
- FS – foreign subsidiaries involved in an innovation activity of parent TNC
- IE – independent entities (firms, research centers, researchers) involved in an innovation activity of TNC


If assumed that the innovation activity is focused on a development of product (new or modernized one), so it consists of three basic and interdependent value-creating functions: R+D (including design), production and marketing. Roles and tasks of particular units and entities are differentiated and devoted to co-creation and/or implementation of innovations or their parts. Management of the innovation activity concerns many actions such as: innovation development, setting up innovation portfolio (set of new solutions of different potential, advancement, use), configuration of actions and the involved units (their locations), methods of integration and coordination, models of developing new products and introducing subsequent adjustments in inputs, production, distribution etc. As it is difficult to draw all aspects of functioning the TNCs’ in-
novation system on the two-dimension Chart 1, it must be added that the complex organization, integration and coordination of the entire TNCs’ innovation activity – consisting of many actions, tasks, participants etc – is a dynamic and interactive process which requires a top mastery in management capabilities.

The complex integration of TNCs’ innovation activity is based on changing management of corporate innovativeness which has been evolving from a closed model (within own organization) towards an open innovation model (beyond own organization) (Huston, Sakkab 2006, p. 60). It means extending the innovation system by inclusion of independent, innovative entities from outside the organization, and quite often from outside home country as well. The opening of TNCs for inflow of external innovation leads to expanding cooperation with other firms – in the same or related sectors – in order to access their pool of knowledge or to develop knowledge (technology, innovations) collectively, in strategic (technological) alliance (Khan 2007, p. 131–132).

Having discovered a valuable knowledge possessed by other entities, TNCs must find out ways to access it, internalize and recombine within their innovation processes. Therefore seeking, discovering and integrating useful knowledge has become a purposeful three-stage action in some firms. The stages include: sensing (to identify and access knowledge), mobilizing (recombination of scattered pieces of knowledge to work out new, commercial solutions), optimizing operations (selecting optimal scale, capacities, locations etc) (Doz, Santos, Williamson 2001, p. 6–10). As it is believed, such a process of global sourcing and harnessing knowledge, its integration and optimal application lays ground for creating a meta-national competitive advantage of TNCs.

The combined effect of the above trends makes a key change which consists in increasing external orientation in the TNCs’ innovation activity. It should be stressed that in fact it is a double externality because it relates to two aspects of the activity. The first aspect is organizational and means extending the innovation process beyond corporate own organization, towards that of other entities. One can add that at the same time – owing to the decentralization of TNCs’ organization – the innovation process has been extended beyond central labs and R+D centers close to corporate headquarters and has moved downward hierarchies, towards foreign subsidiaries. The second aspect is locational and relates to domestic or foreign location of the R+D and entire innovation activity (usually particular parts of it). The internationalization of innovation activity leads to the increasing role of external (foreign) locations what means transferring it to foreign centers/subsidiaries as well as obtaining it from foreign entities (by acquisitions or cooperation). At the result some impacts for host countries do arise. So the external orientation of TNCs’ innovation activity has become an important problem not only for corporations themselves but also for their many competitors and partners (including foreign ones), and host countries as well.

**TNCs’ innovation networks and the role of foreign subsidiaries**

A general trend of the TNCs’ organizational evolution consists in gradual moving away
from large, multi-layer hierarchies to flatter and more flexible networks. TNCs’ networks tend to be more and more differentiated (large differences appear in characteristics of its units – foreign subsidiaries) and at the same time they become more heterogeneous (many independent entities are included in value-creation process). In relation to the TNCs’ innovation activity it means that roles of foreign subsidiaries are much differentiated and participation of independent entities expands gradually. In such a mixed innovation structure, corporate headquarter usually plays a leading role which is based on parent’s strong position (its resources, capabilities, global brands and market share) in relation to its independent participants (entities) in the network. We shall start with explaining innovation networks - and R+D networks in particular – which are made of independent (external) entities.

The mixed (heterogeneous) R+D networks are created by enterprises which accept sharing costs and risks born on a path to improving their competitive advantages by means of achieving new solutions and applying innovations. Due to participation of various enterprises (with own networks) they are called external R+D networks. Participants of the networks are linked with cooperation agreements (alliances) devoted to R+D works. Such activity is conducted collectively by partners (in a join project or venture) or individually with exchange of research results, or it consists in outsourcing R+D tasks (even offshoring them) to independent suppliers. The main tasks of the mixed R+D networks include reduction of costs and risks, deepening inter-firm “division of labor” and specialization, quick learning, coordination of pre-competitive actions etc. (De Man 2004, p. 9–12, 31–33). Beside R+D relationships of private enterprises, the research networks can be initiated with Government-sponsored consortia (like SEMATECH in the USA) or by EU-worked-out programs (like JESSI or EU-CAR). Another way of developing the networks relates to initiatives of particular firms which engage in many research projects with different partners and create so-called portfolio networks. At the result they are at a disposal of a large set of alliances or R+D projects which provides them with opportunity to choose and develop the most competitive solution (e.g. technology) in the future. As complements to mixed R+D networks there are created multilateral standardization networks which aim at establishing particular technical standard in a given sector. This way a dominant technology is introduced what finally stimulates sales of products by network participants on the market.

Firms in the external research networks participate on different positions and play diversified roles, so they can be classified in three groups (De Man 2004, p. 39–46):
• Equal member (or partner),
• Bridge-firm (or joiner),
• Orchestrator (or integrator).

Even as an equal member of the network, a firm can enjoy the following benefits of networked R+D: access to information and knowledge, speeding up R+D process, learning technical standards and business practices, setting up contacts with key players in a given sector. However an equal position (which is sometimes a weaker position) can result in too much dependence upon stronger partners, too
much “inward orientation” in the network, quicker erosion of own competitive advantages etc. A bridge-firm in the network creates relationships with other firms or group of firms, whereas there are no alliances among them. A bridge position provides opportunity to access information and knowledge in various sources, to act in a more sophisticated and flexible way, to diversify risks etc. However sometimes a bridge-firm is not regarded a trustworthy partner, its relationships and social capital in the network are weaker, and it cannot improve its position in a given sector.

The strongest position in research networks is taken by an orchestrator (or integrator, as called in some publications). Quite often it is a TNC which is well-known for a global brand and significant market share, a large-scale organization and many alliances as well as much experience in international management. The outstanding position of an orchestrator stems from its competitive resources, integration capabilities, global vision and strategy, first-mover actions in the sector etc. As the network leader, an orchestrator decides upon participation of members and their positions, sets forward cooperation and specialization, stimulates innovativeness and learning. Consequently, not only its position but also resulting benefits are asymmetric.

The external networks are complementary to internal systems of TNCs’ subsidiaries and R+D centers. Taking into consideration two kinds of networks – the external and internal ones – we can notice emerging a double network of the TNCs’ innovation activity as an unique and salient feature of such activity. The external and internal networks are interdependent and interactive, and these characteristics are transferred directly to a mode of carrying out corporate innovation activity with participation of diversified units and entities.

Most large TNCs set up a global scope of their double innovation systems what means locating own units and choosing independent entities on three continents at least. However under the expanding regional economic integration and advancing the integration process itself – like in the EU – innovation networks are often shaped regionally at present (although regional subsystems or hubs can make parts of global corporate systems). The double TNCs’ innovation networks are embedded in regional innovation systems (if they have emerged) and in national innovation systems of host countries as well. In a regional integration grouping TNCs can access advanced resources and capabilities which are critical for their innovation process but at the same time their supply becomes less available for local firms, especially for small and medium seized enterprises (Christopherson, Clark 2007, p. 1224, 1233). It means that the national supply of resources and capabilities is less available for local enterprises, but on the other hand some innovative local firms can be included into the TNCs double innovation networks (by means of alliances or acquisitions). It can result in weakening of the hosts’ national innovation systems for some time and finally in mitigating international competitiveness of local firms and the economy.

The internal network of TNCs’ innovation organization consists of corporate units including headquarters (global and/or
regional ones), foreign subsidiaries (involved in R+D, production and sales functions) as well as research centers, labs, design divisions or centers. Significance and position of each unit in the TNCs’ innovation activity depends on:

• Possessed technologically advanced resources and capabilities,
• Achieved initial position in a corporate system,
• Functions and tasks charged by a headquarter,
• Effectiveness of unit’s staff in developing its competitive capabilities,
• Cooperation and competition of units within a given organization.

Theses characteristics support a view of TNCs’ networks – innovation ones included – as a structure consisting of units differentiated with endowment in resources and capabilities as well as internal and external linkages and relationships (Nohria, Ghoshal 1997, p. 11–15,19). And this differentiation results from headquarter decisions of organizational and investment character as well as growth potential of corporate units, first of all foreign subsidiaries. Their growth is a process of long-term accumulation of resources and capabilities by particular units under given intra-firm conditions and processes as well as external environment in a host country. In case of the innovation activity it means growth of innovativeness of foreign subsidiaries with moving from incremental adaptation of technologies transferred from headquarters towards upgrading scale (numbers), quality and significance of own innovations based on expanding both corporate internal knowledge and other knowledge internalized from entities in the local environment.

A successful growth of a foreign subsidiary or research center conveys it to an outstanding position of the leader in a given function which is called a center of excellence. It is defined as a corporate unit which is appreciated by a headquarter for achieving the highest capability of creating value added in a given function and is acknowledged to transfer this capabilities to other units for making the best use of them (Frost, Birkinshaw, Ensign 2002, p. 997, 1000). Becoming a center of excellence can be a springboard for unit’s further growth as far as it can obtain more means for the capability development. Centers of excellence make true “growth poles” in the TNCs’ innovation activity although valuable new solutions can be created in other units as well.

Changing organization of the TNCs’ innovation activity is strongly linked to growth of foreign subsidiaries as units of internal network and places of enhancing or creating competitive advantages. The latter issue needs to be cleared. Competitive advantages of TNCs’ foreign subsidiaries are developed in three ways: transfer from a headquarter, growth of their own capabilities as well as internalization of knowledge, technology and innovations from external environment, mostly in host countries. As subsidiary-specific advantages one can point out: high-rank managerial capabilities, results of own R+D, innovations in products, production and marketing etc., new combinations of existing assets or advantages, access to unique sources of high-quality inputs, taking advantage of business cluster, good relationships with local entities. If these advantages are transferable and can boost value creation in other corporate units, they can speed up subsidiary’s “career” as a center of excellence.
Growth of competitive advantages which are specific to a given unit/subsidiary and can boost competitiveness of the parent company have triggered a true evolution of TNCs’ foreign subsidiaries. It means a gradual departure from their traditional role (e.g. in multinational strategies of corporations) based on transferred resources/capabilities and focused on foreign market penetration in effective way. More liberal and decentralized approach of TNCs to their innovativeness has implied recently a more active role of foreign subsidiaries in the entire value-creation activity and their more outward-oriented actions to strengthen their capabilities with knowledge acquired from external sources.

To accomplish that task in foreign subsidiaries there are needed: sourcing capability (arising form R+D expertise and enabling assimilation of external knowledge) as well as combinative capability (arising from managerial expertise and enabling effective integration and recombination of external knowledge). Both capabilities contribute to increasing scale and quality of innovations in foreign subsidiaries and enhancing their specific competitive advantages based on sources outside their parent organization. Thus at present subsidiaries’ innovation capability can rely less on own corporate network and more on access to external or foreign knowledge what requires also its capable absorption, internalization and creative recombination in foreign subsidiaries (Phene, Almeida 2008, p. 902–907, 913–914).

Therefore it is stated that many foreign subsidiaries undergo a process of “creative transition”, what relates to their upgraded and more offensive role in the TNCs’ innovation activity (Manolopoulos, Papanastassiou, Pearce 2005, p. 251–263). So there has emerged a non-traditional role of foreign subsidiaries in their parent’s innovativeness what means that they are granted more self-dependence and charged with more duties to deliver knowledge, technology, innovations both worked out by themselves and within the corporate system as well as obtained from other entities in host countries. Thus the subsidiaries’ activity can generate demand for a local knowledge to be internalized in the corporate innovation system.

The TNCs’ innovation systems are partly embedded in particular host countries. Therefore their economies are affected by direct and indirect effects of the corporate activity which emerge on national (local) factor and product markets as well as by local linkages and externalities. Transfer of technology (disembodied as patents or embodied in various goods) to a host country is one of the most appreciated effects on its local market of production factors. Moreover, competitive pressure from technologies or products supplied by TNCs’ subsidiaries forces local firms to improve their innovativeness for defending their position on the local market or penetrating new niches on the global market.

However foreign subsidiaries become not only suppliers of technology to host countries but presently they can also absorb new competitive knowledge available on a local market as well. It means buying knowledge or technology on commercial terms, access to it through alliances or acquisition of local innovative firms (pure imitation is not considered here). In case of the emerging market countries, favorable
supply effects in TNCs’ technology transfer predominate in host economies, although some unfavorable demand effects of subsidiaries’ drive to internalize knowledge cannot be excluded in the future. Much depends on development of advanced resources/capabilities and innovativeness in host countries.

To assess significance and roles of TNCs’ R+D centers located in Poland it is necessary to present basic facts on their activity. In 2007 there were active 30 foreign research centers owned by the leading US corporations (20), European ones and South Korean (1). As classified by technology intensity the group of foreign research centers located in Poland included mostly high-tech industries (20 centers) and medium-high-tech industries (10 entities). By particular industries (or areas of activity), the highest number of centers fell to: software and IT services (5), IT/telecommunication (5), automotive supplies (5), electronics and software (4). Two corporate centers were recorded in each of the following industries: ICT solutions, chemicals/pharmaceuticals, electrical engineering, aerospace supplies, chemical/cosmetics. Most of the corporate R+D centers – exactly 19 ones - have been set up after the year 2000 what is compatible with the general trend of increasing foreign expansion of TNCs’ internal research networks in the present decade (Kraj 2008, p. 179–180, tab. 3, 4).

FDI was a basic mode of expanding TNCs’ research capabilities in Poland and a yearly FDI inflow for setting up R+D centers increased from 52 to 62 million USD in 2000–2003, what made a rising share of 0.56% to 1.33% of the total investment inflow to Poland over the period. At the same time foreign R+D expenditure rose from 13.1% to 19.1% of Poland’s total business outlays for R+D (Kraj 2008, p. 174). The expanding – although still relatively weak – involvement of TNCs in the Polish R+D sphere can be classified as primarily motivated by resource seeking, especially for a pool of high-skilled labor to be employed in corporate centers as well as for new knowledge to be internalized into corporate structures. Another important motivation concerns efficiency seeking what can be achieved by means of increasing scale economies in the global/regional internal corporate network as well as by its reconfiguration due to the eastward enlargement of the EU grouping. For Poland, the TNCs’ increasing involvement can be assessed positively, due to growing significance of research works in the corporations’ direct business activity on the national market as well as some participation in the country’s research and innovation activity.

Characteristics of the research works led by foreign R+D centers in Poland reveal their roles in corporate networks. The centers are tightly integrated in corporate structures, providing other corporate units (mostly subsidiaries) with their research results. First of all the R+D centers – sometimes operating as centers of excellence – are focused on developing or upgrading product technologies devoted for regional or global markets. Developing product technologies for the Polish market was also recorded although its importance was assessed as minor. Thus it is worth to stress that creating and developing technical knowledge strongly predominates over adapting parent’s technologies to needs of the local market by foreign R+D centers in Poland. However, local link-
ages of the TNCs’ centers are weak. They do not use much cooperation with local entities (companies, research centers) although there are few examples of cooperating with Polish technological universities. In general, corporate internal research networks in Poland have not transformed into double research networks (including local entities) integrated by TNCs. Therefore, participation and impacts of foreign R+D centers in the Polish innovation system are rather poor (Kraj 2008, p. 183–184). To change this situation there are needed both adjustments in TNCs’ approach as well new initiatives in the Poland’s innovation capabilities, system and policy.

Innovation activity in Poland as a precondition for TNCs’ involvement

The present form, structure and effectiveness of the innovation system in Poland should be regarded as legacies of the centrally-planned economic system in force till the end of the 1980s as well as systemic transformation of the economy in the making throughout the 1990s. One of disadvantages of the centrally-planned economy was relatively poor state of the R+D sphere and even poorer implementation of research results in economic sphere, i.e. in state-owned enterprises (SOEs). Due to a permanent shortage of goods and a lack of competitive pressure in the economy, SOEs could do without implementing innovations, while concentrating on search for needed raw materials and other inputs. It implied decreasing production and scale economies, poor quality and technological backwardness of products and production capabilities. Therefore imports of ordinary consumer and capital goods were regarded as luxuries and evidence of advantages of the market-economy system.

Under the systemic transformation of Polish economy in the 1990s, Government policy was focused on macroeconomic stabilization, external liberalization, ownership changes, curbing unemployment and some structural adjustment. Technology or innovation policy seemed less important as the emerging market and competition should have forced enterprises to initiate innovation activity by themselves. Due to budgetary crisis, R+D expenditures were cut, research centers were closed or sold (e.g. in privatization deals), equipment became obsolete or useless, research staff moved to other occupations. It was assumed that R+D expenditures and innovation activity would be undertaken by firms in the emerging private sector before long. It was also expected that FDI inflow and transfer of technology by TNCs would boost innovativeness in Poland. However it did not happen. The transfer did not include leading technologies but rather medium-level and fragmented ones, quite often under a tight control of owners and with small spillovers. The emerging private sector was too weak to bear R+D expenditures and SOEs could not bear them as well.

In 2007 a ratio of gross domestic expenditure on R+D (GERD) to GDP amounted to 0.57% (against 0.64% in 2000–2001) while employees in R+D sphere accounted for only 4.6 persons per 1000 economically active persons (slightly above 4.3 persons in the previous year) (Science and Technology in Poland in 2007, 2008, p. 32). All data on the R+D activity in Poland are low by international standards as far as it is generally accepted to reach a 2% ratio of GERD/GDP to catch up with the countries leading in research activity, and a 3% ratio is assumed to be neces-
sary for becoming a true knowledge-based economy in 2012.

Not only level and ratio of GERD are relatively low but also its structure is inadequate to trends in developed market economies. The mentioned 0.57% ratio of GERD/GDP contains predominating parts of Government and higher education sectors (0.20% and 0.19% respectively), while a part of business enterprises in the ratio accounted for a humble 0.17% in 2007. Otherwise, the business sector accounted for ca 30% of the Polish GERD, whereas it is well over 60% in developed countries.

Not only budgetary constraints are responsible for the low GERD/GDP ratio in Poland but also some other factors which include first of all: a lack of full-ranged innovation policy and inadequate institutional conditions for innovating activity (e.g. poor protection of intellectual property rights), insufficient efforts of domestic enterprises to raise competitiveness by means of improving their innovativeness, a lack of finance for R+D activity and implementing innovations in small and medium sized enterprises, poor linkages of national research and business spheres, lack of research specialization in science and technology, small involvement in R+D activity by TNCs operating in Poland. Thus the low level Polish GERD/GDP ratio reflects a problem of poor basic conditions for conducting the R+D and innovation activity in the research sphere and business sector Poland.

In a general opinion the present innovation activity of industrial enterprises is rather weak in Poland. Only 36.7% of the enterprises introduced innovations (mostly product ones) in the years 2005–2007. The leading shares of innovating enterprises (in a whole branch group) is recorded in the following industries: petroleum refining, chemicals, tobacco, domestic appliances (TV and audio equipment, white goods) and motor vehicles. By no means they can be considered as high-tech industries which are usually leaders in the R+D and innovation activity.

Expenditure on innovation activity in industrial enterprises increased from ca 15.5 bln zlotys to 20.2 bln zlotys in 2003–2007 with decreasing amounts and shares of expenditures on R+D activity and acquisition of disembodied technology and software form 15.9% to 9.7%. In the same period amounts and shares of outlays on buildings, land, equipment and machinery increased from 78.8% to 83.1% of all expenditures on the innovation activity. Increases are recorded for shares of staff training and marketing of new or significantly improved products from 9.7% to 15.9% (own calculations based on Science and Technology..., p. 140). Therefore, a trend towards modernization of fixed capital predominates over creating or acquiring knowledge for innovations to be applied in Polish industrial companies. A group of large private enterprises — accounting for 83.2% of all outlays — sets trends in the innovation expenditures which are financed mostly from their own funds (87%).

The share of new or significantly improved products in value of sold production of industrial enterprises dropped from 20.7% in 2001–2003 to 14.7% in 2005–2007. Even larger drop was recorded in companies with foreign-capital participation or ownership (i.e. foreign subsidiaries or joint ventures) from 35.0% to
21.6% over the same period. Probably the Polish market has become less competitive and consumers less demanding in the recent years. Another reason can be increasing imports of high-quality, innovative products manufactured by subsidiaries of parent TNCs or independent companies in other countries.

In the Polish innovation system foreign entities can be regarded important components, however rather due to their potential than a real innovation activity. Potential possibilities stem form a large presence of TNCs and their subsidiaries in the Polish economy after almost 20 years of its transition to the open-market system. In 2006 as much as 18,015 foreign subsidiaries (in non-financial sectors) were active in Poland (with only 30 of them operating as R+D centers). Over 1 thousand large TNCs as foreign investors accumulated FDI inward stock worth 103.6 billion of US dollars in 2006 and 142.1 billion of US dollars in 2007, by data of UNCTAD (World Investment Report 2008, p. 257). FDI inflow reached a large share in total investment outlays, as they accounted for 45.6% in the whole Polish economy and to 58.6% in the manufacturing industry. The share of foreign subsidiaries in total sales revenues of enterprises on the Polish market amounted to 39.7% in the whole economy and to 50.9% in the manufacturing industry in 2006. The technology structure of manufacturing production sold by foreign subsidiaries on the Polish market is rather unfavorable for Poland as long as products classified at low-technology level and medium-low-technology level accounted for 50.1% while high-tech products for only 7.1% of the sales in 2006 (Inwestycje zagraniczne w Polsce. Raport roczny 2008, p. 72–76, 112–118).

As compared to companies of Polish ownership, innovation activity led by foreign-capital companies (corporate subsidiaries) was higher than that of the domestic ones, although not increasing in the recent years. The share of foreign-capital companies reached 29.4% of whole innovation outlays by all medium and large manufacturing enterprises in Poland while their share in a total number of such enterprises was only 17.4%. The highest shares of foreign subsidiaries in the innovation outlays were recorded in marketing of new or improved products (56.7%), acquisition of disembodied technology (54.3%) and staff training (33.7%). However the share of subsidiaries in R+D outlays was much lower and accounted for 22.9% in this category of innovation outlays in 2006. It can be explained by a transfer of R+D results and technology by industrial foreign subsidiaries from parent TNCs or other corporate units (like excellence centers) rather than researching by themselves. Moreover, the R+D works in industrial foreign subsidiaries are much more often focused on adaptation of new products or processes to specific needs of a given unit (while R+D centers deliver research results for regional and global markets). From scant data on innovation outlays of foreign-capital companies in the service sector one can see that in general their innovation involvement was much lower than in the manufacturing and more focused on outlays for new equipment and marketing of new or improved products (Inwestycje zagraniczne..., p. 116–117).

In a national innovation system all components or members – first of all enterprises, both domestic and foreign ones – are interdependent and interactive. In Poland much
depends on domestic enterprises, both public and private ones. There was much evidence that under pressures of competition on the local and the EU markets Polish firms increased R+D expenditures significantly to improve their innovation-based competitive advantages in 2007. However it is not sure that this upward trend can be maintained under the 2008 economic slowdown. Therefore, attractiveness of the Polish innovation system, and especially its domestic entities, as sources or partners for the TNCs’ innovation activities becomes a problem to be considered in a long term.

However, some opportunities have emerged for improving Poland’s innovation capabilities significantly in the future, if a new external finance is effectively used. Assistance to the business sector can be provided with economic instruments and financial means available under the new EU-sponsored Operational Programme “Innovative Economy” (OP IE). It devotes as much as EUR 9,711.6 million for upgrading R+D activity and business innovation capabilities in Poland, with a focus on ICT infrastructure. The main task of the OP IE is to stimulate growth of the Polish economy based on innovativeness of enterprises and development of the information society. Activities under the Programme consist in a direct financial support for enterprises, R+D centers and institutions in the business sphere as well as support to set up institutional regime and incentives for innovative firms. The support will be offered to start-up firms to implement their innovation projects and to established companies for implementing innovations by themselves or for expanding cooperation with partners, i.e. other firms or R+D centers. As assumed, the support will be provided to all entities operating in Poland, both domestic and foreign-capital ones. It means that TNCs’ R+D centers and foreign subsidiaries – as companies registered in Poland – will also take advantage of finance from the OP IE and will have more opportunities to tap to Poland’s technologically advancing resources and capabilities. Hopefully, effective implementation of the IE Program will assist to remove most disadvantages of the present Polish innovation system and it will speed up growth of enterprises and the national economy based on knowledge and innovations created and implemented in Poland.

Implications for Poland

Considering the above research results of changing TNCs’ innovation activity and the conditions of innovativeness in Poland, it is possible to draw up the following implications:

1. Increasing role of innovativeness in sustaining competitive advantages of TNCs leads to a general intensification of international competition based on knowledge, new technologies and innovations. It implies the need of exerting much more efforts by Polish enterprises to raise their technological and competitive capabilities through higher innovativeness. It will make a basic condition for more effective competition and/or cooperation with TNCs on both domestic and foreign markets.

2. Expanding internationalization and decentralization of the TNCs’ innovation activity lead to seeking foreign locations to set up R+D centers and subsidiaries engaged in research work. It implies more opportunities for Poland as a host country to attract FDI inflows to R+D sphere and some sectors of the economy and to expand their
FDI-led growth in the future. However, the quality of the TNCs’ investment package much depends on our own efforts to raise Poland’s international competitiveness and attractiveness, by means of upgrading technological advancement of domestic resources and capabilities.

3. Augmenting external orientation in the TNCs’ innovation activity consists in seeking and internalizing knowledge, new technologies, innovations from outside of corporate organizations. It implies for the Polish entities potentially more opportunities to exchange flows of knowledge on foreign and domestic markets. However, if benefits of the exchange are shared in accordance to bargaining powers, it cannot be sure that Polish entities (and the country) will receive fair shares.

4. Changing organization of the TNCs’ innovation activity leads to the expansion of double R+D and innovation networks with increasing participation of the independent entities. It implies a possible integration of some Polish entities in the innovation networks, most probably in the ones dominated with TNCs as orchestrators. However, it will not be an equal position. The characteristics and effects of the cooperation will depend on quality of technological capabilities of Polish firms and their “knowledge input” to the TNCs’ innovation networks. At the same time it will be important for Polish entities to absorb much knowledge from other network participants, if possible.

5. “Creative transition” of the TNCs’ foreign subsidiaries means their more active roles in the corporate innovativeness through improving their own specific competitive advantages based on innovations as well as internalizing competitive knowledge, technology or innovations of some local entities. It implies that foreign subsidiaries will strain to take advantage of more and more tapping to the Polish resources – mostly high-skilled staff, knowledge and finance – to increase their innovativeness. It implies more competition on the local market for advanced resources, capabilities and finance with possible increasing prices, at least for some of them.

6. Small group of TNCs’ research centers located in Poland mostly takes advantage of local high-skilled labor and benefits corporate internal research networks with results of regional and global reach. It seems that for foreign R+D centers the Polish market is neither demanding enough for introducing many innovations nor well-equipped enough for cooperating with local entities. Like foreign subsidiaries, also R+D centers require a pool of skilled personnel, good infrastructure, some finance, investment incentives. Their resource- and efficiency-seeking approaches will be even stronger, if more high-tech resources and capabilities are available on the Polish market. A new, unfavorable implication can emerge in the future, if Poland’s advancing resources and capabilities are used by foreign centers and/or subsidiaries to generate competitive knowledge for benefit of parent corporations, and to disadvantage of local enterprises.

Thus a new research topic appears which means investigating the experience of other countries how to manage this problem. And a new challenge for Poland emerges to work out an open and effective national innovation
system made of diversified participants – i.e. domestic and foreign entities – which can innovate much, reinforce each other, improve competitiveness, generate and distribute benefits fairly.

1 The first and shorter version of the article – under the same title – was prepared as a paper for the 12th General Conference of EADI (European Association of Development and Training Institutes) Global Governance for Sustainable Development held in June 2008, in Geneva.

2 However of some importance is a fact of increasing R+D and technological capabilities outside the Triad, first of all in China, India and some other emerging economies.

3 The total TNCs’ research expenditures could reach as much as 400 billion of US dollars in 2005, what accounted for approximately 80% of all business expenditures and 60% of R+D expenditures by countries (including Government and business expenses) in the world. The R+D outlays of particular TNCs – like the largest car makers – exceed such outlays of several countries, including Poland (Zorska 2007, p. 112–113).

4 As declared, Procter & Gamble aims to reach soon from external sources as much as 50% of all inventions and innovations applied in its organization.

5 The available published results of investigating R+D activity of TNCs’ units – worked by K.M. Kraj (2008) – concern R+D centers but not foreign industrial enterprises (which usually lead adaptation works, if any).

6 Unfortunately, more recent data on R+D in the FDI flows are not available.

7 Poor innovation capabilities of Polish entities make the main reason for it similar conclusions on the innovations activity led in Poland was drawn in the unpublished PhD dissertation by Marte, M. (2006) Ewolucja współczesnych procesów innowacyjnych w korporacjach transnarodowych (Evolution of the Contemporary Innovation Processes in Transnational Corporations). Warszawa: SGH.

8 In the years 1990–1993, at the beginning of Polish transformation, the GERD/GDP share decreased from 1.9% to 0.58%, research staff was reduced by 23%-37% in various R+D centers or units, equipment depreciation rate rose to 71.6% from 50.4% (Sitarska, Zorska 1996, p. 29–30).

9 For details see: www.mrr.gov.pl

Bibliography


