Economy

# Innovativeness of Polish Economy in the Transitional Stage of Development

Joanna Kotowicz-Jawor, Lesław Pietrewicz
Michał Zajfert, Elżbieta Mączyńska, Tadeusz Baczko
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# Contents

Introduction 7

Chapter 1
**The Concept of Stages of Economic Development: The Case of Poland 11**
Introduction – The Concept of Stages of Economic Development 11
1.1. Quantitative Characteristics of Polish Development Stage 24
1.2. Analysis of Empirical Data Obtained in the Project 33
1.3. Analysis of Correlation 41

Chapter 2
**Exogenous, Civilizational and Systemic Determinants for Innovative Development of Polish Economy 47**
Introduction 47
2.1. Secular Stagnation by Alvin H. Hansen 51
2.2. Relevance of Secular Stagnation Theory – Threat to Investments and Innovations 52
2.3. Casus Poland – Development and Stagnation Antinomian Drift 55

Chapter 3
**Endogenous Barriers for Moving Polish Economy to the Innovation--driven Stage of Development 61**
Introduction 61
3.1. Institutional syntheses 62
3.2. Endogenous Theoretical Syntheses 65
3.3. Results of Empirical Analysis 68

Chapter 4
**Demand Determinants of Innovative Processes in the Transitional Phase of Development 77**
Introduction 77
4.1. The Demand Side of Innovativeness – a Review of Literature 80
4.1.1.The Demand Side of Economic Development 80
4.1.2. The Neoclassical Theory of Consumer Choice 82
4.1.3. Changes in Consumer Preferences 85
4.1.4. Technological and Cultural Innovations 89

4.2. Empirical Studies 91
4.2.1. Hypotheses 92
4.2.2. Results of Statistical Analysis 95
4.2.3. Regression Models 103
4.2.4. Conclusions and Recommendations 107

Chapter 5
**Supply Factors of the Innovativeness of Polish Economy in Transitional Development Phase 111**
Introduction 111
5.1. Theoretical and Research Basis 112
5.2. Analysis of Results 125
5.3. The Financial Zone of Innovative Enterprises 139
5.3.1. Research Assumptions and Methods 139
5.3.2. Basic Data and Financial Ratios of the Surveyed Enterprises 142
5.3.3. An Analysis of Correlation between Spending on Innovation and the Selected Economic and Financial Values 144
5.4. The Internet and Digital Technologies in the Operation and Strategies of Enterprises 150

Chapter 6
**The Role of Research Sector in the Transition towards Innovation driven Economy 159**
Introduction 159
6.1. Research Sector and Investment driven Economy 160
6.2. Research Sector and Innovation driven Economy 163
6.3. Polish Science and Economy in the Transitional Stage of Economic Development 167
6.4. Business and a Research Unit – Mutual Expectations 171
6.5. Cooperation between the Research Sector and Economy in Poland 174

Summary and Recommendations 185
References 195
List of Tables 209
List of Figures 211

# Introduction

Development of Polish economy which belongs to the group of countries catching up with the leaders in knowledge-based economy is determined by the following key factors:

- globalisation processes including financial sectors,
- increasing conflicts between the global processes and national states,
- increasing dynamics of technological changes,
- decreasing labour resources, alarming disparities in the income distribution,
- aging of European population,
- regional integration processes,
- relocation of global economic centers towards Far East and Latin America,
- the phenomenon of secular stagnation present in highly developed countries,
- fundamental transformation of the existing model of market economy.[1]

All these phenomena outline new conditions for competing on the open market. Prerequisite for achieving and maintaining competitive advantage is high innovative capacity on the micro- and macro-economic level.

It was expected that the considerable public aid from EU structural funds dedicated to innovation would stimulate growth of innovativeness of Polish economy in the global competition race. The aid provided in the Operational Programme Innovative Economy, 2007–2013 totalled 8,3 billion euro, and 9,7 billion euro (Weresa, 2015) in the Human Capital Operational Programme**.** However, the transfer of structural funds failed to produce the expected results. Innovativeness of Polish enterprises at the time of absorption of those funds did not improve but in fact fell and Poland dropped in the EIS 2014 ranking (European Innovation Scoreboard) from the 5$^{th}$ to the 4$^{th}$ position from the bottom. In 2014 Poland ranked 24$^{th}$ among 28 EU countries in terms of innovativeness, that is the penultimate group among the four so-called moderate innovators groups. According to The Global Competitiveness Report 2014–2015 (2014) Poland ranked 43$^{rd}$ among 144 countries worldwide in terms of competitiveness.

Although in the years 2004–2013 one could observe convergence of the real GDP/per capita against the EU average, at the same time we noted lack of this convergence in terms of the development of Polish innovativeness system. In 2015

1 Compare more: J. Kleer, M. Kleiber (2015).

the NIS picture of Poland determined by 22 indicators compared to their median value in the OECD countries showed only three indicators above the median, these were: two factors related to remote communication and one concerning cooperation in the area of patenting activities together with foreign inventors. The number of patents registered by local inventors in the European Patent Office increased threefold in the period of 2007–2012, that was 10 times less than the EU average (Weresa, 2015).

A question which as yet has not been fully addressed in the rich subject literature is the identification of the cause of inefficiency of the pro-innovative public EU aid for Polish enterprises.

The aim of the undertaken by the team of researchers at the Institute of Economics of the Polish Academy of Sciences is to establish interrelationships between the current stage of development of the Polish economy and determinants of its innovative capacity in the context of absorption of EU structural funds.

It is hypothesized that the current stage of transition between investment-driven (maximising of effectiveness) and innovation-driven economy stimulated by a qualitative criterion (knowledge maximizing) outlines the main supply-side and demand-side determinants of innovation processes that condition efficiency of EU structural funds' pro-innovative support. These factors define the direction of changes in the transitional development stage.

Individual chapters present a number of detailed hypotheses that are then verified on the basis of empirical data. The research was undertaken in the years 2007–2013. Empirical analysis covered 85 innovative industrial enterprises which implemented new significantly improved product, process or management method in the analysed period. According to the OECD's definition an innovative enterprise is one that has implemented at least one innovation in the period considered.

The research involved questionnaire surveys, interviews as well as a model of the level of economic development and innovativeness developed together with Biostat.

Individual subject areas have been presented in 6 chapters of the study. The first chapter of the monograph presents analysis of conceptual theories related to the stages of economic development. This is where evolution of the main growth and economic development theories has been outlined. There is particular focus on the M. Porter's model identifying development determinants (diamond model) as well as the concepts of the four-stage development. Furthermore, applicability of this model in the modern economy context is presented. The theoretical considerations have been supplemented by the quantitative characteristics of the present stage of Polish economy development. The study revealed that it is in the transition between the second investment-driven and the third-investment-driven one according to the M. Porter's model.

The second chapter looks at major exogenous barriers to the growth of innovativeness of the Polish economy. It has been established that the key risks result from global civilization and political changes. Particular attention has been

given to the secular stagnation in advanced economies. It is the outcome of the global negative democratic trends (aging population), increasing income disparities, premature deindustrialization, growing unemployment, increasing demand barriers, deflation processes, low interest rates and liquidity trap syndrome. All the above-mentioned factors inhibit innovative processes and are a threat to Polish economy.

The third chapter presents analysis of the key endogenous barriers to moving Polish economy to the innovation-driven phase. The research has been based on the institutional and resource theoretical synthesis. The long list of obstacles is headed by institutional barriers, the quality of human capital, information asymmetry and investment risks. Hypotheses presented in this part have been verified by means of the qualitative empirical study of the observed sample of enterprises.

The fourth chapter concerns the demand-side determinants of innovation processes in the transition period of economic development. The aim of the analysis is to find out if the preferences of local consumers support innovative activities of Polish enterprises.

According to M. Porter during the transitional stage of shifting towards innovation-driven economy one may observe consumers' growing preference for innovative products. Thus, the adjusting of the competitive strategies of the surveyed innovative enterprises to the consumer preferences has been investigated.

The theoretical part presents analysis of the implications of demand characteristics for the innovation-driven economic growth as well as changes in consumer preferences conditioning economic growth and development of innovative activity. Researchers implemented the microeconomic theory of demand in order to better understand present preferences of Polish consumers.

Distinction between technological and culture innovations fundamental for differentiation of competitive advantage based on the functional value and symbolic (visual) value of a product has been introduced. The research focuses on the link between the symbolic and functional product capacity with consumer preferences determining pro-innovative activities of enterprises, their production structure and competitive strategies (interactions between the preference change and production structure).

It has been hypothesised that consumer preferences have impact on the capacity to gain competitive advantage and achieve development targets. The abovementioned thesis has been then broken down into six partial hypotheses and subsequently verified through statistical analysis of empirical material comprising 85 innovative enterprises. The conducted analysis confirmed that the surveyed companies sought competitive advantage predominantly in the functionality aspect of their products, whereas their symbolic value remained underdeveloped. It characterises economy in transition from investment-driven to the innovation-driven stage of development. Key demand-side determinant of innovativeness in advanced economies is the prevalence of symbolic consumer preferences. Researchers have used regression models apart from statistical analysis.

The fifth chapter has been devoted to the supply-side innovation factors of Polish economy in the transitional development stage. The study presents evolution of the theories of innovation at the turn of the 20th and 21st centuries, its main movements and implications for the development of the theory of economics. The study sought to identify on the basis of statistical analysis determinants and the way enterprises adjust their activities to the transitional stage of development of Polish economy and absorption of structural EU funds. Factors determining innovative propensity of the surveyed entities and the efficiency of EU support.

Convergence of supply-side barriers has been revealed in relation to innovation leaders and less innovative enterprises. These barriers differ in the group of the least innovative organizations. The research presented differences in the way enterprises assess innovation obstacles. The obtained results helped to group hierarchically enterprises and identify four types of organizations. The first cluster is dominated by enterprises defined as innovation followers, the second one – groups innovation leaders, the third one includes – moderate innovators, whereas the fourth one – modest innovators. This enabled one to investigate the hierarchical structure of enterprise links facing innovative barriers.

One should mention two aspects of the analysis of the supply-side factors determining innovation processes, e.g. comparison of application conditions for EU development funding with the number and types of barriers for using these funds to finance development strategies. The second important aspect involves comprehensive analysis of innovation barriers observed in the surveyed enterprises. Analysis of the supply-side determinants included the study of financial aspects connected with enterprises as well as considerations of the influence of Internet and digital technologies on the functioning and strategies of organizations.

The study presents a set of recommendations for the economic policy aimed at minimising or eliminating innovation barriers and better use of EU support dedicated to innovation.

The sixth chapter considers the role of science sector in the process of transition of Polish economy to the innovation-driven stage of development. It was confirmed that the science sector required major reorganisation in accordance with the model of a modern university otherwise achieving innovative stage of development would not be possible. The functioning of the sector of knowledge in economy at the investment-driven and innovation-driven stage. The study found that despite substantial EU support the links between the knowledge sector and business remained poor. This in turn inhibits shifting economy from the transitional to the investment-driven stage.

The book presents unique approach to innovation processes in Poland. The adopted evolutionary approach (stages of development) enabled one to better understand the reason of low efficiency of EU support dedicated to increasing innovation activities of Polish enterprises.

Chapter 1

# The Concept of Stages of Economic Development: The Case of Poland

## Introduction – The Concept of Stages of Economic Development

The idea of defining stages in the process of economic development has a long tradition. It grows out of the distinction between economic growth and economic development which reflects a conceptual separation of quantitative growth from a qualitative change. The most popular quantitative measure of economic growth is the GDP dynamics, often presented as per capita category in international rankings. The use of this tool as an objective cumulative measure of economic efficiency evokes numerous doubts, also in Polish literature (e.g. Drozdowicz-Bieć, 2013; Mączyńska, 2013). Even proponents of this measure, relating to particular GDP dynamics emphasize 'quality of growth', referring to the sources of growth, i.e. whether it is powered by various 'engines' and therefore can be sustainable, or depends on one 'engine' which results in greater vulnerability to unfavourable developments in external environment. Hence, from the point of view of economic processes and their sustainability the achieved growth values are not comparable. Therefore, quantitative measure should not be treated as a complete parameter and its applied value is limited.

Economic growth, as the Noble Prize winner, Amartya Sen (1983) noted, is but one aspect of the process of economic development. Economic development is a measure of progress related to the improvement of the standard of living and the 'health' of economy. Some authors consider economic development as a strictly qualitative measure, whereas others, including prof. A. Sen, perceive it as one comprising both qualitative and quantitative aspects. Regardless of the assumed definition, multidimensional nature of the economic development concept remains its integral feature. The fullest expression of this multidimensionality is found in the theory of stages of economic development.

Alexander Gerschenkron and Walt Rostow are considered founders of the theory of stages of economic development. The former created the concept of economic backwardness and the model of belated economic development (Gerschenkron, 1962). He argued that countries might be ranked according to the level of economic backwardness and depending on the position their development pattern would vary. The less economically developed the country is the more its development depends on investment growth (and less on consumption growth). Thanks to the implementation of new technologies created in more economically advanced countries, the less developed ones may make a considerable economic leap and at least partially catch up.

Walt Rostow in an article from 1960 and the book *The Stages of Economic Growth* (Rostow, 1962) presented a five-stage model of economic development. He identified the following stages (1) traditional society, (2) creating conditions for start, (3) start, (4) maturity, (5) period of high mass consumption. Although in comparison to Gerschenkron's model Rostow's model was more complex, in following years it was severely criticised. It was charged with being too mechanical, with consecutive stages automatically following one another disregarding changing growth factors, resulting in particular stages forming ex post classification. Moreover, this model based on historical experiences of the Western Europe and USA failed to explain alternative development paths, like those of Asian countries (Itagaki, 1963).

A huge step forward in terms of qualitative differences related to the sources of growth was accomplished by Michael Porter who presented the model of microeconomic foundations for economic growth in his book *The Competitive Advantage of Nations* (Porter, 1990). Although a quarter of a century has passed this model remains a benchmark for discussions related to the stages of development and is the basis of the most popular model used in the annual competitiveness report presented by the World Economic Forum.

The aim of this part of the study is to describe determinants of economic growth in Porter's model, characteristics of particular stages of economic development and then to present contemporary applications of Porter's ideas. Finally, key discrepancies between the original model and its presently used version will be presented and the questions concerning universality of the model and the usefulness of the concept of stages of economic development in the contemporary world will be raised.

## Diamond Model – Determinants of Economic Development

Michael Porter (1990) believes that microeconomic foundations of economic growth result from the international competitive advantage of enterprises. At the core of the analysis is the thesis that numerous sources of this advantage are external to the enterprise and are linked with the location and thus with local circumstances. Domestic environment defines the grounds for local competition and is

critical for execution of strategies by enterprises and the prospects of their success. Whereas international success of local organizations is related to the overall performance of economy and its growth.

Porter argues that aspects of local conditions are critical for building international competitive advantage of enterprises and therefore economic development of the country determinants of national advantage and presents the idea in a diamond model comprising 4 attributes:

- production factors,
- demand factors,
- related and supporting industries,
- strategies, structures and competition between enterprises.

Various factors may support international competitiveness of industries and segments. Thus, sources of competitiveness should be analysed from the industry rather than state perspective. Countries succeed if the local conditions support development of strategies suitable for specific industries and segments and boost creating competitive advantage valued in other countries so that they may be used globally. Countries tend to succeed in branches where local environment forces enterprises to pursue new better means of competing. On the other hand, countries fail in industries where enterprises do not obtain appropriate signals or pressure, or lack skills needed to improve or modify their strategies.

Countries are more likely to succeed in branches and segments where the 'diamond' (determinants of national advantage recognised as a system) is most favourable. Particular components of the model are interrelated and depend on each other. Thus, advantages resulting from one aspect of the environment may create or support advantages to other components. Success may be achieved in low technology and mining industries if one or two aspects of the environment provide competitive advantage, however more advanced industries require achieving competitive advantage in more areas although not all of them. Interrelations between advantages in different areas are self-reinforcing and thus difficult to copy by foreign competitors.

## Production Factors

According to Porter traditional classification of resources (labour, land and capital) does not help to pursue contemporary sources of competitive advantage and therefore economic growth. Thus, he distinguishes the following categories of resources: human resources, natural resources together with geographical location, knowledge resources (scientific, technological, related to the market), capital (availability and cost) as well as infrastructure (quality and cost). He stresses the difference between the basic production factors including natural resources, climate, geographical location, workforce with basic and secondary education, debt capital and the advanced ones, i.e. communications infrastructure, highly qualified human capital and research institutions in technologically advanced areas.

Although resources of production factors have impact on competitive advantage achieved by enterprises from a particular country, production factors critical for productivity growth (the ultimate competitiveness measure according to Porter) in developed economies are created rather than inherited. The status quo of factors at given time is less important than the scale and speed of creating, upgrading and specialisation of those factors matching the requirements of various industries. The basic production factors are passively inherited or created through simple investments. The significance of these factors in building competitive advantage of a country is gradually declining. However, they remain crucial in mining industry and agriculture. The competitive implications of the factors are globally decreasing due to lower demand for them and increasing availability or ease of obtaining them overseas. Moreover, this trend results in lower return on investment from these factors regardless of their location due to lack of differentiation and high price pressure exerted by suppliers from poorer countries.

These are advanced factors of production that substantially contribute to competitive advantage in contemporary economies. They are critical in building more advanced competitive advantage, such as product differentiation or own technology. These factors are not as common as the basic ones since they require greater and continuous investment in human and physical capital as well as building institutions needed to support continuous development, e.g. research and education centres. These factors cannot be easily purchased abroad or obtained through establishing an overseas subsidiary.

Production factors are becoming less important as the basis of a lasting competitive advantage unless a shift to the more advanced factors is made or these factors are subject to continuous specialisation. Knowledge resources as well as education of the workforce are the two key factors in the process of building more sophisticated competitive advantages. They are subject to quick depreciation and require continuous investment.

Competitive advantage results from low cost or extremely high quality of factors critical for competing in the branch. Countries succeed in branches where they are able to create and improve remarkably smoothly necessary production factors (Porter, 1990, p. 80). Their role in building competitive advantage is more complex though. These are other factors in the diamond model that determine where advantages related to production factors may bring international success and indicate the ways they should be used (Porter, 1990, p. 76). Finally, one should observe that the existence of advanced and highly specialised factors of production is not only the origin of competitive advantage but at least partially its result.

## Demand Conditions

According to Porter the structure of local demand has strong influence on the national competitive advantage. Its volume and growth characteristics, in turn, may

affect positively or negatively this advantage through the impact on investors' actions. Countries achieve competitive advantage in industries and segments where enterprises obtain clear or prior information from the market about the changes in preferences and thus are forced to introduce and build more advanced competitive advantages earlier than the overseas rivals.

Better awareness of the ever-changing consumer needs is extremely important in this group of factors. Open communication and in-depth understanding of the environment help to achieve this goal. Appropriate structure of demand-side segments helps local producers to outline priorities. Relatively bigger segments attract more attention faster. If majority of the segments are covered by local demand rather than the overseas market, local enterprises are more likely to succeed in achieving international competitive advantage in these segments. The significance of the absolute volume of the local segment is smaller.

Advanced knowledge and customer requirements help enterprises to achieve international competitive advantage. Local enterprises can identify customer needs faster than their foreign counterparts due to both physical and cultural closeness to clients. Moreover, it facilitates co-operation related to developing various projects. What is important is that the needs of local consumers should anticipate requirements of overseas customers. If local customers have high expectations which are very specific to a country, then the international competitive position of local enterprises is inhibited. If the development of the needs of local market falls behind the trends observed abroad, international competitiveness of local enterprises will deteriorate.

According to Porter the demand-side factors affecting international competitiveness of local enterprises include: demand volume (critical in industries characterised by high economies of scale and steep learning curve, the number of independent clients (greater pool of market information, stimulates progress and lowering entry barriers), market dynamics (influence on investment rate in the industry and the speed of implementing new technologies), market saturation (boosts innovation), internationalisation of demand (imitating needs of local clients by overseas demand helps local enterprises which is particularly important when the culture of a particular country is disseminated).

As far as international competitiveness is concerned the most important demand factors are those that force investment actions and innovations as well as moving to more advanced market segments. Different demand aspects may similarly to production factors reinforce each other and their impact on international competitiveness of local enterprises depends on other diamond model components.

## Related and Supporting Industries

Another group of determinants related to the national advantage involves operating on the local market suppliers and related industries competing globally. Their positive impact on other industries is subject to similar mechanisms.

The first mechanism connected with the impact of globally competitive supplier's results in effective, early and quick preferential access to cost effective inputs. The very access to equipment or components does not guarantee success in international competition. Continuous coordination results in more significant advantage of suppliers. Porter observes that overseas enterprises rarely mange to successfully perform this function even through the established branches in a country. Innovation and improvements constitute the biggest advantage related to the operation of local enterprise on the global level. Thanks to those suppliers enterprises can recognise new production methods. Suppliers provide quick access to information and ideas whereas enterprises are given an opportunity to affect innovative endeavours of suppliers as well as co-operate and test innovations offered by suppliers. Co-operation in B&D and joint problem-solving lead to better and instant effects. Therefore, the speed and accuracy of innovations are growing.

Internationally competitive related industries operating on the local market support development of new internationally competitive industries. Related industries are defined as branches where enterprises may jointly coordinate activities or share them in chain value or those creating complementary products. The presence of such industries enables better information flow whereas geographical and cultural closeness make the exchange between local enterprises easier in comparison to foreign organisations. Presence of advanced related industry helps to recognise market opportunities, facilitates new entries and increases diversity of competitive strategies. International success of one industry may create demand for products or services offered by related industries. Close co-operation between such enterprises may result in better utility value of their products.

The scale of benefits resulting from potential effects of the discussed factors in terms of related and supporting industries depends on the other components of the diamond model. Benefits related to the closeness of the world-class suppliers and producers of complementary goods may weaken the impact of shortage of advanced production factors, poor development or lagging expectations of local consumers.

## Strategies, Structure and Competition between Enterprises

The last element of the model of competitive advantage of local industry is "the context enterprises operate in, are organized and managed as well as the nature of local competition" (Porter, 1990, p. 107). Porter indicates that goals, strategies and organisation of enterprises in particular industries differ substantially from country to country. National advantage is based on the optimal match between these choices and the sources of competitive advantage in industries. Whereas the character of competition on the local market affects innovative processes and success in international competition.

There are no universally applicable systems of management. Countries succeed in industries where management practices and organisation match the industry sources of competitive advantage. Differences in the area of managers' education, management styles, organisational structures, tools related to decision making, relation with clients, coordination between functions, and approach to activity internationalisation as well as industrial relations are the source of competitive advantage or weakness depending on the industry. A large number of national characteristics affect significantly the above-mentioned factors as well as organisation and management of enterprises. These characteristics include approach to authority, interpersonal behaviour norms, social norms concerning an individual and community and many others. These results, in turn, from the system of education, social changes, religious traditions, family model and many other intangible factors. Countries succeed in branches where these elements support building international competitive advantage.

Summing up this part of analysis one should stress the importance of competitive pressure exerted on enterprises leading to innovations. This is a mechanism whereby diamond components contribute to the success of particular industries. According to Porter enterprises achieve competitive advantage in industries where local conditions characterised by means of the four groups of factors facilitate and support fast accumulation of specialised competences and assets. It takes place in industries where enterprises achieve locally information advantage related to product and process standards and where the environment is extremely dynamic and demanding.

## The Stages of Economic Development

Economic development is inextricably connected with the enterprises' ability to expand and compete in the more and more advanced segments and industries. Thus, enterprises have to develop and use more and more sophisticated sources of competitive advantage. With gradual progression some of the sources are becoming increasingly important, whereas others become obsolete. Porter defines the shift to the more advanced sources of competitive advantage as competitive development and distinguished 4 stages of the development – the basis of economic development, these are:

- development based on production factors,
- investment-driven,
- innovation-driven,
- based on accumulated wealth.

Economic development should be focused on providing high revenues and salaries. The first three stages involve the shift to the more sophisticated sources of competitiveness and result in increasing wealth of society. The last stage leads to stagnation and eventually results in deterioration of the country competitive

position. Although competitiveness is determined on the industry level, international competitiveness of enterprises depends on the stage of economic development of the country and numerous industries and segments share the same grounds of international competitiveness and sources of success.

Together with the move from the economies based on the primary resources to knowledge-based economies countries are facing a different set of development challenges and priorities. Hence, it is extremely important that the economic priorities match achieved stage of economic development. It is particularly difficult to move to the next stage of development (Porter, Sachs, McArthur, 2002).

## Competitiveness Based on Primary Factors of Production

Economic growth at the preliminary stage reflects economy's potential to organise primary drivers of production. International competitiveness is achieved exclusively by industries relying on availability and low cost of production factors. Local producers compete with lower price and implement low cost strategies (the so called 'cost leadership') and obtain standard technologies overseas. Production of more sophisticated commodities by means of the more advanced technologies is limited to assembling parts in plants built by foreign producers or for overseas enterprises. Local demand strongly restrained by low purchasing power as well as poorly developed consumer competences constitutes a significant development barrier. More advanced enterprises seek export opportunities however access to overseas markets is controlled by foreign companies. At the same time local demand for exported goods is marginal.

The main challenge related to this stage of development is proper organisation of the primary factors market. Thus, countries should strive to build appropriate political and macroeconomic stability and support operation of sufficiently free markets of production drivers.

## Competitiveness Based on Investments

At the investment stage of development enterprises invest in efficient factories enabling large scale production with the use of the best technologies available on the international market. Technologies and design as in the previous stage of development come from abroad. Yet this time technologies, are obtained not only through import, imitations, foreign investments, licensing agreements or joint ventures but are increasingly modified and adopted to local environment whereas enterprises are developing competences needed to further develop these technologies. Economic development at this stage depends on the ability to absorb and improve foreign technologies, however these tend to be a generation behind world technological leaders who are reluctant to sell state-of-the-art

technologies on the open market. Local manufacturers are strongly dependent on overseas technologies and machines as well as foreign production components at this stage of economic development. This results in high capital-intensity of production. These are predominantly industries characterised by standardised products, economies of scale, high availability of technology, significant capital requirements and major share of labour costs in the overall production costs that undergo dynamic investment development. Due to low life standard the demand remains low and is not very sophisticated. Therefore, enterprises tend to compete with low prices and more modern products reflect the needs of overseas consumers. Local commodities, therefore, are at least one generation behind global leaders. Although local enterprises frequently manufacture under contract and according to the specifications made by foreign clients, they gradually expand the range of competences in the chain value. They build local sales networks and begin to develop the overseas ones. This phase is characterised by high vulnerability to financial crises which is related to major dependence on foreign financing and foreign demand shocks in the most sophisticated branches where local enterprise rely on export (Porter, Sachs, McArthur, 2002). In this phase development depends on continuous infrastructure investments. Government priorities should therefore focus on improving regulations and development of physical infrastructure. Considerable improvement in the above-mentioned areas will enable economy to better integrate with global economy – the key source of development at this stage.

## Competitiveness Based on Innovations

What distinguishes innovative stage of development is creating technologies by local enterprises. In some industries manufacturers present global level. Innovative stage of development has been achieved once machine industry – initially locally and eventually globally has been developed. It signalises ability to further expand process innovations (Porter, 1990, p. 563). This phase is also characterised by development of industry clusters. Enterprises continuously invest in educating staff, they initiate and intensify relationships with other companies from the branch, deepen specialisation and division of labour. Moreover, the flow of labour and competences increases among enterprises and relations involve both competition and co-operation.

Companies succeed in achieving global level in terms of products, production processes, marketing and other aspects of competition. The increasing level of income and wealth of local clients, higher education level and growing demand result in bigger profitability of developing strategy of diversification and growing competition on the local market. Parallelly enterprises develop strategies of diversification on foreign markets, build sales networks and invest in a brand. Further development of more advanced industries is related to increasing labour costs and

currency exchange rate. This, in turn, impedes maintaining competitive advantage based on production drivers and more broadly cost advantage. This leads to the loss of competitive position in industries and sectors sensitive to price or those requiring less qualified labour or less advanced technologies.

Move from the investment-driven development stage fuelled by improvement of the imported technologies and efficiency increase to the innovation-driven one proves the most difficult shift among all stages of development (Porter, Sachs, McArthur, 2002). In order to reach this stage government's direct involvement in supporting high rate of innovation is required. Government should endeavour to reinforce public and private investments in R&D, higher education as well as ensure the smooth functioning of the capital market and regulatory system supporting establishing and expansion of technological start-ups. Engagement in capital allocation, market protection, licensing, export subsidies and other form of direct state intervention become ineffective and its role is declining. Governments should focus on stimulating development of increasingly sophisticated resources, shifting demand towards more advanced solutions, helping to establish new enterprises, support competition on the local market – overall rely on the indirect methods.

## Competition Based on Accumulated Wealth

Increasing wealth results in more favourable demand-side conditions locally however growing labour costs impede competition in numerous manufacturing industries. At the stage of development based on accumulated wealth economy shifts towards services. Competition in many service industries tends to be multinational thus services are less exposed to foreign competition than industrial production. Whereas enterprises from manufacturing sector operating internationally lose their former position.

Porter hypothesizes that economy driven by accumulated wealth is not able to maintain the wealth – competitive advantage disappears and economy contracts. This process predominantly results from the changes in the motivations of investors, managers and society which decrease willingness to invest and innovate, whereas new ambitious social goals replace former economic development drivers. Competition between enterprises weakens when they are more focused on maintaining gained positions than the struggle for further improvement. It is reflected in the increasing number of mergers and acquisitions – enterprises hold surplus of free assets but avoid high risk investments in start-ups and prefer to reduce competition on the market and stabilise it. High labour costs and difficulty in identifying new market opportunities result in companies' propensity to invest in financial assets rather than the real ones. At the same time underinvestment may affect human capital and lead to changing labour market. Manufacturers are not able to increase salaries therefore more and more people are seeking career in

non-production sectors, e.g. the financial one. These branches are supported by changes in demand, i.e. growing need for services related to free time activities as well as premium commodities. It may lead to development of new branches however will not compensate for the deterioration of many formerly built industry clusters.[1] Competitive advantage may be maintained by enterprises operating in markets based on wealth, that is those related to luxury, entertainment, art, security, healthcare, education as well as the opulence of production drivers such as natural resources.

Countries pass through the three stages of competitive development provided they succeed in maintaining dynamic process of improving fundamentals of national advantage. It involves shifting to the more sophisticated competitive advantages and moving economy towards development in industries and segments characterised by higher productivity. Parallelly competitive advantage in the less advanced branches and segments with lower productivity declines. What should be highlighted is the fact that there is no universal development path since development may be achieved differently. National economies may move directly from the stage based on primary production drivers to the innovation-driven stage and omit the signs of passing through the investment-driven stage. It requires though a long history in production activity which results in considerable development of human resources, education institutions, etc. (Porter, 1990, p. 564). As far as countries extremely reach in natural resources are concerned direct shift from the primary production factor stage to the wealth driven phase is possible. Porter observes that retreat to earlier stage is possible too. 'A country which got stuck in the development stage driven by accumulated wealth may go back as far as the primary production factor stage. Losing position in industries characterised by higher productivity may lead to decreasing labour costs and other factors to the point where the economy may compete through the cost of production drivers' (Porter, 1990, p. 565). This regression may be stopped according to Porter by means of changes in the economic policy, significant external shocks or changes in the society related to the systems of values.

## Competitiveness Index and Classification of States according to the Stage of Economic Development

The idea of stages of economic development proved catchy. It resulted in building indexes which for years have helped to measure aggregated competitiveness of countries and annually published by the Global Competitiveness Report issued by the World Economic Forum. These indexes are supposed to assess progress made by particular countries on the economic development path. The first one, Business Competitiveness Index – created in 2000 by M. Porter – concerned

1 Porter uses the term *declustering* (Porter, 1990, p. 557).

microeconomic drivers for development and the following one (established in 2004), Global Competitiveness Index – GCI, combined microeconomic and macroeconomic factors of competitiveness. The latter was improved in 2008 and included the most updated scientific knowledge which proved difficult as there was and there is still no concern concerning the sources of competitiveness. The results of empirical studies differ remarkably depending on the choice of countries, measures considered in the model (Porter, Delgado, Ketels, Stern, 2008) as well as the surveyed periods. The authors of the index (professors: Michael Porter, Scott Stern, Antonio Ciccone, Mercedes Delgado and Christian Ketels) sought to combine various perspectives and this resulted in a rather eclectic approach. The main strengths of the model are related to its complexity taking better account of the macroeconomic factors as well as the international environment. However, it may be criticised for its lack of transparency and substantive consistency and intermingling of the individual constituents of the index called pillars of competitiveness. What is more, the connections between particular factors (pillars) are not clearly distinguished and thus the usability value of this approach is limited.

The undertaken research resulted in substituting the four determinants of national advantage included in the diamond model which were identified in *The Competitive Advantage of Nations* (Porter, 1990). This model was replaced by 12 pillars of global competitiveness, these are: (1) institutions, (2) infrastructure, (3) macroeconomic stability, (4) health and primary education, (5) higher education and training, (6) efficiency of markets of goods, (7) labour market efficiency, (8) financial market development, (9) technological readiness, i.e. absorption of technology by enterprises, (10) market size, (11) business sophistication that is the network of clusters, the quality of functioning and strategies of individual enterprises, (12) innovations. These components describe local environment at the country level managed by government policies. They help to better understand weaknesses and competitive advantages of countries and create a set of reform. This is what differs this approach from the typical scientific perspective aimed at identifying a small group of factors through statistical analysis determining the differences in wealth between countries.

Michael Porter's team and other associates managed to identify GDP thresholds and sub-index weights helping to classify particular economies according to the stage of economic development; they are presented in table 1.1.

Despite the significant changes in the model involving independent variables, definitions of the stages of economic development have remained almost the same. It might be the evidence of their timeless nature. Subsequent stages are defined by the changing nature of competitive advantages and competition methods. What should be observed is renaming of the investment-driven stage to the effectiveness-driven stage. Moreover, the fourth stage of economic development i.e. economies based accumulated wealth has been omitted in the Global Competitiveness Report.

**Table 1.1.** GDP thresholds per capita and sub-index weights used to include individual countries into particular stage of economic development

| Stage of economic development Assessment criteria | Stage 1 based on primary production factors | Transitional stage between stages 1 and 2 | Stage 2 effectiveness-driven | Transitional stage between stages 2 and 3 | Stage 3 Innovation-driven |
|---|---|---|---|---|---|
| GDP threshold per capita in USD | < 2 000 | 2000–2 999 | 3 000–8 999 | 9 000–17 000 | > 17 000 |
| Sub-index weight of primary criteria (%) | 60 | 40–60 | 40 | 20–40 | 20 |
| Sub-index weight of effectiveness support (%) | 35 | 35–50 | 50 | 50 | 50 |
| Sub-index weight of innovation and sophistication (%) | 5 | 5–10 | 10 | 10–30 | 30 |

**Source:** *The Global Competitiveness…* (2014, p. 10).

One may only speculate why the fourth stage as well as the transitional stage between the innovation-driven and wealth driven have been omitted. Therefore, one may question the timelessness, at least the relative one, of the model proposed by Porter's[2] in 1990. Since then capitalism has undergone at least two economic 'earthquakes' – internet revolution (in fact two of them) changing management principle on the micro level and economic crisis triggered by the financial crash of 2008–2009, which questioned what we had already 'known' about macroeconomics, finances and economic policy. Dobbs, Manyika and Woetzel (2015) stress the breakthrough character of the present times and mention 4 forces shattering the long prevailing principles and rules in almost all parts of the world, that is: rapid urbanisation, accelerating technological progress, galloping societies aging, unprecedented access to information. These authors argue that the above-mentioned forces driving and supporting each other began to affect global economy only 15 years ago. However, it was enough to subvert the principles governing economy for decades and break long-term trends and undermine the role of numerous institutions and customs. According to these authors the changes occur ten times faster in comparison to the industrial revolution process and their scale is 300 times higher than and their impact is 3000 greater. Thus, they observe that relying on 'knowledge' based on intuition and experience may turn into a trap.

Since economy has changed appropriate new approach to it is needed. It is hence justified to question the full applicability of the Porter's model of the stages

2 In *The Competitive Advantage of Nations* Porter mentioned countries in the fourth stage of development, such as Great Britain or Germany in the transitional stage between the third and the fourth phase.

of economic development to contemporary economic environment. By no means though should the value of the idea of stages of economic development be undermined.

## 1.1. Quantitative Characteristics of Polish Development Stage

The conducted comparative analysis of Poland's present development stage and the level of innovativeness against other countries is based on two most frequently quoted innovativeness rankings presenting EU and other countries i.e. – Innovation Union Scoreboards and The Global Competitiveness Report. The presented calculations were determined based on empirical data published in 2014. Newer data published at a later time could have some influence on the results obtained in the following analysis. The aim of the conducted analysis is to identify the drivers for the current condition of Polish economy development on the basis of quantitative characteristics. The need for the above-mentioned analysis was recognised as the disputes over the factors which led to the present state of Polish innovativeness intensified. Identification of these factors may help to understand innovative processes and create innovative policy (*Podręcznik Oslo*…, 2008, p. 39).

The adopted research method includes comparative analysis for each of the factors and indicates positive and negative drivers for the present level of competitiveness in Poland. Methodology related to innovativeness rankings has been used to carry out the analysis. Innovations as well as innovative potential are difficult to support and measure. It results from the multi-stage character and complexity of the process of creating and implementing novel solutions. Therefore, in order to diagnose or make international comparisons of innovativeness numerous indicators included in the aggregated rating indexes are used. They are not solely limited to technological innovations but take account of those of process, marketing and organisational nature according to the innovation decision proposed by OECD (*Podręcznik Oslo*…, 2008).

### The Level of Poland's Development Compared with other EU Countries

One of the most frequently mentioned analyses comparing EU countries is the Innovation Union Scoreboard. It is based on the analyses of 25 indexes mainly the economic ones based on statistical data collected by Eurostat. They describe

economic situation in individual countries and have been aggregated into three categories:

- Innovation drivers – eight factors determining the level of education and the level of science: human capital, access to finance for innovators (commercial or public help), quality, openness and attractiveness of the local research system. They tend to be determined by the percentage of individual parameter in total population.
- Business activity – nine factors determining innovative activities of enterprises: business investments in innovations, co-operation with other entities and creating intellectual property. They are defined by the percentage of costs or incomes related to a particular parameter in relation to the total turnover or revenue for all enterprises.
- Results – eight factors determining tangible economic effects related to innovation and the number of innovating organisations. Most of them are established by the percentage of innovativeness effects such as the number of patents and the exports revenues in relation to the aggregated revenue obtained by all enterprises.

Minimum and maximum values for all EU countries have been identified for each index and this helps to determine its volatility field. Next the volume of individual indexes for each country is scaled up in order assume values from 0 (minimum) to 1 (maximum). The average value of all the 25 standardised indexes describing individual countries indicated the aggregated index of innovativeness.

Each country is then assigned to one of the four groups of sates representing different levels of innovativeness depending on the index volume. According to the latest report (*Innovation*…, 2014, p. 63) Poland belongs to the third group, the so-called moderate innovators and is close to the lower end of the range. Poland takes 24$^{th}$ place in the group of 28 EU countries, lower positions are occupied by Rumania, Latvia and Bulgaria. In the years 2006–2013 innovative index for Poland changed within a narrow range (0,26–0,28), which in the view of continuous increase of the index for the entire EU shows that Poland has been in fact moving away from other EU countries. The volume of innovativeness index for Poland fell from 54% to 50% in relation to the EU average.

In 20 out of 25 indexes Poland achieves considerably lower volumes than the average for all EU countries. Analysis of the structure of particular indexes enables one to indicate the indexes where Poland obtained significantly low volumes. These are:

- The share of non-EU PhD students which accounts for 8% of the EU average. It reflects the way overseas students assess Poland's attractiveness and the opportunities to obtain highly qualified foreign scientists and knowledge diffusion.
- Expenditure on R&D amounting to 25% of the EU average.

- The number of international patent applications related to significant social challenges accounts for 27% of the EU average.
- Revenues from the export of licenses and patent equals 28% of the EU average.
- Poland is distinguished positively by two factors (assumed volumes are higher than the EU average), these are:
- Other expenditure on innovations (apart from R&D), which amounts to 182% of the EU average.
- The education level of society which equals 110% of the EU average.
- In comparison to the previous year one may observe in Poland positive changes reflected in considerable growth in the following areas:
- The number of registered Community designs (increase by 21,6%) and trade marks (increase by 11,4%).
- Corporate expenditure on R&D (increase by 9,0%).
- However, at the same time significant decrease in numerous parameters is noted, e.g.:
- SME's participation in creating innovations (launch of a new or significantly improved product or process) independently (decrease by 7,4%) or in cooperation with another enterprise (fall by 11%).
- The number of PhD studies graduates (decrease by 9,4%).
- Sales of innovative products and services (drop by 7,2%).

## Poland's Level of Development in Comparison to Other Countries

*The Global Competitiveness Report* has been widely recognised competitiveness ranking for years. It results from annual research comparing environment for economic development across the world conducted by the World Economic Forum. This tool helps to determine individual country's ability to secure long-term economic growth. It is valued due to a large sample of countries it comprises as well as a set of over 100 factors describing prerequisites for developing innovation in individual countries, cyclicality of the research and scientific foundations of the implemented methodology.

This report aims to quantify Porter's theory presenting development level of the competitive advantage drivers of individual countries in order to assess their current stage of competitive development. Yet even the author himself was not able to produce a reliable methodology quantifying determinants related to the last stage of development driven by accumulated wealth (Porter, Stern, 2004). Therefore, quantitative description of development is limited to three stages of development, i.e. driven by primary factors of production, investment-driven and innovativeness--driven. 144 countries were included in the latest edition of the report made by the World Economic Forum. The assessment was based on 105 factors determining

current state of economy in terms of 12 pillars of competitiveness assigned to one of the three above-mentioned stages of development.

Drivers for economic growth characteristic for the first stage of development based on the primary factors of production form four pillars describing institutional environment, infrastructure, microeconomic situation of the country, healthcare level and primary education level. Efficiency drivers attributed to the second, investment-driven stage build six pillars illustrating higher education level, market size and its effectiveness related to products, labour and finance market size as well as the level of technological development of the country. Factors critical for the third innovativeness-driven stage create two pillars describing the level of development and sophistication of the business area as well as innovativeness.

Majority, i.e. 71 factors are relative on a scale from 1–7 and have been indicated on the basis of questionnaire study conducted among global business leaders. They answer questions related to subjects describing 10 pillars of competitiveness. What should be emphasised here is that the empirical data in the global context, in particular, concerning these areas are hardly available. The 2014 study comprised 14 091 questionnaires from 148 countries (95 questionnaires per country on average), completed in the first half of that year. The remaining 34 indexes characterising the most critical macroeconomic volumes as well as the level of economic development of a particular country were established due to empirical data from international agencies and national statistical bodies. For each of the 144 indexes a ranking of all 148 countries were created. This enabled one to determine individual position of each country in relation to each indicator. Individual indexes obtained various weights depending on the current stage of economic development presented by a given country and to position each of them. Poland obtained 43rd position in this ranking and belonged to the group of countries in transition from the investment-driven to the innovation-driven stage (*The Global Competitiveness*…, 2014). It puts Poland in an unfavourable light in comparison to other European countries. Majority of EU members are at the innovation-driven stage, only two (Rumania and Bulgaria) are at the investment-driven stage and four, including Poland, at the transitional phase (the other three are Hungary, Lithuania and Latvia).

Establishing objective criteria for explicit value judgement of the scores obtained for particular factors seems unfeasible. Therefore, particular assumptions enabling one to list factors which will bring Poland closer to the innovation-driven stage as well as the biggest obstacles to achieving this goal have been arbitrarily assumed.

It has been presumed that factors where Poland obtained a score higher than 5 in relation to the relative factors assessed on 1–7 scale are the ones that bring Poland closer to the innovation-driven stage. As far as factors based on empirical data are concerned it has been assumed that the factors where Poland obtained one of the 40 best scores as regards particular determinant among all 144 assessed countries. With this in mind one may indicate 17 factors bringing Poland closer to the innovation driven stage. They are presented in table 1.2. All the presented

factors have been divided into key groups for the individual stages of economic development.

**Table 1.2.** Factors bringing Poland closer to the innovation-driven stage of development

| No | Factor no[a] | Factor[b] | Result (1–7) | Position (1–144) | Weight factor (%) |
|---|---|---|---|---|---|
| **Key prerequisites for development** | | | | | |
| 1 | 2,08 | Mobile telephony saturation (no of users/100 citizens) | 150 | 23 | 0,83 |
| 2 | 1,13 | Costs resulting from terrorism | 6 | 27 | 0,19 |
| 3 | 1,14 | Costs connected with crime and violence | 5,4 | 27 | 0,19 |
| 4 | 3,05 | Country rating (source: Institutional Investors LLC) | 73,2 | 31 | 1,00 |
| 5 | 1,15 | Organised crime impact | 5,6 | 35 | 0,19 |
| 6 | 4,06 | HIV/AIDS impact on the functioning of organisations | 6,1 | 39 | 0,31 |
| 7 | 1,21 | Investor protection index (transparency of actions, responsibility of management board to shareholders) | 6 | 45 | 0,16 |
| 8 | 2,07 | Stability of energy supplies | 5,5 | 46 | 0,83 |
| 9 | 4,04 | TB impact on company operations | 6,1 | 47 | 0,31 |
| **Effectiveness increase** | | | | | |
| 10 | 8,98 | Level of protection of borrowers and lenders (0–10 (best) scale) | 9 | 11 | 1,42 |
| 11 | 10,02 | Value of export of products and services | 5,7 | 22 | 2,13 |
| 12 | 5,02 | Gross tertiary enrolment rate (number of all students/100 people aged 19–24) | 73,2 | 23 | 1,42 |
| 13 | 7,02 | Flexibility of wage-setting | 5,6 | 29 | 0,85 |
| 14 | 9,07 | Mobile broadband services (number of connections at the speed of 512 kb/s/100 citizens) | 58,5 | 30 | 1,06 |
| 15 | 9,06 | Internet bandwidth (average bandwidth for users kb/s) | 73 | 37 | 1,06 |
| 16 | 6,01 | Local competition level (what is your assessment of local competition?) | 5,3 | 51 | 0,41 |
| 17 | 8,06 | Banking system intensity | 5,4 | 51 | 1,42 |

[a] the first figure given in the factor number relates to the pillar number it belongs to;
[b] most factors are relative on the scale 1–7, they have been established on the basis of answers to the question: *How do you assess….* Italics have been used in the quoted question in case of unclear factor description. Units or sources of sources were given in case of the factors based on empirical data.

**Source:** self-study based on T*he Global Competitiveness…* (2014, p. 311).

Considering all 105 development factors one may attempt to indicate the ones which contribute to the current transitional position of Poland. Unless areas with low scores are improved Poland will not be able to reach innovation-driven stage of development. In terms of the relative factors evaluated on the 1–7 scale it has been decided that the key ones are the factors where Poland obtained a score lower than half of the scale, i.e. from 3,5. As regards factors based on empirical data the ones where Poland obtained lower position than 90th among all 144 assessed countries have been identified as the key determinants. Thus, one may indicate 22 key factors divided into 3 groups. They are presented in table 1.3.

**Table 1.3.** Key inhibitors for achieving innovativeness-driven stage of development by Poland

| No | Factor no[a] | Factor | Result (1–7) | Position (1–144) | Weight factor (%) | Correction coefficient | Corrected position |
|---|---|---|---|---|---|---|---|
| **Basic requirements for development** | | | | | | | |
| 1 | 3,01 | Budget deficit (result =%GDP) | 4,5 | 100 | 1,00 | 1,057 | 106 |
| 2 | 3,04 | Public debt (result =%GDP) | 57,5 | 96 | 1,00 | 1,057 | 101 |
| 3 | 3,02 | Level of gross national savings (result= %GDP) | 16,9 | 91 | 1,00 | 1,057 | 96 |
| 4 | 1,1 | Efficiency of legislative system in dispute resolution | 2,9 | 118 | 0,15 | 0,647 | 76 |
| 5 | 1,09 | Burden of government administrative requirements (permissions, reporting, etc.) | 2,9 | 117 | 0,15 | 0,647 | 76 |
| 6 | 1,04 | Society trust in politicians | 2,4 | 101 | 0,25 | 0,707 | 71 |
| 7 | 1,11 | Possibility of challenging government decisions and regulations by enterprises through legal system | 2,8 | 110 | 0,15 | 0,647 | 71 |
| 8 | 1,08 | Waste of government spending | 2,9 | 85 | 0,15 | 0,647 | 55 |
| 9 | 1,07 | Lack of impartiality in decisions made by government officials | 3,1 | 67 | 0,38 | 0,778 | 52 |
| 10 | 2,03 | Quality of rail infrastructure | 2,9 | 55 | 0,42 | 0,800 | 44 |
| **Effectiveness growth** | | | | | | | |
| 11 | 7,09 | Country's ability to attract talented people | 2,5 | 124 | 0,94 | 1,037 | 129 |
| 12 | 7,08 | Country's ability to retain talents | 2,7 | 117 | 0,94 | 1,037 | 121 |

Table 1.3 (cont.)

| No | Factor no[a] | Factor | Result (1–7) | Position (1–144) | Weight factor (%) | Correction coefficient | Corrected position |
|---|---|---|---|---|---|---|---|
| 13 | 7,03 | Regulation related to employing and dismissing employees | 3,4 | 113 | 0,85 | 1,001 | 112 |
| 14 | 6,16 | Client's sophistication (buying decision criteria, 1 –lowest price criterion, 7 – advanced analysis of product characteristics and attributes) | 3,2 | 93 | 1,40 | 1,169 | 109 |
| 15 | 8,05 | Availability of high-risk capital | 2,3 | 99 | 0,85 | 1,001 | 99 |
| 16 | 8,04 | Credit availability | 2,6 | 89 | 0,85 | 1,001 | 89 |
| 17 | 6,07 | Time needed to formally establish a company (result=number of days) | 3 | 111 | 0,42 | 0,795 | 88 |
| 18 | 7,05 | The impact of fiscal policy on hiring new employees | 3,4 | 88 | 0,85 | 1,001 | 88 |
| 19 | 6,04 | The impact of fiscal policy on investment propensity | 3,3 | 102 | 0,41 | 0,795 | 81 |
| **Innovative development** | | | | | | | |
| 20 | 11,04 | Character of competitive advantage of the country (based on the question: What is the character of competitive advantage of your country on international markets? 1-low costs of labour or natural resources, 7- unique products | 3,1 | 102 | 1,58 | 1,202 | 123 |
| 21 | 12,03 | Companies' expenditure on R&D | 2,8 | 98 | 2,00 | 1,240 | 122 |
| 22 | 12,05 | Public procurement including products technologically advanced | 3,2 | 89 | 2,00 | 1,240 | 110 |

[a] the first figure given in the factor number relates to the pillar number it belongs to.

**Source:** *self-study based on The Global Competitiveness…* (2014, p. 311).

Simple ranking of the above-mentioned factors according to the position occupied by Polish economy in comparison to other countries will prevent objective assessment of their impact on the contemporary state of Polish economy since – according to the methodology assumed by the World Economic Forum – individual factors are assigned a different weight. They are presented in three groups of pillars

and each of them has defined percentage impact on the final result. For each of the 12 pillars percentage impact on the groups constituting it has been established, and within each of the groups – the impact of particular factors. While analysing the data one may determine the weight of each of the factors in the joint statement (compound interest). It must be considered in the final evaluation: *which of the analysed factors have prevented Poland from achieving innovation-driven stage of development, i.e. the areas which need to be addressed.* Therefore, the overview presents Poland's position corrected by an index defined by a polynomial function.[3] In case of critical factors it lowers Poland's global position (it increases numerical value of the position), whereas in terms of the less important factors it increases Poland's position. Thus, the final ranking of factors in the presented ranking better reflects their impact on the current distance separating Poland from other countries at the innovation-driven stage.

Analysis of factors presented in the Innovation Union Scoreboard which describe Poland's level of innovativeness positively leads to conclusion that Polish society is educated and creative. It is demonstrated among others by new designs and trademarks which shows Poland's innovativeness potential. Simultaneously Poland in comparison to other EU members is hermetic in the area of science and development in a broader sense and this results in decreasing knowledge diffusion and limited opportunities to attract highly qualified scientists.

Enterprises invest heavily in innovations. However, these expenditures rarely involve R&D activities but tend to focus on purchasing technologies, licenses and machines. Although overall, these activities result in increasing innovativeness level of Poland yet predominantly involve imitation of world leaders and thus constitute a critical factor leading to the middle development trap. It is consistent with other determinants indicating Polish enterprises' significantly lower involvement in pro-innovative activities, such as R&D and the number of registered international patent applications resulting in lower revenues related to these investments. Majority of factors considered in establishing the presented innovativeness index describe microeconomic outcomes of the functioning of particular economy. Thus, according to the author it prevents one from identifying explicitly the microeconomic sources of current disadvantageous stage of development of Polish economy.

3 Function describing the correction coefficient is a quadratic polynomial, whose progression is outlined by three points. First point: Poland's position obtained the lowest value for the highest weight factor (Poland achieved the maximum numerical value among the considered positions). The second point: for the weight equal to the average of weights of all the considered factors the correction coefficient equalled 1 (after correction the position has not changed). Third point: for a hypothetical factor whose weight has been determined as 0% (no impact on our country's position) Poland's position will be best among all the considered factors (minimum numerical value).

Quantitative characteristics of Poland's stage of development in terms of *The Global Competitiveness Report*, presented in earlier in tables provides a lot of information and enables one to draw numerous conclusions.

Significant number of factors positively describing Poland are related to rapid development of IT and telecommunications services as well Poland's geographical location. The above-mentioned development results from the considerable progress in the area of modern wireless techniques which on the one hand is connected with technological advancement and on the other – reflects low quality and poor access to fixed network during the political transformation as well as later catching up in the field of telecommunications technology.

According to the methodology assumed by the World Economic Forum all factors favourably describing Poland have been divided into groups important for the particular stages of economic development. Half of them belong to the category defined as the prerequisites for development, the other half – determine effectiveness growth. Therefore, at present one cannot indicate any factor whose value is positive for Poland in the category of prerequisites for development. This implies necessity of improving present state in terms of all factors critical for reaching innovation-driven stage of development. Wide range of the needed changes is presented in table 1.2. Almost half of the indicated factors describe Poland's state negatively are related to the broad institutional barriers. They include formalities related to establishing business activity, regulations regarding hiring and dismissing staff, the impact of fiscal policy on enterprises' willingness to increase employment and invest, the burden of administrative requirements, efficiency of legislation in solving disputes, the possibility of contesting government decisions and regulations by entrepreneurs. These factors have been mentioned in numerous reports and publications which indicate that implementation of economic policy promoting competitive regulatory environment is prerequisite for avoiding middle income trap (Bukowski, Szpor, Śniegocki, 2012, p. 9). The carried-out analysis confirms key importance of those factors. Necessary changes related to those issues do require good will rather than major investments. The second group of factors results indirectly from those already mentioned and is connected with the present state of public finance (budget deficit, public debt, national savings level) as well as the overall evaluation of the state's functioning efficiency (social trust in politicians, waste of public funds, biased decisions made by public officials).

Another group of vital factors identified as the unsatisfactory ones in the World Economic Forum report is linked with the broad scientific progress of the country. They involve first of all country's ability to attract and retain talents as well as the volume of public procurement including technologically advanced products. These factors are closely related to the following issues: low level of client sophistication (purchase decisions based on the price criterion), the character of country's competitive advantage based on low labour costs rather than product uniqueness, insufficient business expenditure on R&D as well as low capital availability.

## 1.2. Analysis of Empirical Data Obtained in the Project

Factors presented in table 1.4 are the biggest inhibitors to running business according to respondents interviewed in the project and they coincide with the determinants indicated in *The Global Competitiveness Report*. The critical ones are related to the institutional environment comprising both formal (tax rates and other financial burdens, fiscal regulations, restrictive regulatory framework) and informal aspect (inefficient bureaucracy, corruption).

Moreover, data shown in table 1.4 reveal a significant difference in the way obstacles resulting from the instability of economic policy are assessed. Enterprises participating in the study marked this factor as the 7th one, whereas the average score for Poland was 13, i.e. the last determinant. Thus, one may assume that potentially innovative organisations using EU support perceive the weight of this factor as considerably bigger than other enterprises.

Similar situation occurred in terms of the evaluation of employees' education – this factor's weight came 6th as indicated by innovative organisations, whereas the average score for Poland ranked this factor on the 10th place according to its weight. This might suggest that lack of proper education of employees is a much bigger barrier for innovative organisations than for the whole community in Poland. Considering high school enrolment rate in Poland one may observe that the subjects studied by candidates do not respond to the actual needs of employers especially those operating in innovative sectors.

**Table 1.4.** The biggest inhibitors to running business

| No | Factor | Number of indications | Average weight of factor | Ranking according to The Global Competitiveness Report | Difference (absolute value) |
|---|---|---|---|---|---|
| 1 | Tax rates and other fiscal burdens | 59 | 2,611765 | 4 | 3 |
| 2 | Inefficient bureaucracy | 65 | 2,505882 | 3 | 1 |
| 3 | Fiscal regulations | 54 | 2,435294 | 1 | 2 |
| 4 | Access to financing | 55 | 2,411765 | 5 | 1 |
| 5 | Restrictive legal framework | 51 | 1,941176 | 2 | 3 |
| 6 | Skills gap | 38 | 1,329412 | 10 | 4 |
| 7 | Instability of economic policy | 33 | 1,258824 | 13 | 6 |
| 8 | Unsatisfactory level of innovativeness | 34 | 1,235294 | 7 | 1 |

Table 1.4 (cont.)

| No | Factor | Number of indications | Average weight of factor | Ranking according to The Global Competitiveness Report | Difference (absolute value) |
|---|---|---|---|---|---|
| 9 | Poor work ethics on local market | 24 | 0,764706 | 11 | 2 |
| 10 | Unsatisfactory access to infrastructure | 24 | 0,705882 | 6 | 4 |
| 11 | Corruption | 18 | 0,529412 | 8 | 3 |
| 12 | Government instability | 15 | 0,470588 | 9 | 3 |
| 13 | Low standard of public healthcare | 14 | 0,305882 | 12 | 1 |

**Source:** self-study.

## Model of the Level of Entrepreneurial Innovativeness

The model defining innovativeness of enterprises is based on 11 variables based on endogenous variables used by *Innovation Union Scoreboard* report. These factors have been identified through aggregation of particular factors mentioned in questionnaires describing individual enterprises.

**Table 1.5.** Variables used in innovativeness model

| No | Aggregated variable | Factors applied in the aggregated variable |
|---|---|---|
| 1 | Co-financing of new technology development | Undertaking research activity + development of networks with scientific centres + purchasing of new technologies and acquisition of patent rights + purchasing of scientific instruments + implementation of innovative production technologies + environment protection |
| 2 | Co-financing of production factors | Enhanced product diversification + change in production mix + hiring external experts + developing networks with other entities + improvement of financial standing + penetrating new markets + purchasing of specialised equipment + creating new products + improvement of the quality of services + building production facility + lowering costs + infrastructure modernising + increasing availability of the offered services |
| 3 | Co-operation with scientific centres | R&D centre + research institute + within the framework of a cluster or an association + research entity + university |
| 4 | Co-operation with other entities | Local enterprises + foreign enterprises + without partners + consortium + municipal/local authority |

| No | Aggregated variable | Factors applied in the aggregated variable |
|---|---|---|
| 5 | Impact of co-financing on different aspects related to research and production infrastructure and co-operation | Participation in clusters and networks + development of technologies/production innovativeness growth + operating in high risk industry (biotechnology, pharmaceutical chemistry + increase in expenditure on R&D + developing own R&D facilities + innovativeness |
| 6 | Impact of co-financing on strategic aspects related to competitiveness and winning new markets | Internationalisation of business activity (export, direct foreign investments) + new product + new strategy + new development directions + building new competences + improving quality of service + increasing availability of the offered service + diversification of income sources + expanding contacts and co-operation with foreign entities and individuals + gaining new clients + expansion of production capacity of the company + service diversification + opportunity to buy modern fixed assets |
| 7 | Higher employment in R&D | Employed in R&D 2013, employed in R&D 2010 |
| 8 | Percentage of employees with higher education | With higher education in 2013, overall in 2013 |
| 9 | Number of patents | Number of registered patents in 2007–2012 + number of registered patents in 2013 + international PCT in 2007–2012 + international PCT 2013 + number of obtained patents in 2007–2012 + number of obtained patents in 2013 + number of sold licenses in 2007–2012 + number of sold licenses in 2013 + registered industrial designs in 2007–2012 + registered industrial designs in 2013 + registered trademarks in 2007–2012 + registered trademarks in 2013 + norms in 2007–2012 + norms in 2013 + purchasing utility model in 2013 + new products, knowledge and experience in 2007–2012 + inventions in 2007–2012 + technological advantages |
| 10 | Development of new technologies | Biotechnology + nanotechnology + information and communication technology |
| 11 | Approximate share of export in production sold | Approximate share of export in production sold (%) |

**Source:** self-study based on: *The Global Competitiveness…* (2014, p. 311).

The undertaken aggregation enables dispersion of the negative impact of the potentially low representativeness of individual indexes on the obtained result.

New variables have been scaled to the 0–1 scale by means of the following formula:

$$n_x = n_{x1} + (n_{x2} - n_{x1}) * \frac{x - min_x}{max_x - min_x}$$

where:

$n_x$ – new volume of the variable,

$n_{x1}$ – minimum of new scale (here 0),

$n_{x2}$ – maximum of new scale (here 1),
$x$ – volume of variable to be scaled,
$min_x$ – minimum volume $x$ in the set of data,
$max_x$ – maximum volume $x$ in the set of data.

Thus 11 new variables have been created. Each of them obtained volume in the range of 0 to 1. Then arithmetic average based on the obtained variables was established for each enterprise. The achieved results were classified according to the method assumed in the *Innovation Union Scoreboard*:

- Innovation leaders – 120% over the average,
- Innovation followers – between 90–120% of the average,
- Moderate innovators – between 50–90% of the average,
- Modest innovators – up to 50% of the average.

The obtained results are presented in table 1.6.

**Table 1.6.** Classification of the innovativeness level

| Innovativeness level | Number of entities | Share (%) |
|---|---|---|
| Innovation leaders | 24 | 28,2 |
| Innovation followers | 23 | 27,1 |
| Moderate innovators | 30 | 35,3 |
| Modest innovators | 8 | 9,4 |

**Source:** self-study based on *Innovation…* (2014, p. 63).

**Table 1.7.** Indicators distinguishing the sample of researched innovative enterprises

| No according to *the Innovation Union Scoreboard* | Index | Poland | EU average | Polish innovative enterprises |
|---|---|---|---|---|
| 2.1.1 | Expenditure on R&D | 0,33% | 1,31% | 2,45% |
| 2.1.2 | Expenditure on innovations except R&D | 1,02% | 0,56% | 5,05% |
| 2.2.1 | SMEs implementing innovation on their own or in co-operation with other companies | 11,3% | 31,8% | 78,4% |
| 2.2.2 | Innovative SMEs co-operating with other entities | 4,2% | 11,7% | 29,4% |
| 2.3.1 | International patents PCT | 0,67 | 1,98 | 0,85 |
| 2.3.2. | International patents PCT in socially viable areas | 0,25 | 0,92 | 0,32 |
| 2.3.3. | Trademarks | 3,21 | 5,91 | 9,39 |
| 2.3.4. | Industrial design | 4,76 | 4,75 | 33,30 |
| 3.1.1. | SMEs introducing product or process innovations | 14,4% | 38,4% | 98,0% |

| No according to *the Innovation Union Scoreboard* | Index | Poland | EU average | Polish innovative enterprises |
|---|---|---|---|---|
| 3.1.2. | SMEs introducing marketing or organisational innovations | 19,9% | 40,3% | 43,1% |
| 3.1.3. | Fast developing innovative enterprises | 13,7% | 16,2% | 4,5% |
| 3.2.1. | Enterprises operating in the area of knowledge | 9,7% | 13,9% | 13,8% |

**Source:** self-study based on *Innovation…* (2014, p. 63).

One should emphasise that the scores have been obtained by comparing 85 enterprises covered by the study. By no means do they relate to the whole business community in Poland. Therefore, the relative evaluation of their level of innovation resulting from the use of the presented model where the choice of companies was deliberately narrowed to innovative organisations has limited informative capacity. Yet these scores enable one to conduct further analysis over the correlation of assessment of endogenous factors made by these enterprises against the defined thanks to the model relative innovativeness.

One may seek to conduct evaluation of Poland in a hypothetical situation when it is assumed that all enterprises operating in Poland are as innovative as the ones covered by the study. Thus, a summary innovation index has been identified for Poland in accordance with the methodology assumed by the *Innovation Union Scoreboard*. Microeconomic parameters describing entrepreneurship have been assumed in accordance with calculation scores obtained for the researched sample and presented in table 1.7.[4] Whereas other factors defining country-specific context have remained unchanged. The resulting summary index for Poland would equal then 0,486 (the actual index came to 0,279) and this would imply that our country would be closer to the EU average, EU 0,554. However, Poland would still belong to the Moderate Innovators group but then it would occupy the first and not the present last position in the group.

This result might imply that the pro-innovative change of business activities would definitely improve innovativeness level of Poland, however the weight of other factors, i.e. broad conditions for business operation and development of knowledge would not help our economy to move to the higher group of Innovation Leaders. Besides one should remember that the current unfavourable for innovation conditions for business operation and development influence not only the way Poland is assessed but pro-innovative actions of enterprises as well.

4 If the score for a specific indicator was higher than the maximum obtained in the *Innovation Union Scoreboard* the maximum value from this report was assumed in further calculations.

## Model of Country Development Stages

*The Global Competitiveness Report* defining competitiveness of particular countries worldwide became a point of reference in the model of development stage of Poland. Similarly, to the above-mentioned report the analysed indexes are relative and have been identified through questionnaire studies. The total number of these indexes has been limited to those that prevent Poland from moving to the innovativeness-driven stage of development and whose selection methodology has been already detailed. Distribution of variables is presented in table 1.8.

Cross validation based on the leading analytical methods (decision trees, regressions, SVM) has been undertaken in order to identify the most effective prediction model for the given set of data.

The model of average weighted by scores resulting from factor analysis has been implemented in order to aggregate vector of particular responses to one variable. The sign of particular volumes against the point of reference, i.e. the factor adopted in the world report was considered (e.g. *lack of fiscal incentives or state support* has negative relation with the factor: *impact of fiscal policy on investment propensity*, thus the values ought to be rotated so that the highest value subject to modification becomes the minimum). The score has been scaled to the values assumed in the world report by means of the earlier presented formula (see: innovativeness model). 'Leave-one-out' method has been used as a test. It involves investigating prediction capacity of the model as well as selecting individual element whose origin is known from the test set and checking how other data included in the model classify this element. This process has been iterated through consecutive elements of the base and the quotient of correct classifications to all elements is the qualitative result of the prediction model. Thus, the probability of making classification mistakes of third types is minimised. The most promising results have been obtained though classification based on decision trees method. Once a model characterised by high efficacy of classification has been established the research moved on to classification of enterprises. Companies were allocated indexes of country development closest to the parameters obtained in the model. The identified indexes illustrate assessment of the conditions of business functioning in Poland made by enterprises typical for countries at particular stage of development.

**Table 1.8.** Variables implemented in creating stage of development model

| No | Factor no[a] | Factor | Implemented compound variables of a given factor |
|---|---|---|---|
| 1 | 1.10 | Efficiency of legislation system in solving disputes | Lack of regulations + unclear tax regulations |

| No | Factor no[a] | Factor | Implemented compound variables of a given factor |
|---|---|---|---|
| 2 | 1.09 | Burden of administrative requirements (permissions, reporting, etc.) | Restrictive legal regulations + ineffective bureaucracy + formal factors (level of regulation in legal acts) + bureaucracy + complicated patenting procedures + restrictive legal regulations + maladjustment of legal regulations to the company needs + lack of legal regulations + long term of verification of request for payment or payment execution + frequent changes of request for payment applications + complex and maladjusted requirement concerning project applications + low quality of customer service (beneficiaries and applicants) + excessive formal criteria + poorly prepared competitions by institutions + the requirement to submit and store paper documents related to applying for funding and project execution + lack of effective IT tools enabling online application process + lack of specialists in all supporting institutions + excessive formal criteria + restrictive regulations related to execution of project goals (indexes) do not consider external dynamics |
| 3 | 1.04 | Society trust in politicians | Instability of governments + instability of economic policy + (Instability of governments + instability of economic policy) |
| 4 | 1.08 | Waste of government spending | Tax levels and other fiscal contributions |
| 5 | 1.07 | Lack of impartial decisions made by government officials | Corruption + informal activities such as customs, traditions, informal codes of behaviour, culture factors + corruption |
| 6 | 7.08 | Ability to retain talent | Inadequate education of potential employees + low work ethics on the local market + (skills gap) |
| 7 | 6.16 | Client sophistication (purchasing criteria: 1 – only the lowest price criterion, 7 – advanced analysis of product features and attributes) | (Price) + (brand + fashion + environment friendliness + social responsibility of the producer + design) + (reliability + longevity + additional characteristics (additional functions)) + (unstable demand for innovative (new) products + lack of demand for innovative (new) products) |
| 8 | 8.04 | Credit availability | (Access to financing + difficult access to external financing) + (lack of information on available forms and mechanisms of support including EU help) |
| 9 | 7.05 | Impact of fiscal policy on propensity to hire employees | (too high taxes and social contributions) |
| 10 | 6.04 | Impact of fiscal policy on investment propensity | Tax regulations + (lack of tax incentives and government help) |

Table 1.4 (cont.)

| No | Factor no[a] | Factor | Implemented compound variables of a given factor |
|---|---|---|---|
| 11 | 11.04 | Nature of country's competitive advantage (developed on the basis of the question: *what is the character of competitive advantage of companies from your country on international markets?* 1 – low cost of labour or natural resources; 7 – unique products) | (Low level of management team + low creativity as regards undertaking innovative actions by management) + (low level of qualifications of the research team + low creativity when undertaking innovative actions by the research team) + ( low level of qualifications of other employees + low creativity as regards making innovative decisions by other employees) + (lack of knowledge about consumer needs + lack of knowledge about the needs of other enterprises + lack of knowledge about scientific-research units + lack of knowledge about technologies + lack of market knowledge) |
| 12 | 12.03 | Business expenditure on R&D | (Lack of own financial resources + high cost of implementing innovations + high cost of R&D) + lack of funds to support execution of R&D work) |

[a] the first figure given in the factor number indicates the pillar number it belongs to.

**Source:** self-study based on: *The Global Competitiveness…* (2014, p. 311)

**Table 1.9.** Classification of development stages

| Stage of development | Number of enterprises | Share (%) |
|---|---|---|
| Stage 1 | 1 | 1,2 |
| Transition from 1 to 2 | 6 | 7,3 |
| Stage 2 | 15 | 18,3 |
| Transition from 2 to 3 | 10 | 12,2 |
| Stage 3 | 50 | 61,0 |

**Source:** self-study based on: *The Global Competitiveness…* (2014, p. 311).

The largest percentage of enterprises (61%) perceive present conditions of running business in Poland as typical for countries at the third stage of development. Another 12,2% of companies assess the state of Polish economy as characteristic for the transition between the second and the third stage of development. According to 18,3% of enterprises our country is at the second stage of development. The remaining enterprises argue that Poland is in transition between the first and the second stage (7,3%), whereas (1,2%) believe Poland is at the first stage of development.

The presented model is an attempt to describe empirically current stage of development of Poland according to the interviewed enterprises. Obtained results indicate that the researched companies (despite various barriers and problems mentioned by them) assess conditions of operating in Poland much higher than *The Global Competitiveness Report*.

## 1.3. Analysis of Correlation

### Correlation of factors defining innovativeness of enterprises

The undertaken analysis indicates weak correlation between specific factors defining level of innovativeness and factors determining functioning of business according to the enterprises. One may indicate three pairs of factors with the highest correlation although the results are close to the minimum of statistical validity, these are:

- The impact of co-financing on strategic aspects related to competitiveness and winning new markets ↔ skills gap/low work ethics on the local market ($r = 0{,}373$).
- The impact of co-financing on strategic aspects related to research and production infrastructure and co-operation ↔ Society trust in politicians – instability of economic policy ($r = 0{,}350$).
- The impact of co-financing on strategic aspects related to competitiveness and winning new markets ↔ Lack of impartial decisions made by government officials – corruption ($r = 0{,}311$).

All the mentioned pairs of factors are related to the influence of co-financing on business activities. Thus, one may conclude that: due to EU help some enterprises decided to modify certain aspects of the strategy in order to adjust it to low work ethics, lack of stability of economic policy and corruption of government officials.

### Correlation of Aggregated Factors

The undertaken analysis presents weak correlation between the aggregated factors defining innovativeness level of enterprises and the perceived by these organisations aggregated factors determining their functioning in Poland. There have been identified three pairs of factors with the highest correlation although this correlation is close to the minimum of statistical validity, these are:

- Impact of co-funding on strategic aspects related to research and production infrastructure and co-operation ↔ Impact of tax policy on investment propensity ($r = 0{,}313$);
- Co-operation with other entities ↔ Lack of impartial decisions made by government officials ($r = -0{,}268$);
- Co-financing of development of new technologies ↔ Burden of administrative requirements, etc.) ($r = -0{,}261$).

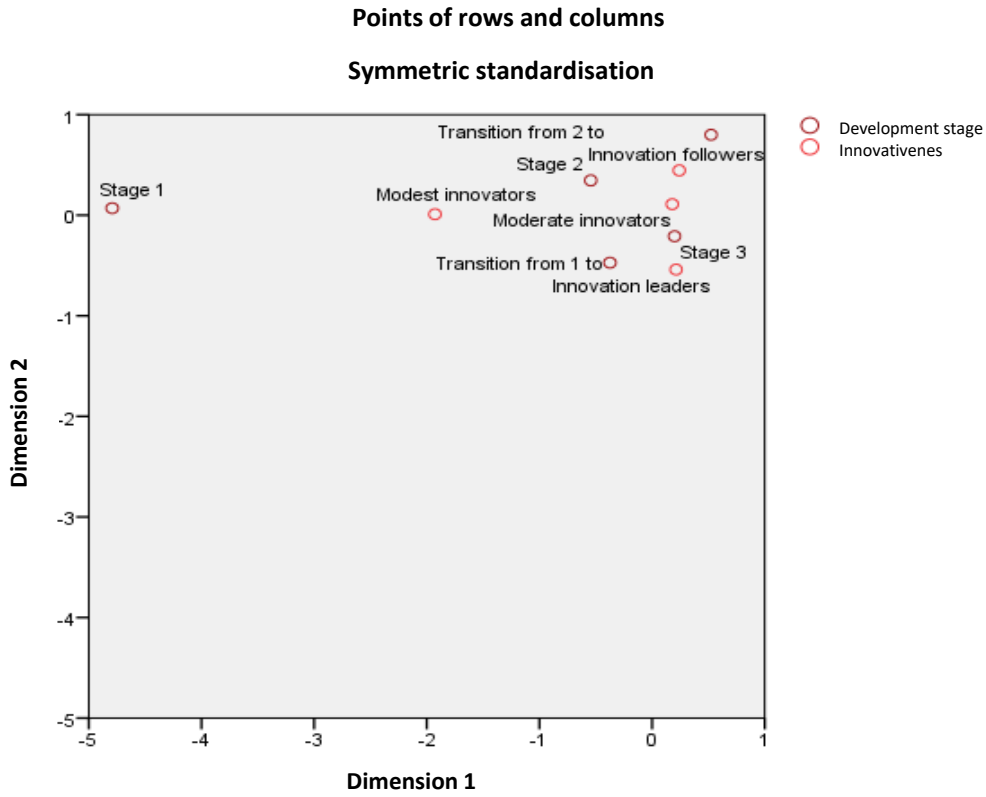


**Figure 1.1.** Analysis of dispersion
**Source:** self-study.

The undertaken analysis of dispersion indicates that the present stage of development in Poland is better assessed by more innovative entities. It proves that the developed models are consistent with each other and seem to fairly accurately reflect reality.

Companies classified as *innovation leaders* and *moderate innovators* describe present stage of development of Poland as typical for the third stage of development. Whereas *innovation followers* assess our stage of development as typical for the transition from the second to the third stage. Modest innovators perceive environment as typical for the first stage of development. Yet the small volume and large inertia of points describing these enterprises reflect limited representativeness of such indications and this distorts their interpretation and has little informative value. These characteristics rarely appear in the analysed sample of enterprises and significantly vary from the average of the investigated sample.

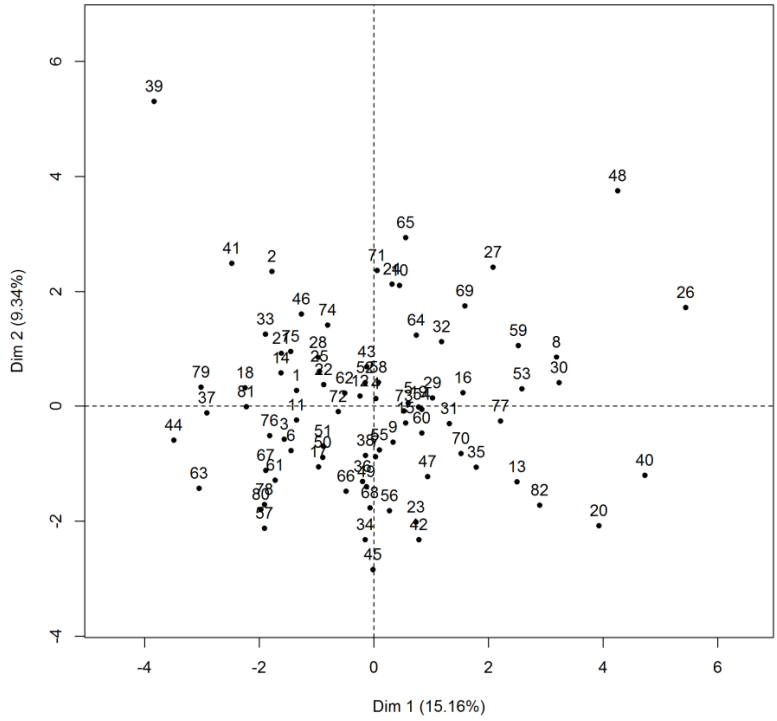


**Figure 1.2.** Particular enterprises in two-dimensional perspective
**Source:** self-study.

Figure 1.2 presents relations of particular enterprises against two assumed dimensions of further analysis. Only three companies from the whole sample are significantly distanced from the centre of the coordinate system (positions 39, 48, 26). Therefore, one may observe that there are only three enterprises which deviate markedly from the average. This in turn, confirms that the assumed in the analysis aggregation of variables to two dimensions is an adequate reflection of the analysed sample. It justifies further research into the analysed sample in the created two-dimensional perspective. The created key components enabling aggregation of all variables to two dimensions coincide significantly with the division of factors describing exogenous innovativeness (Dimension 1), i.e. external factors determining operation of business in Poland, as well as the endogenous ones (Dimension 2), i.e. internal factors determining innovative activities of enterprises.

Two of the external factors (component Dimension 1): credit availability (X8.04.) and the impact of tax policy on investment propensity (X6.04.) indicate significant correlation towards each other (their vectors are nearly parallel) and at the same time substantial positive correlation with factors describing innovativeness of enterprises (component Dimension 2). Thus, one may conclude that these two factors were perceived as major obstacles by innovative enterprises.

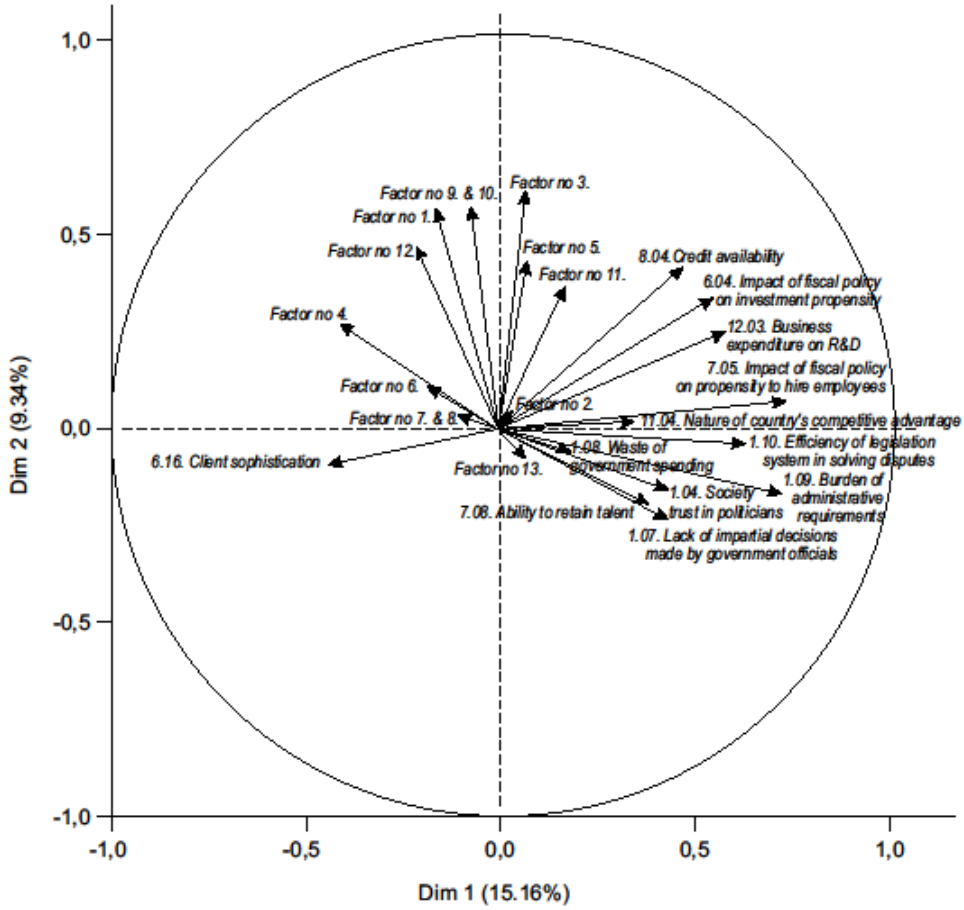


**Figure 1.3.** Pie table showing correlation between aggregated variables
Note: Factors and their numbers are the same as in table 1.8.
**Source:** self-study.

Only one factor defining innovativeness of companies demonstrates significant correlation with external factors (component Dimension 1); it is co-operation with other entities (variable 4), its correlation is negative. One may observe that the negative impact of external factors discourages enterprises from co-operation with other entities.

Among primary variables, i.e. exogenous factors it is the impact of fiscal policy on the willingness to hire new employees (X7.05) that demonstrates significant positive correlation with the character of competitive advantage of the country (X11.04). Whereas consumer sophistication (X6.16.) is strongly negatively correlated with these two variables – vectors of these three factors are nearly parallel. Both character of the country competitive advantage and client sophistication demonstrate advantage of price over quality according to enterprises and clients. Correlation of this factor with the impact of fiscal policy on the willingness to hire

new employees indicates the area which should be addressed in order to reverse present negative preference of price over quality.

Two exogenous factors, i.e. lack of impartial decisions made by government officials (X1.07.) and country's capacity to retain talent (X7.08.) present significant positive correlation towards each other and at the same time are negatively correlated with a pair of endogenous factors: co-operation with other entities (variable 4) and impact on strategic aspects related to competitiveness and winning new markets (variable 6). It may indicate that both current low capacity to retain talent and poor co-operation of enterprises with other entities result from the negative impact of EU support on the assumed by companies strategies related to competitiveness and winning new markets as well as lack of impartial administrative decisions, although these decisions are not directly linked with the talented persons. This may confirm that there exist unequivocal indirect inter-dependencies between apparently distant and completely separated aspects of functioning of economy and state.

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The bulk of our knowledge of capitalism is not valid any more. Since economy has changed our thinking about it must be revised. Enterprises and economies have been subject to deep transformation thus present theories and economic models need to be reviewed. However, by no means does it diminish usefulness of Porter's idea of stages of economic development. The model needs to be updated and further developed.

The undertaken analysis reveals that the level of Poland's innovativeness is far from satisfactory. According to the latest edition of *Innovation Union Scoreboard* Poland belongs to the third (penultimate) group – the so-called *moderate innovators* and being close to its lower limit, occupies 24$^{th}$ place among 28 EU countries. According to *the Global Competitiveness Report* Poland belongs to a group of countries in transformation from the investment-driven stage to the innovativeness--driven one, whereas majority of EU members are at the innovativeness-driven stage. This report ranks Poland on the 43rd place out of 144 assessed countries.

Poland faces the threat of remaining at the present stage of development and falling into the middle-income trap. Current development model based on copying technical solutions from the West and use of cheap labour is becoming obsolete. Growing costs of labour inhibit further growth of labour-intensive production, whereas import of advanced technologies is becoming increasingly difficult and expensive. Since solutions which might help to increase productivity of the country are very close to the global technological boarder and thus are subject to restrictions and are located in most innovative countries (Eichengreen, Park, Shin, 2011).

The undertaken comparative analysis of the quantitative characteristics of particular countries enables one to identify factors related to the changes necessary to

move Poland to the innovativeness-driven stage of development. Broad institutional barriers constitute nearly half of them. The other half is related to the broad scientific development of Poland.

However, based on the obtained scores, one may indicate factors supporting Poland's shift towards innovativeness-driven stage of development. Majority of them reflect development of telecommunication and IT communication services, high level of education and favourable geographical location. Yet one may not indicate a single factor presented in the report helping to reach innovativeness – driven stage of development by the country.

Results of the undertaken comparative analysis are not surprising. Well-known factors indicated in the quantitative description of Poland confirm their significant role. The necessary changes in these areas are essential to the further development of country's innovativeness.

Analysis of empirical data including a sample of innovative enterprises enables one to present the following conclusions:

- Potentially innovative enterprises using EU help perceive barriers resulting from instability of economic policy as more significant than assessed by all the other companies.
- Skills gap is considered a bigger obstacle by innovative enterprises than all remaining Polish organisations. It reflects maladjustment of education specialisation to the needs of employers, in particular in the innovative branches.
- Due to EU co-financing some companies decided to modify certain strategic aspects in order to adjust them to the low employees' ethics, instability of economic policy as well as government official's corruption.
- Analysis of correlation reveals that two factors, that is availability of credit and the impact of fiscal policy on investment propensity, were assessed as significant barriers by innovative companies. Besides, negative influence of external factors discourages enterprises from co-operation with other entities.
- Preference of price over quality indicated by both enterprises and clients is correlated with the impact of fiscal policy on the willingness to hire new employees. This may be one of the areas to be addressed in order to reverse this negative phenomenon.
- Current poor capacity to retain talented persons as well as restricted co-operation of enterprises with other entities may result from the negative impact of EU support on the assumed by companies strategies related to competitiveness and winning new markets as well as lack of impartial administrative decisions, although these decisions are not directly linked with the talented persons. It may confirm that there are unequivocal indirect inter-dependencies between apparently distant and completely separated aspects of functioning of economy and state.

Chapter 2

# Exogenous, Civilizational and Systemic Determinants for Innovative Development of Polish Economy

## Introduction

It is assumed in the analysis presented in this chapter that the primary goal of innovation is socio-economic development and economic growth is a fundamental base for this development. Countries characterised by low level of innovativeness, and Poland is one of them, come across strong development barriers. Even though current GDP indicators are relatively favourable the assessment of the situation as regards innovativeness remains the same. These positive GDP indices result from the typical for the catching up economy potential of internal demand rather than innovativeness. It corresponds to Porter's development model based on the primary production factors. Moreover, economic growth in Poland is built on pro-investment external financing (EU funds and foreign investments), which at the same time stimulates export and this corresponds to the Porter's investment-driven stage. Thus, one may observe that Polish economic growth strongly depends on external environment rather than internal innovative potential. Poor internal innovative potential increases the risk of exhausting current economic growth drivers. This may be reflected in one of the most difficult and widely discussed problems facing Western economies that is secular stagnation (long term or endless). By no means is this a new issue. One may argue it is a timeless problem. It was Adam Smith who warned against stagnation characteristics of market economy, the risk of economic contraction. He argued that no country is resistant to low salaries, minimal profit rate and lack of human or capital growth (Smith, 2013). Similar concerns were expressed by Smith's followers, including David Ricardo, John Stuart Mill and others. Neoclassical economics presented a different view and assumed effectiveness, dependability and the sustainably recovering nature of the free market. It was Alvin Hansen who indicated at the end of the 30s in the 20$^{th}$ century the eternal

risk of secular stagnation (Hansen, 1938). Although the post-war economic boom was perceived as undermining of this conclusion and stagnation was considered as a symptom of cyclicality or trend reversal, the contemporary crisis-like global situation seems to confirm Hansen's (1938) pessimistic hypothesis. It was also Michał Kalecki (1943) who warned against stagnation threats, including the priority for budget balance and insufficient amount of public investments which might compromise employees' salaries or other benefits. Therefore, his work is given more consideration now. It is argued that if one had paid more attention to Kalecki's ideas in the past we would have avoided deep recession shocks (Chakrabortty, 2013). Thus, presently – in the view of the brutal adjustment of the optimistic predictions as in Fukuyama's *End of History* (this correction was made by the global 2008+ crisis) – the issue of secular stagnation inevitably returns. Lawrence Summers's speech in November 2013 triggered intensive debate related to this issue. He claimed that USA was in for a long period of poor GDP growth (Summers, 2014). One should observe that due to high capital mobility the risk of stagnation may gradually spread to other countries and regions. This problem may concern Poland too and this is evidenced by long-term unemployment and relatively low investment level. Numerous economists express their concerns over the threat of stagnation including Jerzy Hausner who based on research argues that Polish economy has reached turning point, i.e. the *middle- income trap* (Hausner, 2013). At the same time there are other factors which might suggest that Poland may have to face the trap of secular stagnation, especially that after 2020 the presently strong investment impulse related to the EU funds will be gradually ceasing. Thus, it is vital that appropriate anticipatory measures in the area of social and economic policy aimed at minimising threats are implemented. Analyses presented in this study are focused on identifying factors threatening innovation in Poland in relation to the secular stagnation risk whose symptoms might be already observed in more advanced economies. Another goal of the research is to identify guidelines for measures preventing stagnation as well as possible pro-innovative solutions.

Analyses concern basic disfunctions, barriers and threats to effective innovativeness policy of the country and enterprises. One of the key threats is the short--termism phenomenon, i.e. shortening of the time horizon as regards various decisions concerning aspects of socio-economic life including innovations and investments. It is reflected in marginalisation of long-term forecasting and the culture of strategic thinking. The most distinctive expression of this approach is the increase in short-term financial speculative investments, frequently at the expense of investing in fixed assets or creating manufacturing workplaces. These interdependent phenomena result from the current civilizational breakthrough manifested by the shrinking of industrial civilisation in favour of the new one, the so-called information revolution leading to the lack of adjustment of mechanisms, regulations and economic priorities to the ever-changing civilisation requirements. One of the examples of this maladjustment is decreasing economic growth and problems in the social sphere and this is related to disfunctions in the area of innovation.

This is reflected in numerous phenomena, such as increase in global unemployment and thus waste of the most valuable creative potential. It demonstrates that the functioning of the socio-economic system including assessment of results of various actions frequently fails to be socially accepted. These phenomena are somewhat linked with a kind of theoretical monism. It is manifested by the dominating for a few decades in Western countries economic doctrine based on the uncritical bias towards neoclassical theory which hypothesises that market reliability and effectiveness constitute basis for economic and investment choices. However, the global crisis of the first decade of the 21st century negatively verified this hypothesis.

Therefore, one may observe the need to seek new models and theories to make economic choices including those related to innovations and the required investments. These models should be adjusted to the requirements of the new civilisation effectively stimulating socially viable activities inclusive of pro-development investments.

If the starting point in creating paradigm and its essence involve sets of questions focused on exploration of reality as well as judgement patterns and sets of tools used to address these questions then the very fact that these enquires are made should be perceived as a vital challenge in the search for new principles of forming socio-economic processes. These are such hermeneutical explorations that this research is focused on.

It is assumed that the contemporary socio-economic changes – with feedback characteristics – are determined by technological breakthrough resulting from information revolution leading to civilizational breakthrough. It is manifested by displacement of industrial civilization in favour of new economy and its new not fully defined model. As yet, the model has not obtained one name and is described differently, e.g. *knowledge-based economy* (a hardly fortunate term since economy is always based on knowledge of some kind), information civilization, digital civilization, wikinomics and others.

The shift from industrial civilization to the post-industrial one leads to a situation where some institutional solutions used in the socio-economic policy do not correspond to the new economy requirements, i.e. economy based on knowledge.

What one may observe is a kind of cultural regression or the phenomenon of cultural anchoring, closing. This lock-in effect described in literature constitutes development barrier including innovativeness barrier as well as the obstacle to moving from the industrial model to the new economy (Hryniewicz, 2012; Gawlikowska, 2014). It means that the tools effective in creating socio-economic development in industrial civilization are still being used despite the civilizational breakthrough and moving towards a new era. In the new reality these solutions prove ineffective and increase the risk of making flawed socio-economic decisions at various institutional levels. It concerns decisions related to broad human and social capital too.

Thus, socio-economic policy is critical, and it results from solutions determining the socio-economic framework. Systemic issues lead to disputes over the role

of the state in economy as well as the role of particular economics movements in developing economy. These controversies and discussions seem to be eternal however recently they have intensified significantly. Efficiency of innovative actions depends on the specificity of civilizational breakthrough, knowledge-based economy and other related preconditions.

It is a big challenge for countries undergoing market transformation and moving from the primary production-based development and price-cost competition to the innovative model. However, theoretical models adjusted to industrial economy become less relevant at the time of civilizational breakthrough. One may assume it concerns Porter's model too. At present it seems that catching up economies (Poland is one of them) will be forced to use simultaneously solutions characteristic of all Porter's development stages and thus form eclectic model. In order to improve the level of wealth of such countries both effective use of primary production factors, investments and parallel transition to the innovation-driven stage of development are necessary to create conditions needed to move economy to the model based on wealth.

According to Porter's theory state's active support and raising salaries resulting in decreasing income disparities are prerequisite for the shift towards innovation--based stage of development. Higher cost of labour will trigger innovativeness and at the same time increase capacity to compete with high-margin production based on advanced technologies rather than low prices. It is closely connected with the socio-economic model. These issues are not adequately considered or appreciated in the socio-economic policy globally or locally. It is evidenced by both scientific research and expert debates. They indicate that challenges posed by the 21st century require close co-operation of science, business, politics and governments. Dennis L. Meadows, one of debate leaders and co-author of *The Limits to Growth*, claims that, one may discuss freely the problems of the future however if we do not use solutions other than the existing ones, nothing will change.[1] The need to implement new solutions in Poland has at least two dimensions. First of all, it is necessary to catch up in the area of investment in R&D and secondly – intensify rational implementation of global knowledge resources aimed at improving socio-economic welfare. In order to meet the challenge, it is necessary to activate all development potential reserves in Poland which at the same time will help to eliminate development barriers. Apart from knowledge a strategic vision is needed here. It is connected with futurological reflection free of ever-present short-termism or short-term priorities.

1 Such observation was made during the debate organized by Max Planck Society and Siemens. Prominent scientists, politicians and businessmen participated in it. The debate sought to address the following question: *How can science, business and governments cooperate to solve the problems caused by climate change, shifting demographics and increasing urbanization?* See: *Science, governments…* (2009) and *Towards…* (2009).

This approach generates numerous questions, such as: what kind of socio-economic solutions will support the best use of knowledge potential? Innovative development in Poland requires at present creating strategy and systemic framework ensuring holistic sustainable reconciliation of economic social and environmental interests. This holistic approach is connected with the growing risk of secular stagnation in developed countries. The above-mentioned risk diminishes validity of Porter's theory and the assumptions of its stages of development.

## 2.1. Secular Stagnation by Alvin H. Hansen[2]

Secular stagnation may be generally described as a permanent loss of the ability to adapt to the socio-economic system to the owned material, financial and labour resources as well as the development needs of the country (countries). This stagnation may be seen in demand-side barriers, setback in economic growth development and the growing discrepancy between the potential and the real development and GDP growth. It is evident in the persistent unemployment. Alvin Hansen, the author of secular stagnation hypothesis as early as in 1938 combined this phenomenon with the deteriorating demographics in highly developed countries, in particular the decrease in reproduction index and society aging. *This in turn leads to lower demand dynamics and inhibits investment drivers and results in higher unemployment and stagnation. This is the essence of secular stagnation – sick recoveries which die in their infancy and depressions which feed on themselves and leave a hard and seemingly immovable core of unemployment* (Hansen, 1939, p. 4). Hansen observed that since net investments are a fundamental development factor, and the financing source – net savings (this is unequivocally confirmed by economic history, including the history of industrial revolution), then the weakening of investment drivers leads to the situation where savings cannot be used due to decreasing demand and eventually lead to secular stagnation. Apart from demographic factors Hansen (following the views of Smith, Ricardo and other economics classics) indicated a number of other investment inhibitors leading to:

- restricted territorial expansion which is discussed today in terms of globalisation limitation;
- constrained capacity for major breakthrough innovations necessitating and leading to the boom of new investments (as observed at the time of industrial revolution);
- increase in capital saving innovations;

2 See: *Reforma kulturowa 2020–2030–2040. Sukces wymaga zmian* (2015).

- monopolisation processes, thereby impairing investment and demand growth.

Thus, according to Hansen, new investments are fading, new workplaces are not created, unemployment is increasing and consequently interest in investments is falling. What is more, aging of society does not reinforce new investments but on the contrary – leads to – divestments particularly in countries where such tools as deferred mortgage loan or life-contingent annuity are available. This may boost current consumption and demand generated by seniors, however considering unfavourable demographic situation, unemployment and the weakening of investment drivers will not prevent stagnation. These adverse factors are interrelated and lead to negative synergy preventing economic growth.

Hansen highlights major threats to economic growth resulting from demand-side barriers and argues that conventional free market mechanisms of stimulating consumption fail under such conditions (Hansen, 1939; Jabłońska, 1988). According to Hansen in order to break the vicious circle of stagnation public investments are needed. They will support creation of new workplaces and support favourable free market conditions for business activity as well as drivers for private investments.

In view of worldwide unemployment problem, relatively low GDP growth, demand-side barriers, income disparities inhibiting demand growth – it is hard to ignore Hansen's concerns. This situation may be observed in many highly developed countries. Yet, it is argued in discussions related to this issue that Hansen's ideas were contradicted by the so-called golden era of capitalism noted after the Second World War and lasting for several decades (until the turn of 70s and 80s), characterised by dynamic economic growth and low unemployment (Summers, 2013). One may assume that this situation should be perceived as atypical, unnatural disruption of stagnation processes due to the war rather than negation of Hansen's theses. It should be observed that after the war it was necessary to repair infrastructure damage including production facilities and potential as well as satisfying, deferred due to the war, aggressive demand. This opinion is fairly justified, especially that the reality of highly developed Western economies seems to support validity of Hansen's ideas.

## 2.2. Relevance of Secular Stagnation Theory – Threat to Investments and Innovations

Following Hansen's theory Lawrence Summers indicates significantly intensifying at present drivers for secular stagnation and this may justify 'new hypothesis stagnation' (*New Secular Stagnation Hypothesis* – Summers, 2013, 2014). Summers

argues that unfavourable demographic trends present in the USA and other well--developed economies in connection with technological changes and information technologies as well as their decreasing costs and prices reduce demand for new capital goods as well as labour. At the same time decreasing prices of capital goods enable financing of a greater volume of investment goods. It is another factor decreasing absorption capacity of savings by investment demand.

The 2008+ crisis as well as the post-crisis experience question free market capacity – without public intervention – to prevent secular stagnation. It is indicated by the decrease in real interest rates observed for a number of decades (related to poor drivers for new private investment decisions). This situation in connection with inflation or deflation may permanently inhibit prevention of stagnation, return to higher interest rates or reduction of unemployment. The risk is increased by hysteresis, i.e. strengthening of unemployment tendencies and transformation of short-term into long-term unemployment. Other adverse factors include financial instability as well as presently observed liquidity trap (business entities stop investments despite growing financial resources). Lower population growth or decrease observed in many countries results in fall of demand which in presence of cost-effective labour-saving information technologies additionally generates technological unemployment. At the same time unemployment strengthens income inequality trend in many countries and this becomes a major demand barrier corresponding to the increasing productivity in manufacturing area. Due to the growing income disparity increasingly large share of profits is obtained by entities characterised by smaller propensity to spend these resources. It is connected with the diminishing marginal income utility with negative impact on demand. Thomas Piketty argues (on the basis of statistical data analysis covering 300 years) that growing income disparity is immanent for capitalism where the rate of capital gain exceeds the rate of GDP growth and salary increase. He maintains that the accumulated social tension is released through revolutions, wars and deep socio--economic crises (Piketty, 2014). The growing disproportions in distribution of world wealth and resulting from it demand barriers as well as social pathologies including unemployment are problems observed in the most countries together with the USA. Janet Yellen, head of FED, expressed her concern about this situation. It has been considered as a new unprecedented approach of the central bank of America. She referred to statistical assessment which revealed that income and wealth disparities in the USA were approaching the highest levels in the last 100 years (Yellen, 2014). Similar conclusions were made in the OECD report which investigates the quality of life worldwide in the last 200 years (*How Was Life*, 2014; Moatsos, 2014). It is also confirmed by the UNICEF report (2014).

Also, Paul Krugman warns against the risk of secular stagnation and argues that the likelihood of zero interest rates in the future is considerably higher than one used to think. Furthermore, he observes that the lasting decreasing trend of real interest rates was already noted before the crisis of 2008. Krugman draws attention to the end of the stage of continuously growing financial leverage which

in connection with declining demographic trends results in strong demand-side barriers. Considering these conditions even zero interest rate policy fails to boost economy and labour market. Liquidity trap is yet another inhibitor. Thus, even the most non-conventional monetary policy does not produce the desired results.

All the above-mentioned factors inhibit GDP and demand growth and lead to higher risk of secular stagnation. It is best evidenced by the data related to the slower GDP dynamics as well as decreasing number of people of working age in the wealthiest countries worldwide.

Thus, one may wonder whether it is possible to prevent secular stagnation. Among numerous recommendations proposed by economists Hansen and Summers seem to present similar solutions. Both of them highlight the importance of public investments. Based on analysis of risk factors leading to secular stagnation Summers indicates two possible ways of preventing this negative trend. Non-conventional monetary policy is one of them, i.e. quantitative easing which due to cheaper credits may become an investment driver. On the other hand though, it may lead to greater financial instability. Therefore, Summers proposes another solution focused on the increase in investments, production and employment which is connected to raising interest rates yet does not involve the risk of financial instability. According to Summers it may be achieved through higher public investments. He also stresses the importance of eliminating structural barriers to private investments, promotion of trust in business as well as providing basic social security. Furthermore, he points to the need to prevent income disparities in order to strengthen purchasing power by redistribution of income towards, lower income groups which will boost market demand quickly and significantly. Summers argues that the adopted by particular countries strategies aimed at preventing stagnation should be adjusted to their situation and socio-economic specificity (Summers, 2014).

Presented analyses reveal growing risk of secular stagnation in well-developed Western economies and this requires significant remodelling of microeconomic policy, socio-economic policy as well as the goals and priorities also in countries which are at present directly unaffected by stagnation. Due to globalisation one may observe infection effect. This risk concerns Poland too. One may indicate in Poland typical for secular stagnation phenomena without in-depth study. These phenomena include deteriorating demographics, unemployment (the technological one resulting from growing resources and increasing efficiency of IT technologies). It leads to strong barriers to establishing new workplaces, particularly due to development of labour-saving IT technologies. This trend is accompanied by the emerging and related to demand-side barriers, deflation processes, decrease in interest rates as well as liquidity trap syndrome which is reflected in limited investment propensity despite the growing financial assets owned by enterprises. It is related to a kind of antinomian drift. These factors constitute significant innovativeness barrier.

Despite the above-mentioned threats resembling vicious circle and leading to stagnation Poland stands out from the other EU states due to relatively favourable

economic results. The rate of GDP growth after the crisis was fairly high (particularly in relation to the recession phenomena which affected Euro zone). It was partially a result of EU funds. Thus, one may raise the following question; what is Poland's development potential? If and to what degree it is endangered by erosion resulting from the growing risk of secular stagnation—barrier to investment and innovativeness?

## 2.3. Casus Poland – Development and Stagnation Antinomian Drift

Key premises for civilizational growth and success of Poland are based on the quality and size of its socio-economic potential. Poland's development capacity is evidenced by the progress observed in the 25 years of economic transformation as well as implementation and strengthening of market economy. It is evident in statistics (due to the common knowledge of these data as well as their large volume, they have not been presented here). Socio-economic development of Poland so far has been typical for Porter's model based on production factors and partly investment-driven grounded in external support, i.e. EU funds. However, transition to the innovation-driven model has not taken place yet. Moreover, resource potential tends to be wasted. The waste origins from economic, cultural and political sources. Furthermore, there is negative synergy of feedback between them resulting in Gordian knots with vicious circle characteristics. According to P. Czapliński, situation in Poland is characterised by both progress and anachronism, being at the front and lagging behind. It is a syndrome of Polish modernity schizophrenia (Czapliński, 2011). Additionally, although it is known how to remove the barriers most of the time, there is not enough determination or political mechanisms or both in order to take needed actions. It leads to antinomian drift acting as Tobin's spanner thrown in the works (Tobin, 1978, pp. 152–159).[3]

Almost each of the development factors of Poland's potential is accompanied by an obstacle (there is always another worse side). Antinomian drift increases susceptibility of Polish economy to secular stagnation (*Reforma*…, 2015). Below a number of examples of this drift have been presented.

Socio-economic sources of innovative potential of Poland includes, inter alia (more on this topic in: Mączyńska, 2012):

3 James Tobin, Noble prize winner in economics in 1981, metaphorically described his concept of anti-speculative turnover tax as spanner thrown in the works of excessively speeding finance sector (Tobin, 1978).

1. Relatively high market potential and resulting from it internal demand generated by approximately 38-milion population. On the other hand, one should consider high level of unemployment, together with demographic threats such as society aging, and depopulation processes related to increasing emigration (according to forecasts by 2050 Polish population will have decreased by approximately 4,5 million) (GUS, 2014, p. 162).
2. Growing enrolment rate, and thus growing number of people with higher education reinforce productivity and social mobility. On the other hand though, anachronistic, inflexible system of education its unsatisfactory quality, assessment fragmentation, testomania, poor co-operation between all levels of education as well as between business and science – marginalisation of vocational education and underdevelopment of dual education system. Present system neglects child-raising function of education generates conflicts and internal contradictions. 'It is not only in primary and secondary schools but also at renowned universities– similarly to shops and bars – that measurable effects are appreciated. That is amount, price, effectiveness and profit. «Pupil/student–University» relationship is increasingly transforming into «client–shop» relationship" (Szumski, 2015). According to Wiesław Szumski, Polish education system is *sclerotic* and inflexible. Shortcomings of development and practical implementation of scientific research potential result in the *leakage* of numerous valuable inventions from Poland (e.g. blue laser, etc.). It leads to low level of innovation which is additionally inhibited by low salaries. This, in turn, consolidates outdated economic structures, marginalises high technologies, petrifies low-margin economy. 'We do not catch up with changes contemporary world is subject to and dynamics of this process reveals with all ruthlessness our lack of preparation to face new challenges, although it is now – before our very eyes – that the future of Poland in the next decades is being resolved' (Kleiber, 2011).
3. Intensifying of investments in infrastructure (thanks to, *inter alia*, EU co-financing) generates investment multipliers and results in additional impulses for GDP growth determining country wealth. At the same time, it is accompanied by pathologies in the area of public tenders and the failure of public-private partnership.
4. Multiplier effects which may result from the development of residential building sector (necessary due to its underdevelopment and increasing housing aspirations of Poles leading to significant residential demand). In the future it may constitute a strong driving force for economy. However, one may indicate numerous pathologies in this area resulting from the lack of transparent long-term housing policy as well as spatial order policy. Housing problem is an obstacle for the society wellbeing as well as labour force mobility. It is also a barrier to construction development – key branch for GDP. It is accompanied by ridiculous underestimation of such issues as spatial order landscape designing as potential GDP growth factors and quality of life improvement.

5. Culture factors rooted in historically high position of Poland in Europe and worldwide together with openness towards new movements or trends in various areas of life support economic growth, on the other hand though – schizophrenia of Polish modernity ('modernised conservatives vs. anticapitalistic emancipists) (Czapliński, 2011) as well as 'folwarkisation' of life, 'folwarkisation' of employer-employee relations (Leder, 2014; Hrynkiewicz, 2007).
6. Potential resulting from the 'backwardness benefit' and the capacity to make the so-called 'frog leap' that is the possibility to move to higher stage of development and skip intermediary phases that other more developed countries went through. It is possible due to the use of experiences of other countries, which helps to shorten the time needed to move to higher stage of development and decreases the risk of making mistakes. It results from the opportunity to learn from the mistakes of others and at the same time adopting models that other more developed countries abandon – vide 'pointisation' in science and assessment prevailing in academic journals, pandemic.

Antinomian drift leads to partial blocking and waste of innovativeness potential due to dealing with problems caused by us (removing spanner from the works). Development barriers are rooted first of all in the mentioned below areas:

1. Inefficiency of the system of law-making and law enforcement, poorly developed judiciary, lengthy court proceedings, including business cases. It is the unclear and ineffective fiscal system that strongly inhibits further socio-economic development. In its present form it does not fulfil properly any of its key functions – neither fiscal nor redistributive. It is neither effective nor efficient. It is costly, ineffective, excessively complex, unclear; encourages circumvention and tax evasion including carousel fraud and VAT theft. The system against the fundamental spirit of law puts the heaviest burden on the poorer people rather than the wealthiest. Yet, another expression of the weakness of law are elements of the 19th century model of capitalism or folwark feudalism in the employee-employer relations.
2. Income asymmetries, wealth and poverty poles, relatively low pay and increasing disparities in wage dynamics and return on capital (Piketty, 2014). Although Poland positively stands out from other countries due to the relatively favourable situation as regards social inequalities (it is reflected in the Gini index), these disparities constitute demand barrier. Research reveals that deep inequalities pose a risk not only to innovation but also market democracy, social trust and the overall free market capitalism (Piketty, 2014). It is not surprising that many actions have been taken worldwide (although so far they proved unsuccessful) to support inclusive capitalism. One should mention here the initiative undertaken by global business leaders who organised in May 2014 in London a conference on inclusive capitalism under the heading "Conference on Inclusive Capitalism: Building Value, Renewing Trust" (*Conference on Inclusive*…, 2014).

3. Growing public debt as well as difficulties related to sustainability of public finance (which is directly connected with unemployment, demographics and increasing expenditure on pensions and healthcare).
4. Disfunction of political system and poor governance including the disadvantageous to economy syndrome of electoral cycle and priority of electoral goals over macroeconomic socio-economic effectiveness. It reinforces a phenomenon characteristic for democratic systems phenomenon described as 'Effectiveness has no electorate'. The syndrome of short electorate cycle and related to its short-term perspective is accompanied by negligence of strategic thinking and inhibits effective investment in economy requiring longer time horizon.
5. The growing phenomenon of anomy and erosion of trust, deregulation of norms, chaos and contradictions in the system of values as well as uncertainty and difficulties in assessing what is good and what is bad in the functioning of economy or socio-economic system, what is acceptable in reaching goals, what is a positive value and what is an anti-value.

This is only a selection of factors confirming antinomian pro-stagnation drift. One should indicate here that all the pro-stagnation factors are evidenced in the research carried out for many years by Warsaw School of Economics dedicated to bankruptcy of enterprises. These bankruptcies perfectly illustrate disfunctions observed in Polish socio-economic system. Results of the research have been presented in the cycle of WSE publications (i.a. Mączyńska, 2014). These results indicate the need to redefine priorities and goals of macroeconomic policy. It is closely connected with shaping of institutional development, as indicated by inter alia Maria Lissowska. According to the author who conducted research into Polish transformation: 'planning institutional changes has been neglected by the transformation decision-makers' (Lissowska, 2008, p. 71). M. Lissowska argues that 'one should not begin liberalising or privatising without proper preparation of solutions and institutional systems. Otherwise market may be dominated by illegal (mafia like) co-operation structures' (Lissowska, 2008, p. 79). It is confirmed by results of analyses carried out by Daron Acemoglu and James A. Robinson, published in 2012 in a book 'Why Nations Lose'. The authors analyse why some nations are wealthy, innovative and others – poor. These investigations lead to a conclusion that it is not determined by culture, climate, geographical location or knowledge of politics. None of the above-mentioned factors – according to the authors – determines development directions of countries. Their answer to the question addressing determinants of state's wealth is as follows: 'Institutions, institutions, institutions'. 'In most case when nations lose it is because of exploiting institutions which function within them'. (Acemoglu, Robinson, 2014, p. 410). 'Exploiting economic institutions do not encourage people to save, invest or implement innovation. Exploiting political institutions support these economic institutions and thus power is held by people who make profit by exploitation' (Acemoglu, Robinson, 2014, p. 414). Therefore, one may pose the question: Have such symptoms occurred in Poland? Creating innovativeness policy should be based on the assumption that fate in

history does not exist. Despite the vicious circle of exploiting institutions can they be replaced by inclusive institutions (Acemoglu, Robinson, 2014, p. 474).

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The increasing risk of secular stagnation is contemporarily a significant innovativeness barrier. Secular stagnation resulting predominantly from unfavourable demographic processes, growing income disparity and other factors has become a difficult challenge facing numerous well-developed countries. One should remember that globalisation increases the risk of spreading of this severe disease. This contemporary illness has been already identified and signalised. Unfortunately, Poland is not immune to secular stagnation despite the achieved unquestioned transformation successes as well as the relatively high GDP growth rate. One should not get blinded by success especially in view of such threats as, inter alia, demographic problems, various development asymmetries including income disparities and antinomian drift. They inhibit development potential and motivation to innovate increasing the risk of secular stagnation. The origins of these risks are complex and mutually looped. They are related not only to economy, politics but also to civilization and culture leading to a vicious circle hard to break. Thus, some of these obstacles (especially the cultural ones) may be difficult to eliminate fast. However, none of them (even the cultural ones) has been given once and for all.

The above-mentioned irregularities have strong institutional and systemic background. It is reflected in the results of the research. Thus, it is vital to focus on rationalisation, optimisation of the socio-economic system, institutional and political system as well as the system of power execution. It is important to reflect upon the broad institutional policy, including the systemic one since it is a determinant driving innovation, effectiveness and social usability of changes. Intensity of factors leading to secular stagnation differs between countries and between the assumed institutional-systemic model. The crisis of 2008 which started in the USA revealed higher immunity of countries less influenced by the neo-liberal doctrine (including Scandinavian countries). It proves that in order to reduce socio-economic diffusion by adapting solutions defining socio-economic model to the contemporary development needs.

Deindustrialisation processes which initiated at the beginning of system transformation in Poland in 1989 in connection with privatisation policy increase the risk of secular stagnation. These processes reflect characteristics recently presented by Dani Rodrik in a publication dedicated to *premature deindustrialisation* (Rodrik, 2015). According to Rodrik immature free market economies face numerous consequences related to premature deindustrialisation such as loss of workplaces

and losing market to stronger economies. Rodrik argues that significantly worse implications of deindustrialisation are faced by democracy and the functioning of the state. Historically, industrialisation was vital in the process of creating modern democracies, democratic institutions including social dialogue. Thus, deindustrialisation anticipating process of creating democratic country and its institutions may result in political instability, poor governance and degeneration of the idea of liberalism (Rodrik, 2015). It may become a major barrier to innovativeness. Symptoms identified by Rodrik may be observed in Poland too. Therefore, microeconomic policy as well as its goals and priorities should be redefined. They are strongly connected with the institutional-systemic policy. It determines state--market relations, the range and structure of the public sector as well as long-term strategic preferences and socio-economic goals extending beyond electoral cycle.

Chapter 3

# Endogenous Barriers for Moving Polish Economy to the Innovation-driven Stage of Development

## Introduction

At the time of dynamic civilisation development accompanying technological revolution – the shifting of global economic centres, economic storms on the global market as well as pursuing a new model of market economy – high innovativeness has become a prerequisite for taking part in competition on the open market. The level of innovativeness of Polish companies has been fairly low. Poland ranks fourth from the bottom in the European innovativeness rankings.

EU structural funds transferred within the 2007–2013 financial framework and subsequently in the years 2014–2017 were supposed to trigger innovativeness potential of Polish organisations. Within the 2007–2013 framework the volume of allocation was impressive and totalled 68 billion euro. 60% of which was dedicated to the so-called Lisbon goals, i.e. innovativeness, new technologies, computerisation and creation of new high-quality sustainable jobs.

However, this enormous non-repayable funding did not bring about the expected results. The diagnosis so far has been superficial and identified only the symptoms.

The subject literature mentions bureaucratic and financial barriers, conservative approach to the structure of financing company development with clear majority of own resources, lack of substantial external financing, functional inefficiency of R&D, information gap between this sector and enterprises. Another barrier which has been identified is the lack of stability of the regulatory system leading to short term planning of business activities.

Another key factor related to poor absorption of structural funds dedicated to innovation is low level of management as well as immaturity of social capital, unwillingness to horizontal co-operation, lack of trust, cultural environment and the

system of values. In this work we have put forward the thesis that the predominant cause of the lack of innovative approach of Polish companies as well as low absorption of the dedicated EU funds is the current transitional phase of development of Polish economy. Analysis of conclusions coming from theoretical syntheses of institutionalism and resource theory depicts its characteristics and supports the thesis.

After one has assumed the hypothesis that the key determinant of the limited effectiveness of the pro-innovative help from EU as well as the low innovativeness of companies is the transitional phase of development of Polish economy, one should address the following question: what prevents individual as well as business entities from investing in new more advanced technologies, developing skills and organizing efficient markets in the transitional phase?

What are the main barriers for moving Polish economy from the investment-driven phase to the innovation-driven stage of development? In pursuit for the answer to these questions we should refer to the theoretical syntheses of institutional and resource economics.

## 3.1. Institutional syntheses

Supporters of institutional economics (North, 2005) argue that what differs wealthy countries from the poor ones is that the former ones have developed a number of efficient institutions. Market effectiveness and the level of transactional costs depend on institutions dedicated to decreasing costs of introducing new products on the market and facilitating access to information (Coase, 2009; Veblen, 1971).

Institutional circumstances of markets are predominantly dependent on the level of social trust, transparency of operating conditions, legal system quality, moral principles, and the system of values and the mentality of business entities.

Typology of institutions includes the following:

- public,
- private,
- market.

*Public institutions* include: law, judicial system, ownership law, intellectual ownership law, succession law, and business law, transparency of state and private institutions. *Private institutions* include: chambers of commerce, credit registers, creditors, cooperation of business partners.

*Market institutions* include: institutions constituting market, development institutions, market stabilising institutions, protective institutions.

Market will function properly provided effective institutional-legal infrastructure, transparent regulatory system and guaranteed ownership rights exist. It is

easier to conduct business activity if the ownership rights are strongly guarantied and the system of debt execution is efficient. Corruption and poor debt execution increase transactional costs, impair entrepreneurship and development activity. Institutions enabling concluding credible agreements are critical for market effectiveness and are the basis wealthy societies functioning.

These theses have been developed in the theoretical synthesis of R.H. Coase's, the Noble prize winner. It is an attempt to address the questions of why new enterprises appear and develop in market economy if according to the neoclassical synthesis the self-regulatory mechanism is the perfect one?

Coase's answer is the conclusion that there are two mechanisms of allocation in the market economy, i.e. the market allocation mechanism of production resources by means of prices and the allocation mechanism of these factors inside the organisation determined by the owner or the manager.

The mechanism of market allocation is not free but involves costs frequently higher than the costs of internal allocation. This is how Coase has developed the theory of transactional costs. These may be divided into the *ex-ante* and *ex-post* ones.

The first category relates to preparation of a contract, market monitoring, and negotiations. The other one involves the cost of monitoring whether the counterparty fulfills their obligations as well as the possible costs connected with recovery of funds from a dishonest counterparty.

Entrepreneurs aiming to reduce these costs develop existing companies or establish the new ones and introduce some transactions into the organisation. This enables them to avoid a major part of transactional costs. In case transactional costs on the market are lower than the internal ones, the organisation outsources some activities and therefor keeps the organisation size on lower level.

Optimal size of organisation is obtained when the cost of organising additional transaction inside the organisation equals the internal cost of this transaction. The criterion of functioning and development of the organisation is profit maximization by means of minimising transactional costs.

The above considerations enable one to conclude that the catching up economies during the transition from investment-driven economy to the innovation-driven one encounter barriers for effective operation of organisations and their dynamic development through innovations due to too high transactional costs related to drafting contracts. These primarily result from the lack of institutions ensuring credibility of contracts. These costs are increased by low level of social capital including the lack of mutual trust between business partners. Strive for minimising transactional ex-post costs during the transitional phase inhibit entrepreneurs' willingness to undertake innovative activities.

The key development factors are the cultural circumstances and value systems which frequently are not compatible with the democratic political system, entrepreneurship and social justice. Effective financial institutions closely linked to the real economy are critical determinants too. An important growth precondition is

the reduction of physical capital gap and the capital of knowledge about production, the functioning of institutions, organisation and management. Another barrier relates to incomplete information which inhibit market functioning. H. Leibenstein (1989) mentions this problem in the theory of 'effectiveness X' discussing the impact of information asymmetry on the productivity of business entities.

This synthesis highlights the conflicting interests of two groups in an organisation, i.e. the principals and the agents. The distinctiveness of their function, goal and opportunism are presented. The principal focuses on maximising company's surplus, whereas the agent's aim is sound performance of the tasks (related to achieving their goals).

'Efficiency X' synthesis stresses information asymmetry between the two entities as well as the propensity to take risk. Agent's information advantage results from their closeness to the production process. Agent may use the existing information asymmetry in a manner which is not in accordance with the company interest.

Another type of asymmetry involves the differences in the two entities' willingness to take risk. Principals (entrepreneurs, managers) tend to take high risk decisions (e.g. investing), whereas agents strive to effectively perform their tasks in the interest of the company avoiding at the same time risk taking due to their opportunistic motives. The outlined asymmetries lower company effectiveness and limit its development prospects (lost 'effectiveness X').

Control of agents' performance is extremely difficult and continuous monitoring of their performance would prove costly and might aggravate mutual relations in the company. Thus, it is the entrepreneur's role to motivate employees to effectively perform their tasks in the organisation's interest by means of the system of financial incentives (bonuses and penalties), level of remuneration **but predominantly by maintaining good atmosphere at work, friendly relationships and openness**. These measures may lead to considerable decrease in the scale of lost 'efficiency X' and improve productivity of company and boost its development potential.

Synthetic account of the key assumptions of Eisenstein's theory enables one to identify another vital barrier for increasing innovativeness of Polish companies in the transitional phase of development. It is low maturity level of social capital including lack of mutual trust, willingness to co-operate, openness, creativity and thorough performance of duties. In the transitional phase of development these are strong impact of information asymmetry and risk in companies that inhibit their willingness to take risky innovative actions including those financed by the structural EU funds.

One should observe that at the transitional level self-financing of development is predominant and the use of external funding together with EU assistance funds is limited. The latest SMEs research carried out by Confederation of private Employers PKPP 'Lewiatan' revealed that as of 2014 only 17% of respondents declared their interest in using structural help to fund innovations (Raport PKPP Lewiatan, 2014).

One should note that one of the key innovation inhibitors during the transitional phase of development is the considerable information gap in the entrepreneur-foreground creators' relationships, i.e. research and development institutions and universities. It disrupts the operation of both demand and supply innovation factors.

It should be mentioned that institutional economics supporters argue that the institutional and cultural determinants of development mutually support each other. Since culture determines institutions and those have significant impact on cultural implications. Political leaders integrating cultural organisational and administrative resources play an important role in stimulating development processes. Low quality of political leaders consolidates the process of taking over public institutions by political parties and weakens efficiency of management staff.

Inefficiency of policy towards states and regions economically under-developed based on the neoclassical development model justifies the need to elaborate a new theoretical model to better understand the mechanisms enabling one to overcome development barriers experience by the less developed regions as well as to catch up with the more developed ones.

## 3.2. Endogenous Theoretical Syntheses

These considerations led to formulating foundations for the **endogenous theories** of economic growth (Romer, Lucas, 1988). Endogenous theories assume that economic growth depends on the capital resource and technological development which are not subject to the decreasing revenue processes.

Advanced technologies in the endogenous model are not easily available as in the neoclassical model. They result from the operating of the economic system characterized by the key role of public institutions in the area of education, scientific research as well as the transfer of knowledge and innovation. It is the result of reverse cause-and-effect relationship where new technologies boost demand for high intellectual competences, new fields of study, R&D activities, new management style and new methods of building development prospects. The endogenous model – in comparison to the neoclassical one – does not limit the capital to the material one but includes the human capital as well. There is mutual interdependence between them since the lack of high-quality human capital will inhibit technological development and thus one should not expect increase in the quality of workforce when the technological level of production is low. The prerequisite for accumulation of high-quality human capital is the process of diffusion of knowledge and skills. In this process the structured well-organized knowledge created in one company spreads among experts leading to the increase in production and innovative potential of companies located in different regions and countries.

The fundamental role of the possessed by companies knowledge capital in its competitive struggle at the transitional development level calls for deeper analysis. Knowledge resource is the key nonmaterial company resource determining its development. Knowledge supports creative processes and is able to develop new resources. Contrary to the material goods knowledge may develop on its own (Kwiatkowski, 2002; Koźmiński, 2000, 2001).

Knowledge is an information resource helping its creators and users to pursue their business plans. There are no limits to knowledge development. Each investment in creating and acquiring knowledge is desired however its ex-ante valuation is practically impossible.

Knowledge is an 'intangible' company resource which is hard to measure yet indispensable for the development of any organisation. These are corporate culture and the qualifications level of workforce both inside and outside the organisation that may prevent further development. One may find numerous typologies of knowledge in the subject literature. The following types of knowledge are mentioned: process, catalogue, historical one. According to another typology one may distinguish: know-what? Knowledge (what to do to make things better?), know-why? Knowledge (why it is not good?), know-how? (How to do it?), know-who? (Who can do it?).

In the era of globalisation and technological revolution knowledge has become the key strategic production factor. However, it requires appropriate management. Development of this resource implies necessity to hire the best workforce, establishing internal research teams, investing in the R&D sector as well diffusion of knowledge by well-organized information systems.

These prerequisites have been partially met at the transitional level of economic development. The key criterion of business activity in innovative economy is maximising of knowledge. In the Polish 'catching up' economy this paradigm is implemented in a very narrow scope. The criteria of turnover maximising and sustaining position on the market prevail.

The transitional phase of development implies relatively low level of human capital, poor R&D involvement of companies, lack of own research facilities, weak links between business and science sector. Corporate culture remains on low level and the methods of knowledge management are not well-developed.

The process of knowledge creation aimed at boosting innovation in a company is far from the knowledge spiral mechanism presented in the theoretical synthesis (Nonaka, Takeuschi, 2000). It is worth pointing out that in the conversion process of tacit/explicit knowledge in the learning organisation, tacit knowledge is particularly important. Obtaining and diffusion of this knowledge depend on direct informal contacts of employees closely located as well as the organization of linked business entities and institutions.

The process of knowledge conversion (penetration) in a learning organisation is divided into four stages:

- socialisation, i.e. transforming tacit knowledge into the tacit one by experience sharing,

- externalisation, i.e. transforming tacit knowledge into the explicit one,
- combination, i.e. conversion of the explicit knowledge into the explicit one by organising, supplementing and convergence of available knowledge,
- internalisation, i.e. transition from the explicit knowledge to the tacit one and learning by doing.

The presented knowledge spiral mechanism results in creating new knowledge, that is innovation.

Analysis of the key assumptions of the endogenous theoretical synthesis enables one to draw a number of conclusions related to the reasons for poor innovativeness of Polish companies at the transitional stage of economy. One of the main development barriers is the fact that companies seem to underestimate the fundamental role of the collected knowledge. What differs our companies operating during the transitional stage from the better developed economies is the distance to the common criteria of knowledge maximising. The relatively low-quality staff and their limited creativity result in underestimating the implications of the process of learning by economic entities as well as the knowledge conversion mechanism with the aim to develop new solutions, i.e. innovation.

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The presented theoretical syntheses indicate that the fundamental prerequisite for moving Polish economy from the investment stage to the innovative phase as well as boosting innovative drive of companies with the help of structural EU funds is providing sufficient institutional infrastructure for business entities. It is vital that the regulatory systems are consistent with the cultural circumstances and value systems (it is well founded proposal however difficult to pursue). Another critical condition is human capital development and focus on increasing maturity of the social capital. Major changes in the education system on all levels and adjusting R&D sector to the needs of the innovative economy will be needed in order to boost employees' creativity. Public institutions must change in order to guarantee transparency and stability of their actions. It applies in particular to the right of ownership including intellectual property law. Institutional and cultural development determinants reinforce each other. Building regulatory system appropriate for innovative economy is a prerequisite for shifting to the Knowledge Based Economy. However, it is strongly dependent on the level of social trust, transparency of the operating environment, quality of the legal system, moral principles and mentality of business entities. Activating mechanisms of new knowledge creation in learning business may accelerate the process of catching up with the economies

based on knowledge. The carried-out analysis helped to identify the key factors inhibiting innovative effects of EU structural funds absorption. These are:

- marginal share of the knowledge maximising paradigm among the criteria of business operation, undervaluing of the essential role of human resources properly managed in order to build competitive advantage of the company;
- low quality of workforce and their poor creativity limit considerably the number of learning organisations which create new knowledge;
- negative impact of information asymmetry and companies' willingness to make risky innovative decisions on their development activity;
- lack of institutional and cultural determinants enabling one to maximise surplus by minimising transactional costs.

All the above presented arguments support the thesis that the institutional, cultural and mental circumstances accompanying the present stage of Polish economy development prevent making a breakthrough in the field of innovative potential of companies and the increase in economic competitiveness related to innovations despite substantial transfers dedicated to innovations from the EU.

## 3.3. Results of Empirical Analysis

The conducted empirical analysis enabled one to positively verify the thesis concerning the fundamental endogenous barriers for transition of Polish economy from the investment to the innovative development phase.

The fundamental barrier for the increase in innovative propensity of companies with regard to the absorption of structural EU funds involve the **weakness of the institutional environment of the investigated companies**. Majority of respondents (67%) mention the following key barriers: overregulation, excessive stringency of regulations and their maladjustment to the needs of employers.

38% of respondents point to legal loopholes. Regulatory limitations include flawed fiscal measures together with the income tax scale, ambiguity and frequent changes of tax regulations, excessive fiscal burdens and contributions to the social insurance (ZUS) and lack of tax incentives for development i.e. Innovative activity. These barriers are extremely vital for nearly 80% of companies. Another important obstacle involves over-complicated patenting procedures (40,2% of respondents).

Apart from the formal institutional barriers the informal ones according to the respondents are relatively less important. They are identified as a key barrier by merely 32,8% of respondents. Interesting fact is that most respondents declare minor importance of corruption present in horizontal relations (70% of firms).

The willingness to make development decisions is hindered by the instability of economic policy and government. These factors result in the increased risk of

business activity and restrict long-term decisions ability because of the frequency of institutional changes. 30% of respondents mentioned this factor in the analysed 2007–2013 period.

**Insufficient level of human capital** constitutes a major block of barriers for the shift to the innovative phase of development. One should note that 61,6% of respondents consider low level of creativity of the management team as a minor factor. Similarly, poor level of qualifications of the workforce was considered as less important by 59,2% of the investigated companies. This surprising result may result from the fact that this group was questioned, i.e. the management team. At the same time, one should remember that the law level of their creativity is a critical obstacle for innovative activities highlighted by 40% of respondents.

Poor creativity of the research team is a vital inhibitor for the innovative drive of 39,6% respondents.

The issue of the insufficient level of human capital calls for more consideration. According to OECD human capital is defined as knowledge, skills and acquired and used by individuals in order to increase one's social or economic welfare (UNESCO, 2015).

The most innovative countries stand out in terms of:

- the expected number of years of school education,
- the level of universities according to the World University Ranking,
- availability of specialised research and training services,
- the level of staff training.

In terms of quantitative membership in education in Poland (number of university students) as well as the expected number of years of education the indicators stand at a level close to the most innovative countries. Thus, the shift to the innovative stage of development should be accelerated. However, the qualitative indicators including the quality of universities, mainly the private ones and the average training level of the personnel are an obstacle. The average rating of the three best universities gives Poland 42$^{nd}$ place among 141 countries in the *Global Competitiveness Report 2015–2016*. The training level of personnel classifies Poland on the 65$^{th}$ place among 140 countries in the *Global Innovation Index 2015* (UNESCO, 2015).

Despite the improvement of the teaching the quality level of the workforce remains unsatisfactory. The overall skills level of adults is relatively low when compared to other OECD countries. It applies not only to those with vocational education but university graduates as well. Lack of qualifications in this social group result from the low level of participation in continuous learning of adults. At the same time one should observe that high level of knowledge and skills of Polish students may boost the process of economy shift to the innovative phase (numerous international rewards for ICT projects).

Empirical studies confirmed the earlier formulated hypothesis that the **insufficient maturity of social capital** is the critical inhibitor for transition from the investment to the innovative phase of economic development. These are lack of trust

in the horizontal relationships between business entities, narrow level of these links as well as lack of openness to cooperation with the science sector.

Within the innovative projects financed by EU 16 cluster co-operation activities were noted (18% of the sample). However only three of them assessed this cooperation positively. Similarly 20% of respondents participated in networking activities. The quality and effects of this cooperation were highly evaluated by four companies, whereas low mark was given by six entities.

Vast majority (67%) of respondents cooperated with government agencies (PARP, NCBR, ARP) during the implementation of innovative projects cofinansed by EU and assessed it very positively.

**Table 3.1.** Selected human capital in Poland

| Specification | Poland in % | Most innovative countries in % |
|---|---|---|
| Gross index of student enrolments (2013) | 71,2 | 68,4 |
| Expected number of years in education (2013) | 16,4 | 16,9 |
| Specialist research and training services (2014/2015) | 4,9 | 5,4 |
| University ranking | 32,8 | 71,9 |
| Staff training (2014/2015) | 4 | 4,9 |

**Source:** UNESCO (2015), *Global Innovation Index 2015*; *Global Competitiveness Report 2015/2016*; *innovative potential of economy: circumstances, determinants*, NBP, May 2016.

This positive opinion most probably results from the fact that these government agencies were fund administrators. Results of other studies (NBP, 2016) confirm relevance of our observations related to the social capital barrier. According to one of the definitions (Landry, Amana, Lamari, 2009) social capital consists of four main elements, i.e.:

- level of trust,
- networking (industry, information, research) resulting in new knowledge,
- participatory capital (frequency of participation in various industry associations),
- relational capital (personal contacts with people employed in organisations supporting entrepreneurship and at universities).

Taking into consideration these criteria one should observe that the overall level of social capital in Poland is very low. The level of interpersonal and institutional trust (confidence in given institutions) in Poland is much lower than the average in the most innovative countries of the world. It is illustrated by the table 3.2.

**Table 3.2.** Selected human capital indicators in 2012

| Specification | Poland in % | Most innovative countries in % |
|---|---|---|
| Overall interpersonal trust | 17,6 | 43,1 |
| Trust in political system | 11,7 | 49,6 |
| Trust in parliament | 7 | 30,6 |
| Participation in NGOs or sport associations | 6 | 19 |

**Source:** UNESCO (2015), *The Global Innovation Index 2015.*

It is worth highlighting that the date presented in table 3.2 concern year 2012 and do not consider present dynamic changes in the social economic situation in Poland as well as the civic attitudes.

In 2012 European Innovation Survey analysts formed a new bold hypothesis that the level of social trust increases gradually which corresponds to the growth in interpersonal trust in 2002–2012 by 6%. Human solidarity, trust in institutions and policy increased remarkably. However it is difficult today to empirically verify validity of the thesis.

Another block of key barriers for moving Polish economy from the investment stage to the innovative one opens **information asymmetry** indicated in the theoretical part of the chapter, information gap between the knowledge sector and the sector of enterprises as well as between companies.

30% of companies (31,4%) mentioned lack of knowledge about consumer needs as a key innovativeness barrier in their activity. A third of the researched companies (27,1%) highlighted lack of knowledge about the needs of other enterprises. 36,5% of respondents declared that the information gap related to the science-research units and the results of their work constitute another major obstacle for innovative activity.

Lack of knowledge about new technologies and markets limits 35% of respondents. Another obstacle mentioned by 24,2% of enterprises is the lack of information about the forms and mechanisms of public support including EU funds.

Enterprises mentioned the weakness of the allocation system of the European structural funds. **Lack of preparation of the institutions organising various project competitions supported by structural funds** was mentioned by 30% of respondents. Other obstacles identified by as many as 61,3% of the survey participants is the long period of verification of payment applications as well as execution of payments.

The institution of **knowledge brokers** should help to decrease information asymmetry between the R&D sector and enterprises. The research revealed that the role of intermediary organisations in the knowledge transfer focused on narrowing down the innovativeness gap is marginal. The offer of knowledge broker was presented to six companies. Only one of them decided to take advantage of it. This intermediation enabled the company to expand its knowledge resources and networking. The tenderers involved in the new knowledge transfer comprised:

Wroclaw Innovation Centre (Wrocławskie Centrum Innowacji), the Ministry of Science and Higher Education (MNiSW), Innovation, Development and Technology Transfer Centre of Silesian University of Technology Centrum Innowacji Transferu Technologii Politechniki Śląskiej) and The Technical University of Krakow (Politechnika Krakowska).

At the same time **considerable increase in cooperation of the surveyed companies with the science sector**, i.e. universities and scientific institutes has been noted. Substantial improvement was observed in comparison to the results of studies carried out in the years 2007–2009 (mentioned in *The Impact of Structural Funds…*, 2012). The recent studies reveal prevailing cooperation with universities. Joint projects cofinansed by structural funds resulted in patents, new projects, new technologies, new management systems, staff training and student's internships in enterprises.

Overall 140 projects in cooperation with universities were carried out in the analysed period. These ventures were undertaken in 46 enterprises (55,3% of the sample). Technical and medical universities as well as all the major Polish universities and the University of Padua dominated in the researched projects. The cooperation resulted in the following achievements: implementation of innovative valve production (patented), implementation of wind turbines (patented), creation of experimental testing and production plant specialising in food supplements, implementation of a new integrated management system.

Cooperation with research institutes was less intensive. 37,6% of enterprises concluded such agreements, only 24 companies (28,4%) carried the deal through. These enterprises launched 71 projects, i.e. less than half of the volume in case of universities. The cooperation involves only 22 technical, chemical, pharmaceutical, nature conservation and ITI institutes. The cooperated parities comprised among others Austrian Research Centre and Academy of Sciences of the Czech Republic.

Observation of the material outcomes resulting from completion of the innovative projects cofinanced by the structural funds may justify moderate optimistic view as regards gradual increase in the process of transition to the knowledge-based economy. One should remember though, that the investigated and the specially selected sample of 85 enterprises comprised solely innovative companies.

During the period considered product innovations were developed in 82,4% of the researched companies, process innovations in nearly 70% (69,4%), new trading markets were gained by 44,7% companies where half overseas markets. Marketing innovations were implemented by 23,5% respondents, whereas the organisational ones by 25% of the researched companies.

One of the key changes in adaptation activities of enterprise benefiting from the EU aid in comparison to the previous years is the **extension of the horizon of development projections** and refocusing of those strategies towards competitive increase in the long term by means of:

- new competences development,
- increasing the level of offered services,
- diversification of income sources,
- increase in expenditure on R&D and development of their own research facilities,
- diversification of production,
- expansion of contacts and cooperation with foreign specialist units,
- undertaking business activity in the high-risk branch (e.g. chemistry, pharmacy).

Extension of the horizon of development projections of enterprises and refocusing on improvement of competitiveness by means of innovative activities, adopting diversification strategies and moving away from the cost criterion, increasing internationalisation – all this may lead to gradual shift of development strategies of the research enterprises from quantitative criteria (productivity increase, maximising of turnover) towards qualitative criteria. It signifies moving from the investment-imitative stage to the innovative development stage stimulated by the criterion of knowledge maximising. It should be added though that quantitative changes of development strategies resulting from the absorption of public EU help were identified only in 25% of the enterprises.

When considering the study results one should pay attention to the **changes in the structure of financing innovative activity** of the researched entities. In comparison to the studies held in the years 2007–2009 (*Wpływ funduszy strukturalnych*…, 2012) certain reduction in self-financing of development to the advantage of external sources. This might indicate gradual increase in maturity of the development mechanism in the researched enterprises. They are moving away from traditional financing conservatism towards the structure of supporting development processes in the highly developed economies.

In 2007 entities subject to the survey financed 61% of their innovative projects with their own resources. In 6 companies innovative activity was financed through own means in 100%, whereas in 2013 self-financing covered merely 47,2% of projects (full financing in four enterprises).

One could observe a shift in funding towards bank credit in the period considered. In 2007 this source was used to finance four innovative projects whereas in 2013 r. there were 14 such projects. Approximately 40% of respondents (37,6%) declared cooperation with commercial banks and vast majority (59%) evaluated it well. Moreover, the entities considered cooperation with international financing institutions such as EBI, EBOR, EFI. Pro-innovative structural EU funds are a vital source of external financing sources. In 2007 they constituted 27,9% of the sources of financing innovation, whereas in 2013 their share increased to 33%. Subsidies (without own contribution) from the European Regional Development Fund (ERDF), played an important role in financing business development among other EU supporting sources. In 2007 seven of the considered entities benefited from this source and the average contribution to financing innovative project stood at

30%. In 2013 thirty five companies took advantage of the financing support and the level of financing totalled 48,6%.

One should observe that the novel use of assistance funding to support innovations by means of repayable funds was not widely used in the researched period. Only one project in our sample was financed in 100% with these funds. Similarly, no external funding of innovation from the high-risk funds (VC, P/E, business angels) was identified. In the whole period of 2007–2013 it stood at 0%.

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The carried out empirical analysis enabled one to verify the hypotheses formulated in the theoretical part of the chapter concerning the key endogenous barriers for moving Polish economy to the innovative phase of development. The conclusions of the analysis indicate that:

- the fundamental growth barrier for the companies' investment propensity at the time of absorption of structural funds are related to the weakness of the institutional environment. It involves overregulation and excessive reactivity of legal norms, their poor adjustment to the needs of entrepreneurs as well as the existing legal loopholes;
- flawed tax regulations, excessive fiscal burdens and social insurance contributions, lack of tax incentives stimulating innovative activity;
- excessive bureaucracy in the process of structural funds allocations as well as corruption;
- relatively low quality of the human capital, poor creativity in making innovative decisions. This barrier concerns management team to a lesser extent;
- low level of the research personnel (predominantly scientific institutes) as well as the incompatibility of the education system with the labour market needs;
- information asymmetry and information gap between the science sector and enterprises inhibit innovativeness of economy. Lack of knowledge about the activity of research centres, sales markets, new technologies and consumer needs;
- one may observe increase in co-operation between enterprises, universities and research institutes;
- a major innovativeness obstacle is related to the malfunctioning of organisations allocating structural funds, extended period of verification of payment applications as well as execution of payments as well as poor preparation of institutions organising competitions for innovative projects supported by the structural EU funds;

- marginal role of intermediaries in transfer of knowledge form the R&D sector to enterprises (knowledge brokers);
- the fundamental significance of low maturity level of social capital maturity, low level of human trust as well as trust to institutions, low level of involvement in NGOs activities for the innovative propensity of business entities. Lack of mutual trust indicates a narrow range of horizontal links between business entities. It increases the level of transactional costs and limits participation of companies in clusters and networks;
- regardless of the conservatism of the structure of financing innovative activity one may observe slow progress towards gradual increase in the share of external financing of development including bank credit and the EU assistance funds. Involvement of the high-risk capital remains marginal;
- strategic changes of the development directions of enterprises resulting from the structural funding ought to be mentioned. Enterprises plan changes of the production profile in the long term as well as the shift from the cost strategies towards diversification strategy, moving away from the productivity maximising towards knowledge maximising;
- requests related to lifting innovative barriers expressed by enterprises focus mainly on the need to organise regulatory system, stabilising it in order to decrease the risk connected with making development decisions as well as transparency of the legal system, limiting autocratic procedures, lowering of the fiscal burden, creating incentives system for the science sector in order to transfer knowledge to enterprises (commercialisation of knowledge).

To sum up the study confirmed the key role of the present transitional phase of Polish economy from the investment-driven development stage to the innovation-driven stage in designating determinants and obstacles for the innovative activity of Polish enterprises. The main barriers for development include institutional limitations, changeability of the regulations which lead to the increase in investment risk as well as shortening of the horizon of development projections of enterprises. Another fundamental barrier relates to the immaturity of the social capital (lack of openness and trust) as well as the weakness of education system at all levels and the incompatibility of educational programmes to the needs of companies in the process of becoming learning organisations.

Chapter 4

# Demand Determinants of Innovative Processes in the Transitional Phase of Development

## Introduction

The strategies of enterprises and the economic policy of the state should be adjusted to the current level of competitive development of the industries and the countries (Porter, 1990). That level of development, conceived in stages, determines the opportunities, as well as the limitations and challenges that have to be faced by managers in enterprises and the persons responsible for the economic policy of the state. One of the key positions among the factors shaping these conditions is held by the characteristics of demand. They co-decide about the legitimacy of implementation of different competitive strategies by enterprises and the effectiveness of economic policy oriented at supporting the supply side of economy. The main way to influence enterprises is to affect their motivations to undertake different kinds of development activities; a lack of appropriate conditions, on the other hand, can impede the development of strategies specified by enterprises, discouraging these enterprises from undertaking them or impeding the achievement of competitive advantage, and in consequence the achievement of market success (Porter, 1990). Favourable conditions are ones which favour or even force undertaking actions serving to achieve competitiveness on an international scale; unfavourable demand conditions do not give enterprises appropriate signals and do not ensure pressure on seeking and developing more advanced competitive advantages (Porter, 1990). This is how demand conditions can also affect the structure of applications for public aid, and in consequence also the directions of allocation of this aid to enterprises.

A particular challenge for enterprises and economic policy is a transition to the higher stage of development (Porter, 1990). In the case of enterprises, it means the necessity to develop competitive advantages of the higher order. On the other

hand, from the point of view of economic policy the essential issue is the capability of the economy – both on the side of supply and demand – to develop the characteristics determining the achievement of a higher stage of development. In the case of the economy of Poland it is assumed that it is currently at the transitional stage of development between the investment and innovation stage, which is also indicated by the competitiveness rankings developed annually by the World Economic Forum. According to Porter a transition from the investment to innovation stage occurs when economy switches from the import of technologies to their development and at least in selected industries reaches the world technology frontier. Transition to the innovation stage is associated with a gradual loss of competitive advantage in industries characterised by standard products and clear advantages of scale, as the cost advantage that is typical for them is becoming increasingly hard to maintain due to increasing cost of labour and currency rates. The development of human capital enables gradual transition to the development of more advanced competitive advantages, and the loss of cost advantage simply forces such a transition. Therefore, companies gradually develop diversification strategies in domestic and foreign markets, increasingly developing sale networks, including the foreign ones, and investing in the brand (Porter, 1990).

As noted by Porter (1990), with the transition to higher stages of economic development, the role and significance of demand factors increases. At the investment stage the standard of living remains relatively low, so demand is relatively unsophisticated, therefore the more advanced products are oriented at export and reflect the tastes and needs of foreign consumers. At this stage, even if the consumers were characterised by high consumer awareness (the so-called consumer competences), their low purchasing power would strongly impede or simply prevent the translation of these competences to effective pressure on enterprises. An increase in affluence and demands of the domestic consumers makes them an increasingly important force and favours an increase of competitiveness by his purchasing power. The higher the purchasing power at the disposal of the domestic consumers, the more attractive they are to the producers; the more sophisticated are their tastes, the more important the role they play as the determinants of international competitiveness of domestic enterprises. In the transition to the innovative stage of economic development the priority is gained by a specific characteristic of demand – the inclination of the consumers to purchase innovative products. An increase in this inclination supports the profitability of innovative activity of enterprises – the higher this inclination on the side of the consumers, the higher the pressure on the producers and the more dynamic the market.

Successful development of innovative foundations for economic requires, therefore, development of favourable conditions on the side of the demand. The main purpose of this chapter is to answer the question regarding the possession of characteristics (preferences in particular) by domestic consumers that are advantageous from the point of view of undertaking all kinds of innovation activities in

Poland. Association of the presence of variety of preferences in reference to the product features with the behaviours of enterprises will help determine which demand characteristics favour development of what kind of competitive strategies and the related innovation strategies of domestic enterprises. One of the studied characteristics, which seem important in the course of making decisions related to innovation in enterprises is the attitude of the domestic consumers to the products of domestic and foreign manufacturers. The results obtained in such a way can then be used for more effective orientation of the innovation policy. An increase in effectiveness of public support for innovativeness of enterprises is a pressing problem due to Poland remaining from the moment of joining the European structures at one of the last positions in the EU in terms of innovativeness ($4^{th}$–$5^{th}$ position from the end in consecutive editions of the Innovation Union Scoreboard), regardless of vast assistance measures allocated for supporting innovation in domestic enterprises. These funds are widely spent with low effectiveness; therefore, and due to the priority of the role ascribed to the increase of innovativeness in the current EU framework programme, an increase of this effectiveness can be recognised as the essential challenge faced by the national economic policy. Moreover, this chapter is also meant to be an attempt to determine if it is possible for national institutions to take steps oriented at the demand side, conducive to an increase in innovativeness of the domestic enterprises and what steps these could be, In accordance with the theory it is possible to distinguish two approaches here: direct, by means of public procurements (and their external effects), and indirect, by means of influence on institutions. Finally, analysis will cover the issue of adaptation of the implemented market strategies to the perceived preferences of the consumers. For this purpose, the perceived preferences of consumers in reference to product features with market strategies of enterprises will be compared, and also the perceived assessments of the offer of the companies in terms of the particular features of the main product being the subject of the studied consumer preferences. Such comparisons will allow to assess the adjustment of the enterprises to the conditions of the environment (specify their strengths and weaknesses in the context of value carriers in a particular market) and offer recommendations concerning public (supply and demand) support for innovativeness of enterprises that are better adjusted to the real conditions and capabilities of these enterprises.

Achievement of these objectives requires taking several steps. The chapter is divided into three essential parts, the first of which is a review of literature, which plays the role of an introduction to the subject matter of the role of characteristics of demand for economic growth based on innovations and forms a basis for formulation of research hypotheses. First of all, a general overview is performed of the literature concerning the relation between the changes on the demand side of economy and economic growth, with particular focus on innovation. The axis of this analysis are changes in consumer preferences as the essential condition for the development of innovation activities and economic growth. Next,

the microeconomic theory of demand is introduced, and its main weaknesses are presented, which form a basis for development of more advanced analyses of the demand side, taking into account the results of empirical studies in the recent years, especially those focused on the mechanisms of formation and changes in preferences. The next fragment of this part of the chapter focuses on these mechanisms, which is used as a basis for understanding the sources of the current preferences of the domestic consumers. The first part ends with an introduction of a distinction between technological and cultural innovations, which further will become a basis for distinction within the framework of competitive advantage based on the functional product features and the symbolic ones (related to the image). A description of the research sample and the most important results of the conducted analyses, including their interpretation, are the subject of the second part of the chapter. The last part focuses on the conclusions drawn from the research and the recommendations for economic policy based on them.

## 4.1. The Demand Side of Innovativeness – a Review of Literature

### 4.1.1. The Demand Side of Economic Development

The complexity and multidimensionality of the processes of economic development resulted in the development of multiple theories seeking sources and explanations for these processes, attempting to predict the phenomena significant for development and suggesting a set of tools and strategies meant to ensure the achievement of development objectives. The most important among them – the linear models of economic growth stages, the structural models, the theories of international interdependencies, the neoclassical growth models, and the modern economic development models, such as endogenous growth models (Romer, 1986; Lucas, 1988) and the coordination failure model (coordination failure theory) – concentrate on the supply side of economy, treating the phenomena occurring there as decisive with regard to long-term growth dynamics and other characteristics of economic development. At the same time, these theories do not put much emphasis on the phenomena occurring on the demand side of the markets, usually assuming that consumption increases with an increase in the income (Witt, 2001a).

The adopted automatism in the growth of consumption is a consequence of an assumption fundamental to economy, stating that human needs are unlimited, and therefore expenditures are determined by the budget limit. However, considering the historically unprecedented rate of economic growth in the last

two hundred years,[1] the automatism of consumption growth with an increase in income ceases to be a clear matter and the question regarding the prospect of full satisfaction of demand including all the consequences for further economic growth is becoming well-founded. This in turn gives rise to an urgent need for a closer focus on what is happening on the demand side of economy, in order for further long-term growth to be possible.

At the current stage of academic development, we understand well that an increase in demand cannot just be an issue of continuous increase in consumption for the same products and services. Although this kind of multiplicative increase occurs to a certain extent, it cannot fully explain the observed rate of increase in consumption *per capita*, as the demand for many consumer products can reach the point of saturation (Witt, 2001b). J.S. Metcalfe (2001) notes that in the mentioned period of two hundred years economic growth was accompanied by the appearance of new consumer products and abandonment of the old ones, which suggests that both these processes (growth and new products) seem to be inextricably linked and interdependent. To go further, as demand for many products can reach the level of satisfaction and continued economic growth requires the progress of replacement of certain products with other ones, the changes in product offers (on the supply side) have to be accompanied by the changes in consumer behaviours (on the demand side). Therefore, it can be stated that what happens on the demand side of economy, i.e. that an increasing amount of products and services can be sold and consumed, should be an indispensable element in each theory of growth (Witt, 2001c, p. 1).

Analysis of the demand side of economic growth heads towards the direction of approach of evolutionary economics, which can be related to the fact that the conditions of demand constitute the most important mechanism of selection of products (and indirectly also enterprises), giving direction to structural transformations on the supply side. These structural changes can lead to (and they are a condition for) advancement of economies to the higher stages of development, based on more advanced competitive advantages. Therefore, this approach also seems appropriate for the fulfilment of the main objective of this work, even though in the evolutionary approach no stages of economic development are distinguished.

It should be noted here that evolutionary economics, oriented to a large extent at the understanding of economy, in which the economic development is driven by innovations, concentrates almost solely on studies of the supply side. This reflects the path of development for this research perspective – the supply side was the focus of attention for one of the fathers of evolutionary economics, Joseph Schumpeter; this issue was covered by a vast majority of more recent empirical

1 According to the data gathered by Harvey (2010, p. 27), production in capitalist countries in the years 1820–2003 increased almost 60-fold (from USD 694 bn to almost USD 41 tn, expressed in constant prices in USD from 1990).

studies and the most significant theoretical publications (such as Nelson, Winter, 1982). The conducted research mainly concerned such issues as: the behaviour of companies, the nature of technological processes and innovations, the competition and dynamic of industries and sectors. As written by Metcalfe (2001, p. 38): "It is an unfortunate feature of the Schumpeterian legacy that consumers are assigned too passive a role in the innovation process". Meanwhile, as noted recently by Nelson and Consoli (2010), since a significant part of innovations in capitalist societies occurs in the form of new consumer services and products, works on the economic growth driven by innovations must cover and realistically present what is happening on the demand side, in particular the reactions of consumers to new products and services.

The undertaken research has not resulted in the development of a comprehensive theory on the demand side of economic growth so far (Nelson and Consoli, 2010; Witt, 2001a). The researcher's efforts are to a major extent concentrated on a single, essential to such a theory, aspect of consumer behaviours, namely the role of consumer preferences in economic growth. Such approach is also assumed as the starting point in this chapter.

### 4.1.2. The Neoclassical Theory of Consumer Choice

The starting point for analysis of the role of the demand side in innovation-driven economic development has to be the microeconomic theory of consumer choice (theory of demand). This theory, developed in the neoclassical tradition, explains how a consumer decides to spend the limited resources that are at the consumer's disposal. This theory is supposed to explain what motivates a person making particular consumer choices, what limitations that person is subject to and how this translates to demand. It should be emphasised that this theory does not attempt to explain the choices concerning particular goods, but rather concentrates on the general rules underlying the process of consumer choices. This comment is important due to the fact that the further studies, including those conducted within the frames of behavioural economics, showed that the choice of particular products in different categories can be influenced by different factors, therefore these general rules are not able to provide hypotheses concerning the behaviours of consumers that would be sufficiently precise and valuable from the point of view of enterprises and economic policy.

Consumer behaviours are modelled here based on three main assumptions, which are presently known to distort the reality in a strong manner:

1) sovereignty of decision – a consumer makes a choice based solely on one's own preferences. Meanwhile, in reality the decisions of consumers are affected by numerous factors of social nature, leading to the lack of this sovereignty, e.g. in the case of taking into account how the decisions related to consumption will be perceived by the environment;

2) rationality of consumer decisions – a consumer makes a choice of such a combination of goods that maximises its utility within the framework of the consumer budget constraint. Studies show that in reality we often do not know our preferences and that we also adapt them to a purchase once it has been made;
3) unlimited needs – the needs of a consumer can never be fully satisfied, and a consumer always strives to reach a higher level of utility. In keeping with the traditional economic approach to consumption, according to which products are consumed and consumer preferences apply to them, it can easily be proved that the needs in relation to many products are actually limited, for example there is probably no person who feels the need to consume 50 hamburgers per day and does not have to prefer to consume more of them than less of them.

The central concept in the theory of consumer choice is utility. It is a measure of subjective satisfaction drawn by a consumer from consumption of a particular basket of goods. What is important from the point of view of measurement, utility is not an absolute (cardinal) measure, but an ordinal one, as a consumer does not assign satisfaction expressed in numbers to the baskets of goods, but a consumer can order baskets of goods with regard to their utility.

The basis for determining subjective satisfaction of a consumer from consumer choices (meaning utility) are the consumer's preferences. They define what basket of goods will be recognised as the best. In the theory of consumer choice it is assumed that a consumer has full information, is able to specify one's preferences unambiguously and compare any baskets of goods (assumption regarding completeness of preferences), whereas preferences are transitive (meaning that if a consumer prefers basket A in relation to B and B in relation to C, then will the consumer also prefer basket A in relation to C), so by comparing baskets of goods, a consumer behaves in a rational manner. This rationality applies to following the rules according to which a consumer orders basket of goods, not the reasons of such preferences or other. What we are discussing here is formal rationality, we do not evaluate nor estimate tastes, the system of goals, values or motivation. In the theory of consumer choice, the reasons why a consumer has particular preferences are not studied. Preferences are in this case of exogenous nature,

The traditional economic theory of consumer choice has from the 1970s been subjected to an increasing amount of criticism, as well as the attempts to extend or modify it. The most widely known extension to the theory of demand in economics is the theory developed by Prof. Kelvin Lancaster (1971). This book, according to the author, is supposed to constitute "a radical departure from the traditional theory of demand". The traditional economic theory of consumer choice is supposed to require redevelopment, as it ignores the features (properties) of products and concentrates on the products themselves. Meanwhile, a consumer is de facto interested in the very properties of the products. The mentioned 'radicalism' is meant to concern the following two aspects: (1) concentration on relations between the

subjects and properties, not between subjects and products, (2) emphasis, for the first time in the economic theory of demand, on the diversity of the consumers (and the distribution of their competences and budgets). According to Lancaster a consumer maximises the utility related to properties, which are acquired within the framework of the available budget constraint.

One of the consequences of the objection raised by Lancaster concerning the treatment by the traditional microeconomic theory of demand of products as a whole, not as a combination of properties, is its inability to predict the reaction of demand to new products. The problem of this inability, justified in different ways, belongs to the objections addressed most often in relation to it. Especially considering the vast significance of innovation for functioning of economies in the modern world the inability to offer valuable indications concerning the behaviour of demand in relation to innovative products significantly lowers the usefulness of this theory for the understanding of functioning of the demand side of economy and economic development. Due to the pursue of many countries, including Poland, to achieve the innovative stage of development, the significance of this limitation will continue to grow.

Limitations concerning the application of this theory in particular economic and civilisational conditions overlap with methodological reservations, including the ones concerning fundamental issues. The most determined critics include W. Hildenbrand (1994), who entirely rejected the idea of founding the theory of demand on the microeconomic theory of utility. He indicated the methodological limitations of the traditional approach, related to the assumption of existence at the aggregate level of a representative maximising consumer, as a result of which it is assumed that market demand is developed as if it was constituted by a single rational customer. Hildenbrand offered an alternative in the form of methodology concentrating on the issue of distribution of demand between households. In his depiction the issues of distribution are more important for explaining the development of demand than the issues concerning rationality (rational consumer choice).

Other authors also raise objections and doubts with regard to the concepts that are even most essential for the discussed theory, based on the results of numerous empirical studies. Of course, it is not possible to present an exhaustive review of the results of such analyses here. However, it is worth pointing out a few fundamental discoveries and conclusions drawn from the research on the process of making consumer decisions. Many authors invoked the main assumptions of the traditional theory, indicating, among other things, the issues raised in combination with the assumptions mentioned above. In addition, empirical studies undermined the validity of applying the concept of utility itself, showing for example that any utility should be ascribed to the states (e.g. the level of affluences), consumers ascribe utility to events (changes in the level of affluence) in relation to certain reference points (*status quo*) and they can evaluate the same objective result as advantage and disadvantage depending on the adopted point of reference (Aversi *et al.*, 1999).

This means that it is not possible to determine the indifference curves in isolation from the current possessions (the so-called endowment effect).

Many researchers are having a critical attitude towards the standard microeconomic theory of consumer choice and indicates the need to develop a more realistic theory of consumption, supported by empirical studies. Such attitude is primarily displayed by behavioural economists, institutionalists and the supporters of evolutionary economics. The most promising trend in their works designates a derogation from the assumption regarding constancy (exogenous nature) of preferences.

### 4.1.3. Changes in Consumer Preferences

The assumption of constancy in preferences adopted in the mainstream economics enabled major progress in modelling market behaviours of consumers and functioning of markets as a result of making it possible to concentrate on relative changes in prices and their influence on behaviours (e.g. Becker, 1976). Questioning this assumption, regardless of the achievements of other sciences which are unambiguous in this respect, has not attracted wide-ranged interest of the economists, which was shown by a very low number of texts on this subject matter in the leading economic academic journals and disregard for it in textbooks, even at advanced level (Frey, 2006). However, variability of human preferences is a commonly known fact and also within the framework of economics one can find researchers with interest in these issues. The deepest level of approach to this subject matter was probably that of Robson and Samuelson (2011), who depicted preferences as shaped by the years of evolutionary (natural) selection. They examined the biological process of evolution of preferences over millions of years, which led humanity to the current form of preferences, the driving force for which was survival and reproduction.

The more typical approach to explaining human behaviours in the context of changes in preferences was the application of the achievements of psychology in economics. This route proved productive, and the implementation of psychological theories in economic analyses enabled economists to identify a range of processes intermediary in changes of preferences, therefore supplementing the concept of change in preferences with rich content (Frey, 2006). Another research trend, which allows to understand the changes in preferences better are studies on happiness, which allow for better operationalisation of utility, which in turn enables empirical studies of changes in preferences (Frey, 2006). Yet another approach is based on extension of the analysis with the achievements of sociology, especially sociology of culture. This perspective emphasises the influence of culture and cultural changes on the formation and changes in preferences.

This latter trend turned out to be particularly productive from the point of view of understanding the roles of features of demand in economic growth. Its central recognition of the social nature of preferences, i.e. taking into account how they

are affected on one side by learning processes, on the other – by culture, allowed for better understanding of differences in economic development between societies (Postlewaite, 2011) and therefore it is of paramount importance for the fulfilment of the objective of this study. The rejection of economics according to Walras and a unidimensional image of a human as *homo economicus* and their replacement with the world of informational asymmetries and endogenous causes that effectiveness of management can depend on the features of particular sides to economic transactions, just as each of them can have motivations and bear influence on the preferences of the other side (Bowles, 1998). Moreover, since preferences are social in nature, one can attempt to influence them consciously by means of economic institutions. If preferences are under the influence of applied institutional solutions and policies, we cannot exactly predict nor reliably assess the probable consequences of a new economic policy or institution without taking into account the endogenous nature of preferences (Bowles, 1998). Planning, implementation and assessment of effectiveness of the tools of economic policy should take into account both the existing preferences of the society and the potential influence of these tools on these preferences.

Before we move on to the issues of forming and changing preferences, we should earlier define what we understand under the term of consumer preferences. Interestingly, this term is not defined in a majority of economic texts on this subject matter. Perhaps their authors assume that this is a concept that is commonly known thanks to the traditional microeconomic theory of consumer choice (according to which preferences are rules used by a consumer ordering baskets of goods) and therefore it does not have to be defined. Where this term is not specified, two approaches can be distinguished. First of all, consumer preferences are understood as the decision criteria applied by the consumers, and therefore as something different from the actual decisions made by the consumers at each purchase (e.g. Valente, 2012). This group includes for example the depiction of preferences by S. Bowles in the following way: *Preferences are reasons for behaviour, that is, attributes of individuals that (along with their beliefs and capacities) account for the actions they take in a given situation* (Bowles, 1998, p. 78; italics in original). The second group of definitions, usually used in the context of changes in consumer preferences, applies to changes in consumer behaviours caused by factors other than relative changes in prices (e.g. Frey, 2006). The existing turmoil is further deepened by the issue of difficulties with differentiation between the needs and preferences, as they are shaped in similar processes and it is often difficult to divide views on what needs to satisfy from the views concerning the methods of their satisfaction, which is also associated with the issue of limited competences in consumer activities (Nelson, Consoli, 2010). The earlier of the mentioned interpretations is adopted for the purposes of this study, which means that consumer preferences are understood as decision criteria applied by the consumers. Adoption of such an approach is related to the structure of the research questionnaire used.

Once the central concept of this part of work has been defined, we can move on to explaining the sources of consumer preferences. Until recently, we knew very little on how these preferences are formed. Bowles (1998) suggested that our knowledge on this subject is at the same stage as the theory of natural selection used to be prior to its integration with the Mendel's (the father of genetics) laws. Researchers who are critical towards the standard approach to the theory of demand indicate that preferences are formed in cognitive processes occurring in the minds of consumers who function in a social environment. We can therefore discuss two groups of processes: related (1) with cognitive and behavioural processes of choice and (2) with social embeddedness (Aversi *et al.*, 1999). Isolating the first of the mentioned group of processes, the learning processes occurring among heterogeneous individuals which belong to a single culture themselves lead to the development of individual differences in terms of consumer preferences. On the other hand, social embeddedness of consumer preferences means that to a certain extent preferences are formed under the influence of culture, and therefore they can differ depending on the cultural surroundings. In reality, we are dealing with interaction and interpenetration of these conceptually isolated processes. It is worth a note here that the idea of social embeddedness forces a distanced approach to individual structures of preferences and behaviour models as the sole foundations of consumer behaviours; instead of that we should take into account the collective adaptive behaviours (Aversi *et al.*, 1999) within the framework of a particular culture. This is related to the fact that in the process of 'culturalisation' individuals internalise the preferences of societies that they live in (Postlewaite, 2011). Therefore, preferences can be considered as cultural features, i.e. socially learned influences on behaviours (Bowles, 1998).

In another different interpretation there are two effects that are distinguished – on one side – of the cultural, and on the other – of the evolutionary mechanism of transfer of preferences (Bisin, Verdier, 2001). In the studies on the evolutionary selection mechanism preferences are usually considered to be shaped by way of imitation, whereas the mechanism of preference transfer as the monotonically increasing function of material benefits related to particular features that constitute preferences (Bisin, Verdier, 2001). In a cultural mechanism preferences are formed by way of adaptation and imitation, among other things under the influence of cultural surroundings, whereas the mechanism of transferring preferences does not have to be a monotonically increasing function of material goods associated with preferences.[2]

The basic channels for acquiring preferences are inheritance and learning (Bowles, 1998). It should be noted that in the analyses of the endogenous nature of preferences there is no reference to the maximisation of utility, rather the formation of preferences in the process of trials and errors, in which individuals experiment

2 For example, it can happen so because the parents who educate children use their own, not necessarily evolutionarily optimal preferences, to evaluate their activities.

with the available alternatives, they evaluate the choices made and try out new alternatives. As noted by Bowles, acquisition of preferences can be deliberate in nature, intentional, but their acquisition can be more important when acquired by means of: regular exposure to something, unintended consequences of actions oriented at different goals (such as migration to a different culture in search for work) or conformism. Preferences are acquired in a similar way as accent, inclination for a particular national cuisine, i.e. by means of processes that can, but do not have to be intentional, however, regardless of the way they are acquired, preferences are internalised, in other words the preferences acquired in particular circumstances lose association with the context and they become generalised motives of behaviour (Bowles, 1998). Other important mechanisms of preference may include economic institutions and advertising, as well as the learning process, in which, as noted by Bowles, behaviours bringing beneficial effects in on sphere of life are then transferred to other. Looking from a different perspective, preference changes can for example occur as a result of: social interactions and the development of certain 'consumption norms' in a population or its part, as well as introduction of new products (product innovations).

It is precisely in the context of innovations that the subject of preference changes gains particular economic significance. This is due to the fact that on one hand a purchase of a new (innovative) product requires a consumer to change preferences, on the other and – these changes in preferences of consumers influence the directions of innovative activities of enterprises (Safarzynska, van der Bergh, 2010). On one hand, new products stimulate learning of consumers and changes in consumption habits, on the other – these changes on the side of demand can and should be used in the design process of new products (Consoli, 2008). The interaction between demand and supply leads in turn to structural changes in economy.

Interactions between a change in preference and the structure of productions have been modelled many times (e.g. Zhang, 1998). The discussed issues raised particular interest among the researchers following the trend of evolutionary models in game theory. Empirical studies showed that the rate of diffusion of innovations varies and depends on the product and the heterogeneous features of the consumers (Consoli, 2008), which means that there is no automatism between the appearance of innovations and demand for them and therefore it cannot be assumed that the features of demand will not be significant for inclinations of enterprises for making innovative decisions. Therefore, consumer preferences should influence the market opportunities of enterprises, their competitive strategies, structure of production and in consequence also the structural changes in economy.

Further studies taking into account the heterogeneity of consumers, informational asymmetry and limited rationality, allowed to indicate a path of diffusion as corresponding to the features of information available in the surroundings (Consoli, 2008). According to such interpretation consumer choices taken into account by the buyer are a result of consumer knowledge – this affects what the consumers perceive as options worth considering. It should also be emphasised that the costs

related to learning and adopting new customs can result in a failure to use consumption opportunities due to insufficient resources, including money and time (Consoli, 2008). The availability of knowledge on innovations and competences of consumers therefore have, apart from the features of products themselves, fundamental significance for formation of demand for innovation, and therefore for market opportunities of innovative products.

Considering the subject matter of this work the greatest significance is that of influence of consumer preferences on the structure of production, market opportunities and competitive strategies of enterprises. Before we move on to the issue of relations between consumer preferences and behaviours of companies, it is reasonable to make a clear distinction between the utilitarian and symbolic features of products and to embed it in the context of consumer preferences.

### 4.1.4. Technological and Cultural Innovations

The final step in this work on the way to realistic representation of the functioning principles of the demand side of economy in the context of innovativeness and economic growth is to take into account in products, apart from the utilitarian features, also the symbolic dimension. The necessity of closer analysis of product features was already clear to K. Lancaster (1971), who emphasised that consumers not so much choose products, as their inherent features, however, among the 'significant' issues he only noticed the 'technological' aspects of a product – physical, chemical, etc. (nowadays we would refer to them as 'utilitarian') and totally disregarded, in accordance with the spirit of economic literature of the day, the sphere of perceived features (behavioural approach, nowadays we would refer to them as 'symbolic features'), concentrating solely on the 'objective' features.

It is worth noting in this context the concept of 'consumption as production', formulated in its most simple form by Gary Becker (1976) in his extension of the theory of demand, depicting consumption as a form of production, in which goods and time are treated as the factors of production (inputs). In the modern form (Ostergaard, Fitchett, Jantzen, 1999) this concept took a definitely more refined form. The starting point for analysis is the observation that in the present world almost all the products are mass-manufactured and mass-consumed (this process is referred to as 'commodification' – whereas these mass-manufactured products are interpreted and used by consumers to create their reality images, the process in which they are individualised. Therefore, although the mass-manufactured products are then mass-consumed, in the process of interpretation they are transformed into products that are unique for the customer, becoming carriers of individual meanings and emotions. Such transformation of mass products to things of personal significance is of essential significance for understanding consumption as the next process of production (Ostergaard, Fitchett, Jantzen, 1999). The quoted authors indicate that this process can be the

most important aspect of production/consumption, as it explains how consumers make consumption decisions – why they desire certain products and what benefits they draw from them.

Products in the process of design/construction and advertising gain meanings exceeding physical, often utilitarian, features of a product. These meanings may concern many issues, such as: prestige, success, attractiveness, effectiveness, dynamism and a range of others. G. McCracken (1986) describes a transition of meaning from a culturally formed world (each product derives meaning from the market it enters) to consumer goods through the system of fashion and advertising, and then from the consumer goods to the life of consumers, i.a. by means of rituals related to possession. Consumer activities are in this interpretation the final stage of the process of production.

In this context it should be mentioned that many economists (e.g. Aversi *et al.*, 1999) noted, following in the footsteps of sociologists, that consumption serves not only to satisfy 'specific' needs, but it is also an element in development of identity. One of the reasons for such state of things is that through consumption, adaptation can occur to the customs and norms of selected social groups, so it (and indirectly also consumption preferences) can serve to aim to improve the social status (Aversi *et al.*, 1999), potentially its maintenance. Thus, as indicated by the above-mentioned authors, consumption habits and their formation are embedded in the processes of socialisation and development of identity.

The specific meaning of the 'consumption as production' process refers to new products, i.e. innovative. U. Witt (2001b) suggests that consumption behaviours of individuals depend on their subjective knowledge on the subject of 'consumption technology' (methods of satisfying needs). Consumer knowledge therefore influences consumer behaviours, and thus the demand itself. Every innovation offers to consumers a chance to change their behaviour. Therefore, learning the mechanisms underlying the development of these preferences is of fundamental significance to market opportunities of product innovations (Metcalfe, 2001). The short analysis shows that apart from utilitarian features of new products, one should also take into account their symbolic features (concerning meanings). Economists usually identify innovations with technological innovations, whereas innovations concerning the symbolic sphere can have significant influence on the behaviours of consumers and the market success of a product. Hence the awareness of influence of the symbolic sphere on consumer decisions should not remain indifferent for competitive strategies in enterprises. The sphere of symbolism can constitute a separate field of competition, to a major extent independent from competing with the utility features.

Producers draw significant meaning from the culturally formed world, and they add it to their products. Therefore, a question arises concerning the influence of cultural differences between the country of origin of a product and the country of destination (target consumption). These differences, first of all, can affect the 'compatibility' of the symbolic features, developed in the country of origin, to

the reality of the country of destination. Secondly, in particular in relation to developing countries (but not only) the applying concept is that of 'culturalisation' of the consumers (national/local consumer culture), i.e. absorption of cultural meanings originating from dominant culture or cultures. The issue of consumer preferences in this scope is vastly significant for the development of demand, as it can considerably affect the relative market success of products similar in terms of utilitarian features, differing in terms of the country of manufacture or origin of the brand (the aspect of symbolic sphere of a product).

## 4.2. Empirical Studies

Since surveys were aimed at a selected purposive sample of innovative enterprises, it was not possible to analyse the preferences of national consumers directly, the only considered opinions were that of representatives of the studied enterprises in relation to theses preferences. A direct study of consumer preferences with regard to the chances of developing various innovation strategies is a natural direction of further studies. Such construction of the conducted empirical studies imposed a range of limitations on the scope of topics in the area of the demand side of economy that could have been a subject of analyses within the framework of the entire research project. The author centred his interests on several thematic blocks concerning the selected quantitative aspects of attractiveness of the markets in which the surveyed companies operate, the meaning ascribed by the consumers to different aspects of symbolic and utilitarian features of products in the markets of the greatest importance for particular producers, as well as the existence of influence of these features on the implementation of different development strategies by the enterprises. The auxiliary nature was that of the question concerning the source of ideas for innovations related to products (approximately equivalent to new utilitarian product features) and marketing (approximately equivalent to new symbolic features), which was supposed to show how much importance the domestic innovators attribute to internal and external sources, and within the framework of the latter ones – to domestic and foreign ones.

Statistical analysis covered the sample characteristics (of selected features), analysis of a range of correlations examining the adjustment of features on the side of the market (consumers) and enterprises, correlations between different goals of development strategies and ultimately the regression models examining the significance of selected characteristics of demand for gaining different competitive advantages (in the form of development goals), and therefore, one can say, the implemented and intended strategies.

### 4.2.1. Hypotheses

The fundamental purpose of this analysis is to specify what features of demand contribute to the enterprises expanding development strategies (and the related innovation strategies) based on the competitive advantages of the higher order. An answer to this question will help to determine the characteristics of demand, which not only make markets or their segments prospective from the point of view of development of innovative activity by domestic enterprises, but they are also conducive to increasing the effectiveness of the use of pro-innovative public aid. Competitive advantages of the higher order, which are – according to Porter (1990) – a basis for modernisation and advancement of economies, are product differentiation or own technology. It should be emphasised that according to Porter cost advantage unrelated to own technology does not constitute a competitive advantage of the higher order. Such an approach is – as it seems – valid due to the fact that in these situations advantage results from lower labour costs or application of external technology, which can hardly be recognised as a basis for reinforcement of international competitive position of an enterprise and economic advancement of countries. And it should be kept in mind that from the point of view of general social and general economic interest the goal should be to ensure increasing wages and premium prices for products on international markets (Porter, 1990). Based on conducted theoretical analysis it is worthwhile as a part of product differentiation to highlight the advantage within the scope of utilitarian features of a product and the symbolic aspects. The main premise for their delineation is the potential differentiation of the bases for gaining them, i.e. differentiation of strategies leading to its gaining.

The main hypothesis, assumed in this chapter, is: **consumer preferences affect the potential of gaining a particular type of competitive advantage (in the category of product features) of the studied manufacturers, as well as their developmental goals**.

Thus formulated main hypothesis is subordinated a range of auxiliary hypotheses. The basis for their determination is a review of literature conducted in the previous part, enriched with additional elements that due to their thematic distinction have not been included in this review of literature on the demand side of innovation and economic growth.

Extensive literature of the trend of the so-called absorption capacity indicates that in modern times for an innovation to succeed it is not sufficient to use the knowledge gathered and developed in an enterprise; it is also necessary to take advantage of external knowledge, which can come from many sources, such as: research entities, competitors, etc. The essential significance attributed to external knowledge for the development of innovations resulted in extensive literature describing the dependence of different types of innovation from sources of knowledge. For example, F. Todtling, P. Lehner and A. Kaufmann (2009) showed that owing to cooperation with universities and research entities, which gave more

'academic' knowledge at their disposal, more leap-type ('ground-breaking') innovations are developed, whereas incremental innovations and implementation of new technologies are more often an effect of interactions with business partners. Therefore, if enterprises from the examined sample are in line with the image of a transitional stage of economic development, they will take advantage to a greater extent of the knowledge on the side of competitors and consumers, and to a lesser extent from the knowledge of research and development institutions. Achievement of an innovative stage of development would suggest taking greater advantage of the knowledge of research and academic entities (in search for leap-type innovations) at the cost of competitors and consumers.

**H1: competitors and consumers are a more important source of ideas for innovations than research and development institutions.**

In accordance with the Porter's model (1990), a manifestation of an economy affiliated with the investment stage of development is the application of foreign design and technology, whereas at the innovation stage – development of own solutions in these areas, that is using domestic design (sources of knowledge). Therefore, the relative significance of knowledge from domestic and foreign sources for the development of innovation can be recognised as one of the indicators showing the degree of advancement of the transitional phase. Since the surveyed enterprises should constitute a specific elite of domestic enterprises (therefore be present in more attractive markets and segments), it should be expected that domestic sources of knowledge will be more important to them than the foreign ones. If that was not the case, this would suggest that Polish economy is maximally at the beginning of the transitional phase. Hence:

**H2: Domestic sources of knowledge are more important for enterprises than the foreign ones.**

If hypothesis H2 is true, this can suggest, in relation to consumers, that in given markets or in given segments they create advantageous conditions for the development of innovativeness. More extensive use of knowledge coming from domestic consumers than from the producers could therefore suggest that the demand factors are more conducive to international competitiveness of domestic enterprises (and therefore also the development of competitive advantages of the higher order) than the next two attributes of domestic surroundings in Porter's model (1990) – related industries and strategies, structures and competition between enterprises.

**H3: domestic consumers are a more important source of ideas for innovations than competitors.**

Should this hypothesis prove to be true, it would first of all emphasise the validity of close examination of the behaviours and preferences of consumers as the elements differentiating the behaviours of enterprises, including their inclination towards undertaking innovative initiatives and the profitability of such initiatives.

The next step in such a situation should be to take a close look at which characteristics of demand are correlated with which characteristics of behaviour of enterprises, which in turn would allow to identify the characteristics of demand which are essential from the point of view of innovativeness and pro-innovation policy.

In the light of the conducted theoretical analysis the essential significance in this context – as it seems – is that of differentiation of consumer preferences in relation to utilitarian features of products on one side and symbolic features on the other. The existence of differences within this scope will affect the profitability of undertaking innovative activities by domestic enterprises, and assuming their 'rationality' – also on undertaking such activities. Differentiation between utilitarian and symbolic features seems valuable due to the potential differentiation of the attitude of consumers to the products of domestic and foreign manufacturers in these aspects.

**H4: consumer preferences in reference to the significance of utilitarian and symbolic features affect the types of competitive advantage achieved by enterprises.**
**H5: consumer preferences in reference to the significance of utilitarian and symbolic features affect the development strategies undertaken by enterprises.**
In hypothesis H4 the phrase "types of competitive advantage" refers to the orientation of competitive advantage at the implementation of advantages in product markets related to the area of utilitarian or symbolic features.

It should be noted here that one of the determinants of the profitability of investing in innovations is the inclination of domestic consumers to purchase native products, referred to by the researchers on consumer behaviours as economic ethnocentrism, and often described by popular press as the element of the so-called economic patriotism. Studies conducted in different countries proved that the degree of intensification of preference in relation to domestic products varies and it depends, among other things, from the degree of economic development of a country, whereas it is higher in highly developed countries (Maison, Baran, 2014). In developing countries, where many products are not manufactured or they have a clearly lower quality than imported products, consumer ethnocentrism is weaker or a downright preference of foreign products appears (Maison, Baran, 2014). Since preferences of products both domestic and foreign can apply to a different degree to utilitarian and symbolic features, significant differentiations should be expected in particular product markets. Since stronger differentiation can be expected in relation to symbolic values (on one hand preference of trendy western brands at a particular level of utilitarian values, on the other 'consumer patriotism' should also apply in particular to the symbolic sphere of products), it is precisely this feature that should differentiate product strategies of enterprises more strongly.

**H6: consumer preferences within the scope of symbolic features are the most important determinant in product strategies of enterprises.**
By product strategies we understand in this context orientation at gaining competitive advantage within the scope of symbolic or utilitarian features. Since the surveyed sample covers enterprises which received pro-innovation public aid, it can be expected that it was mainly allocated to the area of utilitarian features of products – development of new utilitarian features or cost reduction/quality improvement resulting from a purchase of new, more modern and/or efficient machines. At the same time, development of symbolic features must have rather been financed by enterprises from other (non-free) sources, which, considering that this is usually a time-consuming and expensive process, was probably a less popular strategy and its effects were weaker. Hence:

**H7: enterprises achieve competitive advantage within the scope of utilitarian features more often than the symbolic features.**

### 4.2.2. Results of Statistical Analysis

Characteristics of the sample – enterprises and markets in which they operate

First of all, the specificity of the research sample has been determined. Surveys were directed to a selected group of enterprises meeting all the set criteria. The sample was purposive, therefore the obtained responses should not be interpreted as representative for all the society of enterprises operating in Poland. Due to the selection bias phenomenon, widely recognised in the literature, related among other things to a very low rate of return and numerous interactions with organisations which expressed any will to participate in the project, it would also be a mistake to treat the results as representative for all the enterprises meeting the set criteria. Considering the above, description of the sample is of major significance for the interpretation of the further results of the conducted analyses.

**Table 4.1.** Selected characteristics of the market of greatest importance to the surveyed enterprises

| Specification | Average | Mode | Minimum | Median | Maximum | Standard deviation |
|---|---|---|---|---|---|---|
| Estimated average annual sale dynamics on the market in the last 5 years (in %) | 0.35 | 0.07 | -0.10 | 0.15 | 1.92 | 0.47 |
| Forecast average annual sale dynamics on the market in the last 5 years (in %) | 0.30 | 0.15 | 0.00 | 0.15 | 4.00 | 0.57 |

Table 4.1 (cont.)

| Specification | Average | Mode | Minimum | Median | Maximum | Standard deviation |
|---|---|---|---|---|---|---|
| Estimated share (in %) of foreign brands on the product market of greatest importance for the enterprise in terms of quantity | 0.40 | 0.30 | 0.01 | 0.32 | 0.95 | 0.29 |
| Estimated share (in %) of foreign brands on the product market of greatest importance for the enterprise in terms of value | 0.42 | 0.70 | 0.01 | 0.40 | 0.95 | 0.30 |
| Is being a domestic manufacturer an advantage or disadvantage in the market of the most important product of your company? (1 – major disadvantage, 5 – major advantage) | 3.96 | 5.00 | 1.00 | 4.00 | 5.00 | 1.07 |

**Source:** own calculations.

The values obtained (cf. Tab. 4.1) for average annual dynamics for the last 5 years and the forecasts for the next 5 years seem entirely unreliable and they are most probably a result of erroneous interpretation of the question, which is indicated by the obtained maximum values (as high as 400% of predicted average annual increase within the next five years and 192% average annual in the last 5 years). Assuming to be more reliable the data concerning the Median (15% annual average, both for the last 5 years and the forecasts for the next 5 years) and the mode (respectively 7% and 15%), it can be stated that the surveyed enterprises are operating in highly dynamic markets, therefore in the conditions of environment that are favourable in this aspect.

It is also highly advantageous to the surveyed enterprises to perceive being a domestic producer as an advantage (an average of 3.96 on a five-degree scale). Such a high level of the indicator proves a high so-called consumer ethnocentrism, which is a characteristic of highly developed countries, which approximately corresponds to the ones at the innovative level of development. The obtained result seems either to confirm the development of characteristics typical of the innovative stage of development by the demand side of economy, or to suggest a highly advanced specificity of the sample of enterprises, in particular the enterprise-market

pairs. Regardless of which interpretation is correct, the obtained result indicates that demand plays a major role in the activities of enterprises (the result 3.0 could be recognised as 'neutral') Interpretation of advantages resulting from such attitude of the consumers depends, however, on the adopted research perspective. On one hand according to Porter's interpretation (1990) consumers' preference of domestic producers reduces competitive pressure on the latter ones, facilitating their competition on the market, and simultaneously if such preferences cannot be assumed for foreign consumers, this does a disservice to the development of international competitiveness by the domestic producers. On the other hand, the so-called consumer patriotism, manifesting in the inclination to purchase goods and services of domestic companies, is promoted in a significant number of countries, and not only by organisations which associate producers, but also by economic policies of the government, which suggests the validity of such a goal from the point of view of broadly understood socio-economic advantages.

Proper understanding of the specificity of the markets in which the analysed companies operate is required in order to interpret the results concerning behaviours of the enterprises. One of the questions that we asked in the surveys concerned the penetration of the market for the product of greatest significance to each company by the foreign producers (products of foreign brands). Extensive literature on international management indicates that a foreign producer's entry in a given market can cause positive external effects for local companies by means of knowledge diffusion or negative external effects in the form of crowding out. Crowding out can be particularly clear and dangerous in the markets of innovation follower countries, where competition of international corporations on the local host markets – the markets of products, labour, but also capital – can be particularly strong. In this chapter the area of interest is limited to the market of products. Therefore, the adopted research problem solely concerns the perspectives created by an introduction of a foreign product for innovativeness of enterprises in the host country, i.e. Poland. In one of the few empirical studies of this type conducted in the Spanish market, García, Jin and Salomon (2013) proved the presence of negative influence of FDIs on the innovativeness of domestic enterprises (measured by the number of patent applications and product innovations). Although the independent variable differed in this research from the one adopted above, due to the correlation of the occurring mechanisms which intermediate in forwarding impulses, a similar result should be expected for the influence of entry of foreign competitors on the local market regardless of the form of this entry (FDI or export), and differences should be limited to the force of impact (lower in the case of actions limited to export expansions). According to the result obtained by García, Jin and Salomon (2013), intensification of competition related to the entry of foreign companies on the market crowds out the domestic competitors to less innovative market niches. In consequence, domestic producers in industries dominated by foreign players introduce fewer innovations on the market ex post (García, Jin, Salomon, 2013, p. 232). These results are in strong contrast with the results of most empirical

studies on the influence of FDI on the productiveness of local enterprises, which in general show a positive correlation – an inflow of FDI has a positive influence on the productivity of domestic companies.

A relatively low average share of foreign brands in the main markets where the surveyed enterprises operate (40% in terms of quantity and 42% in terms of value), seems to suggest either their past and present clearly above-average competitiveness on the national scale (that they did not let themselves be crowded out of the market), or the existence of a significant market area of low attractiveness to the foreign producers. A comparison of medians and averages in value and quantity suggest the first option, i.e. that the analysed enterprises can by recognised as competitive above average and acting in relatively attractive sectors of the market. In accordance with the research results presented above, markets with limited participation of foreign brands do not limit the innovative activity of the domestic enterprises in a significant manner. With such a result, one can expect above-average innovativeness of the surveyed enterprises on a national scale, which is confirmed by the criteria adopted for the selection of the research sample.

**Table 4.2.** Consumer-perceived significance of the factors presented below in the product market of greatest importance for enterprises

| Factors | Average | Mode | Minimum | Median | Maximum | Standard deviation |
|---|---|---|---|---|---|---|
| Price | 4.71 | 5.00 | 1.00 | 5.00 | 5.00 | 0.67 |
| Brand | 3.45 | 4.00 | 1.00 | 4.00 | 5.00 | 1.32 |
| Fashion | 2.14 | 1.00 | 1.00 | 2.00 | 5.00 | 1.31 |
| Environmental friendliness | 2.82 | 3.00 | 1.00 | 3.00 | 5.00 | 1.35 |
| Social responsibility of the producer | 2.86 | 1.00 | 1.00 | 3.00 | 5.00 | 1.48 |
| Aesthetics/design | 3.07 | 4.00 | 1.00 | 3.00 | 5.00 | 1.30 |
| Reliability | 4.23 | 5.00 | 1.00 | 5.00 | 5.00 | 1.02 |
| Long service life | 3.58 | 4.00 | 1.00 | 4.00 | 5.00 | 1.28 |
| Additional functional features (additional functions) | 3.29 | 5.00 | 1.00 | 3.00 | 5.00 | 1.41 |
| Distribution of average values: brand, fashion, environmental friendliness, social responsibility of the producer, aesthetics/design | 2.91 | 4.00 | 1.00 | 3.00 | 5.00 | 0.93 |

| Factors | Average | Mode | Minimum | Median | Maximum | Standard deviation |
|---|---|---|---|---|---|---|
| Distribution of average values: reliability, long service life, additional functional features (additional functions) | 3.76 | 3.67 | 1.00 | 4.00 | 5.00 | 0.93 |

Note: scale from 1 to 5, where: 1 —no significance, 5-major significance.
**Source:** own calculations.

Among the analysed product features, including the price and different aspects of functional and symbolic values, the ones most significant to the consumers include price (4,71), followed by reliability (4,23). The significance of the other features can be evaluated as moderate (2,14–3,58), whereas when aggregating the aspects of utilitarian and symbolic values one can see that the earlier ones are clearly more important in the given markets (respectively 3.76 and 2.91). A direct question regarding the significance of utilitarian and symbolic features (Table 4.3) gave similar results in terms of direction, whereas the difference between them was clearer (4.58 compared to 3.10). In addition, attention is drawn here to a very high level of significance of utilitarian features (4.58), close to the significance of the price factor indicated earlier (4,71). A definitely higher standard deviation should be noted in the case of significance of symbolic features (1.38) than the utilitarian ones (0.84), which indicates greater variation between the markets in relation to the first of the mentioned features.

**Table 4.3.** Significance of utilitarian features and image-related (symbolic) features for the consumer in the given market

| Features | Average | Mode | Minimum | Median | Maximum | Standard deviation |
|---|---|---|---|---|---|---|
| Functional (utilitarian) LO | 4.58 | 5.00 | 1.00 | 5.00 | 5.00 | 0.84 |
| Image related LP | 3.10 | 4.00 | 1.00 | 3.00 | 5.00 | 1.38 |

Note: scale from 1 to 5, where: 1 – no significance, 5 – major significance.
**Source:** own calculations.

**Table 4.4.** Domestic consumers' inclination to purchase market novelties in the product market of the greatest importance to the enterprise

| Specification | Average | Mode | Minimum | Median | Maximum | Standard deviation |
|---|---|---|---|---|---|---|
| Domestic consumers' inclination to purchase market novelties in the product market of the greatest importance to the enterprise | 3.20 | 4.00 | 1.00 | 3.00 | 5.00 | 1.21 |

Note: scale from 1 to 5, where: 1 – very low inclination, 5 – very high inclination.
**Source:** own calculations.

The domestic consumers' inclination to purchase market novelties in the product market of the greatest importance to the enterprise was evaluated as average (3.2), whereas a clear variation appeared within this scope (standard deviation 1.21).

Moving on from the perceived features of the main market in which the surveyed enterprises operate to the features of the enterprises themselves, we primarily focused on the sources of knowledge, which is a basis for the performed (product and marketing) market innovations.

In the aggregate expression (sources within the enterprise, external domestic and external foreign sources) we obtained almost identical results, which indicates that all these sources have a similar meaning for the enterprises (at average level). Going into details, it is worth a note that the single most important source of knowledge is for the surveyed the foreign competitors, which the products (and marketing) of the enterprise probably imitate. Among the external domestic sources on the other hand the greatest significance is that of consumers, and among the internal sourced – employees of one's own R&D department. It can therefore be assumed that foreign competitors are perceived as more advanced, whereas their solutions are fit to be adapted in Polish conditions, or at least they present a valuable source of inspiration, and domestic competitors are less valuable here, which can arise from an advantage of the surveyed enterprises over the domestic competitors (implementation of different strategies addressed to different segments would mean that they are not actually competitors).

**Table 4.5.** Source of ideas/inspirations for product and marketing innovations

| No | Specification | Average | Mode | Minimum | Median | Maximum | Standard deviation |
|---|---|---|---|---|---|---|---|
| 1 | Competitors in the domestic market | 3.15 | 4.00 | 1.00 | 3.00 | 5.00 | 1.38 |
| 2 | Domestic consumers | 3.76 | 4.00 | 1.00 | 4.00 | 5.00 | 1.27 |

| No | Specification | Average | Mode | Minimum | Median | Maximum | Standard deviation |
|---|---|---|---|---|---|---|---|
| 3 | Domestic R&D and academic centres | 2.60 | 1.00 | 1.00 | 3.00 | 5.00 | 1.26 |
| Distribution of averages 1, 2, 3 | | 3.20 | 3.00 | 1.00 | 3.17 | 5.00 | 0.93 |
| 4 | Producers in the foreign markets | 3.84 | 5.00 | 1.00 | 4.00 | 5.00 | 1.26 |
| 5 | Foreign consumers | 3.62 | 5.00 | 1.00 | 4.00 | 5.00 | 1.30 |
| 6 | Foreign R&D and academic centres | 2.22 | 1.00 | 0.00 | 2.00 | 5.00 | 1.27 |
| Distribution of averages 4, 5, 6 | | 3.27 | 3.33 | 1.00 | 3.33 | 5.00 | 0.91 |
| 7 | Employees of the R&D department of the enterprise | 3.64 | 5.00 | 1.00 | 4.00 | 5.00 | 1.44 |
| 8 | Employees of the marketing department of the enterprise | 3.20 | 4.00 | 1.00 | 4.00 | 5.00 | 1.48 |
| 9 | Other employees of the enterprise | 2.49 | 2.00 | 1.00 | 2.00 | 5.00 | 1.26 |
| Distribution of averages 7, 8, 9 | | 3.23 | 3.67 | 1.00 | 3.33 | 5.00 | 1.18 |

Note: scale from 1 to 5, where: 1 – no significance, 5 – major significance.
**Source:** own calculations.

The least significant for the surveyed companies were the domestic and foreign research and development units. This result seems to confirm hypothesis **H1** predicting lowest significance of knowledge from research and development institutions for the surveyed enterprises. This result suggests concentration of the surveyed enterprises on incremental innovations. A slightly lower significance of domestic than that of foreign ones does not allow positive verification of hypothesis **H2**, whereas clearly higher significance of domestic consumers than competitors seems to confirm hypothesis **H3**.

Supplementing the characteristics of the surveyed enterprises with additional aspects, we described the sample in reference to the price segment to which they target with their offer (Tab. 4.6). Table 4.7 shows an assessment of the owned

competitive position (advantage) in terms of many product attributes, which constitute utilitarian and symbolic features.

**Table 4.6.** Price segment targeted by the offer of the enterprise

| Specification | Average | Mode | Minimum | Median | Maximum | Standard deviation |
|---|---|---|---|---|---|---|
| Which price segment the offer of the enterprise targets | 3.56 | 3.00 | 1.00 | 3.00 | 5.00 | 1.19 |

Note: scale from 1 to 5, where: 1–low, 5–high price segment.
**Source:** own calculations.

The offer of the surveyed enterprises is most often directed at the average price segment, whereas here it should be noted that the difference between enterprises is significant (standard deviation 1.19), which means that in the sample there are also enterprises operating in low and high price segment.

**Table 4.7.** Assessment of the product offer of the enterprise by the consumers

| No | Specification | Average | Mode | Minimum | Median | Maximum | Standard deviation |
|---|---|---|---|---|---|---|---|
| 1 | Brand | 3.94 | 4.00 | 1.00 | 4.00 | 5.00 | 1.03 |
| 2 | Fashion | 2.84 | 3.00 | 1.00 | 3.00 | 5.00 | 1.35 |
| 3 | Environmental friendliness | 3.47 | 3.00 | 1.00 | 4.00 | 5.00 | 1.23 |
| 4 | Social responsibility of the producer | 3.31 | 3.00 | 1.00 | 3.00 | 5.00 | 1.27 |
| 5 | Aesthetics/design | 3.55 | 4.00 | 1.00 | 4.00 | 5.00 | 1.14 |
| Distribution of averages 1, 2, 3, 4, 5 | | 3.51 | 3.00 | 1.00 | 3.60 | 5.00 | 0.98 |
| 6 | Reliability | 4.23 | 4.00 | 1.00 | 4.00 | 5.00 | 0.78 |
| 7 | Long service life | 3.97 | 5.00 | 1.00 | 4.00 | 5.00 | 1.06 |
| 8 | Additional functional features (additional functions) | 3.59 | 4.00 | 1.00 | 4.00 | 5.00 | 1.23 |
| Distribution of averages 6, 7, 8 | | 3.98 | 3.67 | 2.00 | 4.00 | 5.00 | 0.77 |

**Source:** own calculations.

Moving on to the assessment of product offer of the enterprise, we asked the surveyed about the perception of their offer in terms of particular utilitarian and symbolic aspects (cf. Tab. 4.7). We excluded the assessment of product price from

the analysis, as the obtained result would simply be impossible to interpret, as a high price could be perceived both as a disadvantage and an advantage; such results would cancel each other out to a degree that is not possible to estimate. We were satisfied with the previously mentioned information that the producers address their offer mainly to the average price segment. The data presented in Table 4.7 clearly shows that competitive advantage is primarily singled out by the enterprises in the utilitarian sphere of the products (an average of 3.98), especially in reliability (an average of 4.23). On the other hand, the symbolic aspects were evaluated on average at the level of 3.51, and the assessment of their ability to compete in the field of fashion was turned out to be particularly weak. This result correlates with the assessment (the lowest among all of them – 2.14, although the maximum value indicated here was 5 – cf. Tab. 4.2) of the significance of this feature for the consumers, which suggests that the surveyed enterprises mostly operate in 'non-fashionable' industries and this (limited significance) can be a main reason for the low position within this scope, not low effectiveness.

Summarising the characteristic of the markets of greatest significance for the surveyed companies it can be stated that the surveyed enterprises operate in dynamic markets, where being a national producer is an advantage, the price and utilitarian features, especially reliability, are most important for the consumers, the foreign producers have gained control over approximately 40% of the market, whereas in this latter aspects there is a great variety, whereas consumers are characterised by average inclination to purchase market novelties (also with a high variety in this feature). In such markets the surveyed enterprises address their offer to the average price segment, and they see their advantages mainly in the utilitarian aspects of the products (again, reliability is most significant) among the symbolic features, assessing their own brands as the best. These enterprises develop incremental innovations, using to an equal degree the domestic and foreign knowledge, whereas the consumers dominate among the domestic sources.

### 4.2.3. Regression Models

In the next step regression models were developed referring the potential market advantages of the main product to the features of the domestic market, including the perceived consumer preferences in relation to many aspects of products in a given market. These models were supposed to show how much for an ability to gain a certain type of advantage (in the category of product features) of the surveyed manufacturers are selected market features significant, including the consumer preferences dominant in a particular market in relation to the evaluated product features.

The procedure of development of regression models was as follows. A range of dependant variables corresponding to the enterprise-perceived advantages of their offer within the scope of particular product features. For each such variable

regression models are presented for the full scope of variables (price, inclination of domestic consumers to purchase market novelties, being a domestic manufacturer as an advantage or disadvantage, average annual sale dynamics for the last 5 years, prognosis for the next 5 years, estimated share of foreign brands in terms of quantity, price segment targeted by the offer, significance of utilitarian aspects for the consumers and significance of symbolic aspects for the consumers) and reduced to the model coefficients that are statistically significant (maximum significance level allowed in the models 0.1, in accordance with the methodology of iterative elimination of insignificant variables). Next, the same procedure was repeated in relation to the set of dependent variables covering developmental goals.

In the case of the dependent variable 'price' in the final model the remaining were, apart from the constant, the estimated average annual sale dynamics on the market in the last 5 years (in %) and the symbolic/image aspects of the products with Beta coefficients respectively 0.323 and 0.421 with significance 0.07 and 0.021. These results can be interpreted in the following way: the ability to compete with product price is significantly and positively affected by the significance that consumers associate with the symbolic features of the offered products, whereas positive influence, however, with significance outside the typical range of 0.05, also market dynamics. In other words, the greater the significance of symbolic/image features of a product for the consumers, the higher the probability that the surveyed producers will be able to compete with the price effectively. Competing (effectively) with the price in thus far dynamic markets, in which consumers value the image features of a product (an aspect of differentiation) with a simultaneous lack of significance of the variable of addressing the offer to a particular market segment suggests that these producers have lower costs or they accept lower margin, whereas operating in one price segment or another does not influence the behaviour of enterprises within the discussed scope. This in turn suggests competing at the 1st stage of (with production factors) and can significantly impede financial expansion with external capital or means better (cheaper) production technologies.

In the case of effective competition (being distinguished) by means of brand the following predictors turned out to be significant: the estimated share of foreign brands in the market and the symbolic/image aspects of the products (Beta coefficients respectively – 0.384 and 0.551, significance respectively $p = 0.007$ and $p = 0.0004$), whereas the market segment was close to being significant (Beta = 0.268, significance $p = 0.058$, i.e. slightly over 0.05). Effective brand competition is favoured by higher significance attributed by consumers to symbolic values of products, lower share of foreign brands in the market and the presence of the company in the higher price segment (in the latter case the standard significance threshold 0.05 is not maintained).

Effective distinguishing by means of fashion is favoured by significance attached to symbolic aspects (including fashion) by the consumers, whereas negative influence arises from significance attached to utilitarian aspects (Beta respectively: 0.895 and –0.698, $p = 0.0002$ and $p = 0.002$).

In the case of effective competing by means of reliability statistically significant are again the symbolic/image aspects of products (Beta = 0.601, $p = 0.0009$): the greater the significance of symbolic values for them, the easier it is for the surveyed companies to effectively compete by means of product reliability, i.e. the functionality aspect.

In the case of effective competing by means of long service life the statistically significant are again the symbolic/image aspects of products (Beta = 0.481; $p = 0.0009$), whereas the level of significance 0.05 is slightly exceeded by the average annual dynamics of sale on the market for the next 5 years (Beta = –0.334, $p = 0.059$). Lower expected market dynamics favours effective competing by means of long service life of the products.

In the case of additional utilitarian features the only predictor worth of note (Beta = 0.366) is the importance of utilitarian features in the market, however, the significance of this factor $p = 0.072$ does not meet the threshold 0.05.

The ability to compete effectively by means of environmental friendliness influences functioning in a market where being a domestic manufacturer is a disadvantage according to the consumer (Beta = –0.404, $p = 0.021$), the consumers are motivated by symbolic aspects (Beta = 0.707, $p = 0.0001$), the foreign brands have a low share (Beta = –0.321, $p = 0.056$, i.e. above the threshold) and the predicted sale dynamics in the market for the next 5 years is high (Beta = 0.299, $p = 0.064$, above the 0.05 threshold). For the sake of order, one should note a certain inconsistency in being a domestic producer and share of foreign brands in the market).

In the case of effective competing by means of social responsibility of the producer the only significant predictor (Beta = 0.533, $p = 0.003$) is again the meaning of symbolic/image aspects of the products.

Finally, in the case of effective competing by means of aesthetics/design, the significant predictors are: the meaning of symbolic/image aspects of the products (Beta = 0.798, $p = 0.002$) and an inclination of domestic's consumers to purchase market novelties (negative dependence, Beta = –0.539, $p = 0.028$). This result should be recognised as alarming, as it suggests that for the surveyed enterprises it is hard to compete effectively by means of design in dynamic markets, where quick technological progress is accompanied by advanced design. These are the markets that can be described as markets of the future, which offer control over the consumers' minds and high margins to effective players. In order to 'justify' the surveyed companies it should be added that effective competing in such markets requires very high competences enabling effective participation in the technological race, as well as huge scale of functioning, which would enable and justify making very high expenditures on R&D, including design.

A conclusion arising from the regression models discussed above which should be recognised as very interesting is that the most significant, most often appearing as significant, predictor of effectiveness of implementation of particular analysed advantages in product markets is the significance attributed by the consumers to symbolic/image aspects (as statistically significant predictor it appears as many as

eight times, whereas the other predictors one time at the most, with maintained 0.05 significance threshold), which allows for positive verification of hypothesis **H6**.

At the same time hypothesis **H4** (consumer preferences in reference to the significance of utilitarian and symbolic features affect the types of competitive advantage achieved by enterprises) was only partially verified positively, as it turned out that while symbolic features turned out to be a significant predictor for gaining competitive advantages in the case of the eight listed product aspects, utilitarian features turned out to be significant only once (negative dependency in reference to the ability to distinguish by means of the fashion aspect).

The second group of models concerned the significance of influence of the same independent variables on the strategies (development goals) adopted by the enterprises. The development goals for which the importance was subjected to assessment were: increased share in the market, increased profitability, moving to a higher price segment, improved brand perception and foreign expansion.

Adoption of the market goal in the form of increased share in the market was favoured by *low* importance attributed by the consumers to product price (Beta = –0.362), however, the significance of this dependency $p = 0.054$ exceeded the standard 0.05 threshold slightly. The negative dependency mark can seem surprising at first sight, as an increased market share is a typical goal of cost leadership strategy, which seems more appropriate in a situation when consumers attach major importance to the price of products. However, it can be noted that the above-mentioned relationship also means that the higher consumer sensitivity to the price, the lower the inclination to 'jostle' in such a market (acceptance of the existing price conditions), and therefore greater inclination to pursue alternative goals possible.

In the case of dependent variable "increased profitability" only the constant entered the final model. As far as the next goal in the form of moving to a higher price segment is concerned, it was favoured by: importance attributed by consumers to symbolic features (Beta = 0.582, $p = 0.008$), price (Beta = 0.539, $p = 0.015$), assessment of being a domestic producer (Beta = –0.528, $p = 0.018$), addressing the offer to a higher price segment (Beta = 0.489, $p = 0.022$), higher sale dynamics for the last 5 years (Beta = 0.446, $p = 0.039$) and lower predicted dynamic for the next five years (Beta = –0.386, dependence statistically insignificant, $p = 0.073$). It should be noted that high sensitivity of consumers to product price inclines the producers to move to the higher segment (which explains the above-mentioned negative correlation of the importance of price for the consumers and the goal of the enterprise in the form of increased share in the market) and it increases with the worsening perception of being a domestic producer, with the lowering predicted market dynamic and the higher the segment the offer addressed at the starting point, i.e. price was not the only one to compete with.

In the case of the goal to improve brand perception none of the predictors turned out to be significant, the closest to this was the inclination of the domestic consumers to purchase market novelties (positive correlation) and participation of foreign brands (negative correlation).

Lastly, in reference to the foreign expansion goal in the final model also no predictor turned out to be significant, and the one closest to this was the perception of being a domestic producer as an advantage in the market (Beta = 0.354, $p = 0.60$).

To summarise, hypothesis **H5** (consumer preferences in reference to the significance of utilitarian and symbolic features affect the development strategies undertaken by enterprises) was not verified successfully, due to the weakness of the regression model.

### 4.2.4. Conclusions and Recommendations

Association of the presence of variety of selected features of demand, including preferences in reference to the product features with the behaviours of enterprises helped to determine which demand characteristics favour development of what kind of competitive strategies and related innovation strategies of domestic enterprises. The most important conclusions include:

1. A relatively high level of consumer ethnocentrism favours development of innovations by domestic enterprises.
2. The limited level of foreign brands' market expansion suggests a weak crowding out effect, and therefore a significant freedom in development of innovative activity of domestic enterprises.
3. At the same time, regardless of the higher dynamic of the markets, the consumers are characterised by limited inclination to purchase market novelties. This significantly reduces the validity of undertaking such actions.
4. Consumers in the markets where the surveyed enterprises operate, making decisions related to consumption, are primarily motivated by price, then the utilitarian features and finally by the symbolic features. This is also therefore the order of the features deciding about the competitive advantage of enterprises.
5. Used as inspirations for product and marketing innovations, sources of knowledge suggest the interest of producers in incremental innovations (as opposite to the leap innovations), high importance of preferences of domestic consumers and the competences of the producers in foreign markets.
6. The surveyed enterprises most often address their offer to the middle price segment.
7. The surveyed enterprises see the competitive advantage more in the utilitarian sphere of the products than in the symbolic sphere. They perceive their offer as particularly good within the scope of reliability and as particularly poor within the scope of the aspect of fashion.
8. A price advantage is easier to develop for enterprises in markets with high significance of symbolic aspects and high historical dale dynamic. Effective competing with price with a simultaneous lack of significance of the market segment suggests that these producers have lower costs or they accept lower

margin and they are inclined to 'cut down' the prices in every price segment, which suggests a low inclination to make "discretionary" expenditures, especially brand development.

9. When the enterprises are effectively distinguished by the brand, it is favoured by the significance of symbolic features for the consumers, as well as low share of foreign brands in the market.
10. Effective distinguishing by means of fashion is favoured by significance attached to symbolic aspects by the consumers, whereas negative influence arises from significance attached to utilitarian aspects.
11. The higher the significance of the symbolic values for the consumers, the easier it will be for the surveyed companies to compete effectively with product reliability, i.e. the aspect of functionality.
12. Effective competing with long service life is favoured by high significance attributed by the consumers to the symbolic aspects of products.
13. The ability to compete effectively with environmental friendliness is affected by functioning in the market where being a domestic producer is a disadvantage in the eyes of the consumer, and the consumers are motivated by symbolic aspects.
14. Effective competing with social responsibility is again favoured by high significance attributed by the consumers to the symbolic aspects of products.
15. Effective competing with design is favoured by high significance of symbolic aspects, as well as low inclination of domestic consumers to purchase market novelties.

A comparison of selected features of demand, including consumer preferences with the competitive advantages gained by the domestic producers leads to interesting conclusions: these enterprises find it most easy to compete in the markets where the symbolic features of products are more important for the consumers, whereas they compete with many product features in this case. Importantly, greater importance attributed by the consumers to symbolic features favours achievement of competitive advantage by domestic enterprises both within the scope of different constituent symbolic and utilitarian features. This also applies to competing with a price. Other features of the markets turned out to be of low significance in our studies, poorly differentiating the ability of domestic enterprises to gain competitive advantages. It should also be noted that in none of the cases has the dependence in relation to symbolic values not turned out to be negative, therefore these results can be summed up by indicating that it is easier for the enterprises to achieve advantage in the markets where consumers attribute high value to symbolic features of the products. A high inclination of consumers to pay for symbolic features suggests the possibility of gaining relatively high profit margins, however, a range of alarming signals, indicating many limitations, causes that – as mentioned above – enterprises primarily compete with prices, then with utilitarian values, and only in the end with symbolic features. In other words, it is easiest to gain a competitive advantage in the markets where consumers attribute particular

attention to symbolic values, but the domestic enterprises primarily compete there with price, then with utilitarian features, and only in the end with symbolic features. Such approach means that enterprises do not engage in direct competition with foreign competitors ('in an open field'), but they retreat to fight for lower gains.

Reduced ability to undertake open competitive struggle, taking into account that the surveyed enterprises were supposed to constitute an elite of the domestic companies, does not invoke optimistic thoughts and suggest that in their mass they need time and effort to change their attitudes. This is the context in which a questions should be raised for the appropriate role of policy of the state – should it favour the improvement of a competitive position of enterprises with the maintenance of current attitudes, or should it rather attempt to influence the existing attitudes of companies and attempt to modify them in the direction of ones more conducive to the development of innovation-based economy, although such a goal would be definitely harder to achieve.

The results of research presented in this chapter show that support for innovative activity of enterprises operating in the markets where consumers attribute particular attention to symbolic features of the products increases the probability of their success in a significant manner. Therefore, taking this factor into account in the decisions to allocate public funds intended to support innovation of enterprises could be recognised as rational.

Considering the behaviours observed so far and the advantages of domestic enterprises, it would be logical to support the efforts oriented at the development of advantages within the scope of utilitarian values of products. Economic policy has, or in any case it should have, the goal to support structural changes in economy that are beneficial from the point of view of general economic and general social interest. One of the ways to implement such transformations can be demand-side innovation policy. Such a policy can be implemented via multiple channels and cover the sphere of tough regulations, financial instruments (subsidies, taxes, government-set prices), as well as direct purchases by the government. Such actions may, however, prove insufficient due to preferences rooted in consumers, which also (as mentioned in the theoretical part), are not set once and forever, but they can and do undergo gradual changes. Informational and educational policies seem to be particularly significant in this case, as they address the issues of preferences directly.

The starting point for this type of actions should be to specify the direction we want the markets to follow, whereas the tools used to follow the adopted goals should be selected and implemented. A limited scope of conducted empirical studies, particularly the lack of consumer studies, does not allow us to formulate definitive postulates. However, a few recommendations should be noted, which will aid in broader understanding of the essence of the demand-side innovation policy.

The most evident postulate is to support the inclination of consumers to purchase innovations, which could be supported, among other things, by purchase

subsides, setting high standards for product marketing authorisation, especially with regard to user safety, but primarily information and education, oriented at change in attitudes. Another activity could be to support positive perception of innovative brands of domestic producers, which could be supported by, for example, competitions. The behaviours of the most important people in the state, including celebrities, can constitute a reference point and a kind of model for many people, so it would be good for them to promote the attitudes favouring the development of the markets, Finally, the awareness of consumer preferences and the potential influence on them allows to address the demand-side innovation policy more precisely, increasing the effectiveness of expenditures concerning public funds, owing to their allocation to undertakings adjusted to the current shape of demand, or better in supporting the desired transformations within this scope.

Chapter 5

# Supply Factors of the Innovativeness of Polish Economy in Transitional Development Phase

## Introduction

Domestic and international studies indicate low innovativeness of the Polish economy in comparative analyses. This happens despite large efforts of businesses and an unprecedented influx of European funds. Existing theoretical achievements and comparative reports based on data from studies and statistics including international standards, provide no basis for explaining this paradox.

The objective of the analysis is to identify the supply-related conditions of innovative processes in the transitional development phase of Polish economy. The analysis concerns the adaptation of different types of businesses to the limited demand and long list of barriers in their innovative activity in the context of absorbing public aid from the EU.

The role of innovative policy is gaining importance in the functioning of present-day economies. Succeeding in this area is not easy. It turns out that allocating public funds, attracting international concerns spending huge sums on research and development, creating special zones, investing in scientific and research infrastructure plus having modern transport and IT infrastructure is not enough. What seems to be helpful in solving this puzzle is the historical approach, taking into account the evolution of social and economic system and understanding social and cultural conditions.

The literary output of innovation economics helps answer this question. Innovation economics is a field of study characterised by rapid development, which is a result of combining different lines of research. They were oriented on the needs of economic theory and policy (*Oslo Manual*…, 2005, p. 28).

It is both the strength of this approach and its weakness, with the latter resulting from the lack of adjustment to rapidly changing conditions of management and

the growing needs of different groups of economic operators included in the innovation processes. New types of innovation emerge, and the specialised economic policy instruments to influence them grow in numbers. Conditions of managing change. The processes of disseminating new technologies generate space for new innovations. The importance of understanding these processes and the functioning of economic operators implementing them is, therefore, increasing. It is vital in the context of economic policy, which, without taking into account the fluctuating circumstances, cannot have corresponding policies for the needs of rapidly changing conditions.

## 5.1. Theoretical and Research Basis

Innovation economics is still an open area of study. It comprises the origins of innovation in companies, driving forces of innovation, and the factors that inhibit those processes. This requires learning the mechanisms inside the companies and the rules adopted to influence them. Intangible components play a very important role in the processes of innovation. That role is based on the characteristics of knowledge, the method of building that knowledge and its flow among individual operators. Innovation economics distinguishes between macro level, focused on the connections at the national scale or in the international system, and meso level, i.e. sector-oriented and regional.

There already exists a developed system for the measurement of innovative processes, but the use of the data we obtain by applying it is still a major challenge. It causes growing need for empirical research, statistical studies, econometric analyses and theoretical syntheses that would allow the accumulation of knowledge about the behaviours of innovative companies in order to compare them with the behaviours of companies that do not perform such activities, and also in order to identify the types of such behaviours. Creating a coherent theoretical base for these studies is still a big challenge, despite the existing theoretical and research output which is quite impressive. G.M.P. Swann, author of the book *The Economics of Innovation. An Introduction*, reviews the works of twenty prominent economists who were also the biggest contributors to this field of study. The long history of this school of economics, and the positions of its creators in economic theory are noteworthy. Analysing this output will help better understand innovation processes and their multidimensional meanings. First, Swann enumerates two classics of economic thought: Adam Smith (1723–1790) while John Rae (1796–1872). A. Smith focused mainly on the distribution of labour as the source of innovation, while J. Rae demonstrated the opposite view, as he perceived innovation as an important factor of prosperity (Swann, 2009, p. 8). Today, from the perspective of the

21th century, it is difficult not to notice the importance of the networks of connections and their huge impact on the present-day innovative processes (Swann, 2009, p. 14). Few remember that this issue was scrutinised by economists as early as the 19th century. John Stuart Mill (1806–1873) was the first to note that innovations are not always beneficial for everyone, pointing, at the importance of the originality of an invention and the accompanying paradox of positive impact on the well-being of only the chosen few.[1] Karl Marx (1818–1883) saw the key role of innovations in the economic development and their importance in competing. In the production process he sought the key element of the capitalist system, which contributes to changes in social relations (Swann, 2009, p. 20). Another co-creator of innovation economics was John Ruskin (1819–1900). Many areas now regarded as a certain breakthrough in thinking about innovations were already subjects of interest to the of 19th century economists. One of them was Henry George (1839–1897), who also included the costs of innovations in his works (Swann, 2009).

The works of Alfred Marshall (1842–1924) is also of significant importance to innovation economics. He was the first to note that the attribute of innovativeness is not assigned only to the producer. The consumer can be innovative too. This even allows us to speak about the Marshall consumer. This specification is very close to the modern trends related to the demand approach to innovation, the basis of which was founded on the works of Eric von Hippel and Fred Gault. The result of the above is the concept of *innovative consumer* or *innovations created by both the user and the recipient*.[2] We must not ignore here the contribution of Alfred Marshall (which focused on impact on local level), who initiated a very important research trend in innovation economics related to the developing, functioning and impact of clusters.[3]

The sources and the scale of the market activity of innovation are also a big challenge for present-day economics. It is worth noting in this context the output of Thorstein Veblen (1857–1929), who, as an author who combined economic and sociological issues, recoined the saying "necessity is the mother of invention" into "invention is the mother of necessity", by pointing at an area which is very much utilised in marketing, namely creating needs by innovators. In this sense, we are talking about the Veblen consumer. One can even hazard a statement that it is consumers themselves who play the main role in creating markets for innovations (Swann, 2009, p. 11).[4]

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1 A similar view – cf. Swann, 2009, p. 10.

2 Cf. F. Gault, 2010, pp. 150–152. These issues are in the centre of research today. Significant in this matter was also the presentation by E. von Hippel in a conference, organised by the Working Party of National Experts on Science and Technology Indicators OECD (NESTI OECD) on 25–27 September 2006 in Ottawa, titled "Blue Sky II 2006. What Indicators for Science, Technology and Innovation Policies in the 21st Century?".

3 The works of A. Marshall in the field was popularised in Poland mainly by Barbara Despiney Żochowska.

4 For more on the topic, cf. Swann, 2009, pp. 192–194.

Another unquestionable authority on innovation economics is Joseph Schumpeter (1883–1950). His revolution in economics involved indicating the duality of the concept of innovation by showing that innovation creates, but also changes, and oftentimes also destroys, the existing conditions. Schumpeter named this process creative destruction and it found its solid place in economic theory and practice. One cannot overvalue these works in the understanding of innovation process and market changes. The innovator gains competitive advantage and creates new value which translates into a loss of competitive advantage of a rival company. Schumpeter shows that the strength of this process is much greater than price competition. This approach is therefore different from the paradigm of neoclassical thought, which gives priority to price mechanism.

Joseph Schumpeter argued that economic development is driven by innovations in a dynamic process, whereby old technologies are replaced by new ones. In his opinion, significant innovations cause ground-breaking changes, whereas minor changes ensure the continuity of the development process. He put forward five types of innovations: introduction of a new product, introduction of a new production process, opening up of a new market, securing of a new source of raw materials or other inputs, and creation of a new organisational structure in an industrial sector.

Schumpeter's works also provide analyses of innovative activity. They gave us broader understanding of the matter. These concepts of product, process, marketing and organisational innovations, further ingrained by the *Oslo Manual*, made their way to economic theory, research and practice on the global scale. Another luminary in this field of economics was Lewis Mumford (1895–1990), who focuses on the social mechanism of innovations, emphasizing the advantage of innovative process connected with the development of watches and its effects on the establishment of even such ground-breaking inventions as the steam engine.

Other economists whose works influenced the present-day shape of innovation economics include John Kenneth Galbraith (1908–2006) and E.F. Schumacher (1911–1977). They introduced to economics the entrepreneurial trend, but on two separate levels: Galbraith focused on the opportunities to create demand for innovations by managers, while Ernst Friedrich Schumacher, a co-creator of the basis of innovation economics (but also of the basis for the studies on innovative entrepreneurship), was famous for his book titled *Small is Beautiful*,[5] which became an inspiration to several generations of researches, and its importance for the dissemination of innovative entrepreneurship cannot be overrated.

Many outstanding experts on innovation economics highlight the unprecedented contribution of Chris Freeman (1921–2010). He was not only an educator of many generations of innovation researchers, but also became an unmatched example of investigative attitude, intransigence and openness to new fields of knowledge.

5 This book was published in Poland, with an introduction by a prominent Polish sociologist, Jan Strzelecki (Schumacher, 1981).

He paid attention to the multidisciplinary nature of innovations and the limited capacities of economics to encompass the entire area of that field.

One must also not ignore the importance of the academic output of 1972 Nobel prize winner Kenneth Arrow (1921–2017) for innovation economics. In 1962, he noted the limitations of market mechanism (market failure) in relation to innovation and demonstrated that the market economy faces underinvestment of research and invention (in the context of available capacities), because these are risk--bearing activities. The situation related to the fact that products have to be useful only to a certain level, and with growing profits connected with them. Underinvestment will grow when faced with higher expenditure on fundamental research. The more the company engages in increasing the value in this direction, the higher the waste of information in comparison with perfect allocation.

Another Nobel prize winner who made a lasting contribution to innovation economics is Robert Solow (1924–). He made mainstream economics treat technological progress as an endogenous factor of high importance. He also demonstrated that technological progress can be more important than capital growth. Solow also noted the paradox connected with innovations, which he paraphrased by saying that we see computers everywhere apart from productivity statistics. This statement is known as the IT productivity paradox.

One notable trend of research in the area of innovation economics is seeking similarities between the world of organisations and the experience coming from life science research. The result is evolutionary theory of the firm (Nelson, Winter, 1982a). These studies bore fruit in treating innovation as a system (Lundvall, 1992; Nelson, 1993) – cf. (*Oslo Manual*…, 2005). P. Swann emphasizes particular contribution of Richard Nelson (1930–) as a co-author of innovation economics. It is hard to overestimate the influential work *An Evolutionary Theory of Economic Change* (Nelson, Winter, 1982a), which focused on the evolutionary thread in innovation economics. By utilising Schumpeter's approach, the authors demonstrated how economy and innovations evolve together. They also indicated why innovations are such a challenge to businesses. The majority of organisations rely on standard rules of behaviour and avoids changes which may disturb those rules. The more complex the organisations are, the greater the impact of those standard rules on their operations. Innovations bring changes to routine. Innovations necessitate changes in the way we think. Some employees may perceive them as positive, but others may not. There appears a cloud of uncertainty until the rules are stabilised.

The progress of science had a very strong influence on shaping the points of interest for innovation economics, especially in terms of investigating the impact of innovations and technological progress on the effectiveness of corporations. They were accompanied by works connected with the impact of innovations on research and development in the form of positive external effects and spill over effects. Particularly noteworthy in this context are the works by Paul Geroski (1952–2005). He also made a significant contribution to research into the diffusion of innovations, thereby giving a basis for further studies in the area.

Very important in the context of innovation economics is the academic output (in terms of evolutionary theory of the firm) of such Nobel prize winners in economics as: Herbert Simon, author of the theory of bounded rationality of organizations; Leonid Hurwicz, a co-author of the decision and risk theory; and Olivier Williamson, originator of institutional economics. The list should be supplemented with the names of prominent econometrists, without whom further progress of research on innovativeness would be impossible, such as: Zvi Griliches, Jean Mairesse, or the creator of industrial dynamics, Jay W. Forrester. In fact, the list is much longer. Mention should also be made of a group of distinguished authors of industrial economics, such as Richard Schmalensee, Nobel prize winner, Jean Tirole, (for strategy and competition researches), or Michel Porter, or such fathers of institutional economics as Masahiko Aoki.

We must also mention the Polish contribution to innovation economics, in the area of multidimensional microeconomic foundations of economy, i.e. the output of such authors as: Paweł Glikman, Cezary Józefiak, Michał Kalecki, Tadeusz Kasprzak, Krzysztof Matusiak, Jan Mujżel, Urszula Płowiec, Władysław Świtalski, Klemens Szaniawski and Sławomir Szwedowski.

The literary output of innovation economics is growing rapidly, although there are doubts regarding the coherence of its theoretical basis. There are many existing connections between macroeconomics and microeconomic models. We still lack approaches that include microeconomic bases of economy utilising the literary output of economic and interdisciplinary research (Balcerowicz, 2008). Microeconomic basis of economy defined by Michał Kalecki comprise a good underlying basis in this matter. They take into account the elements of the business cycle, the distribution of profits, and the problems of technological progress. This approach is still an unrivalled model for further research.

Summing up, we may state that innovation economics is developing. It combines many disciplines and economic concepts that are based on several different theoretical perspectives, but at the same time bring many valuable remarks in the area of development, industrial economics actions in uncertain conditions, references to evolutionary and institutional approaches.

Organisational innovations have great potential, as they involve not only a reconstruction of structures, adaptation and learning processes, but also technological and environmental transformations, market changes, as well as areas oriented towards either growth of effectiveness or elimination of ineffectiveness X (Harvey Leibenstein). The issues of corporate management and the literary output of institutional economics are closely related to the above-mentioned matters (Olivier Williamson, Ronald Coase). We should also mention at this point the studies related to value chains, connection networks (Michael Porter) or solutions inspired by fractal geometry (Benoit Mandelbrot), such as fractal organization, and also to experiences collected in the area of cluster theory.

Evolutionary concepts bring broad development perspectives and practical uses, as they present innovations as a process connected with a ready-shaped

development path, where knowledge and technologies are born. The influence on their creation is exerted by process participants and other factors. A key role in this process is ascribed to the relation between innovative enterprises and their social and economic environment, which have their impact on the directions of changes. Such factors as demand and commercial applicability influence decisions regarding production structures or the attractiveness of a market technology. Evolutionary approach implies broader inclusion of market and institutional context, and the treatment of them as elements of the system.

Recipient, household, and enterprise are all operators building the basis of economy. They operate in different social, economic and institutional environments. Nevertheless, we can distinguish qualities that are independent of the environment and those that depend upon it. All of them are characterised by their age and certain development path.

In economic practice, one of the most frequently asked questions is whether you are born an entrepreneur or whether you become one as a result of actions. This question has been a subject of international studies for nearly 50 years now. These studies have showed that some identifications of entrepreneurial capacities, tendencies to become an entrepreneur or entrepreneurial effectiveness, have genetic nature. Analyses in this area are included in a group called entrepreneurship genetics (*Handbook of Research on Innovation…,* 2011, pp. 471–485).

The environment in which these entities operate may, to various extents, influence their functioning, and may be beneficial to the entirety or part of their operations. This, on the other hand, may cause internal tensions in their functioning and a need to develop specific procedures of overcoming barriers.[6] These procedures should include challenges linked to internal conflicts, which result from the impact of institutional and individual barriers to innovative entrepreneurship (*Handbook of Research on Innovation…*, 2011). New challenges appear before it in connection with international concerns operating on a global scale (Iammarino, McCann, 2013).

Also important are the achievements of evolutionary approach in the areas of analyses, research and description of the coherence of innovative policy (*European Science and Technology Policy. Towards…*, 2009) including funds for research and development (Duchene, Lykogianni, Vebek, 2009, pp. 193–213). Emphasis is laid on the sources of distance of the European Union in terms of innovativeness (Dosi, Llerena, Labini, 2009, pp. 214–236). The main focus is put on the policy in the area of technology transfer (*The New Economics of Technology Policy*, 2009; cf. also Dosi, Nelson, 2010, pp. 52–127) and the question of its effectiveness (Nelson, 2009, pp. 7–32). The analyses also relate to the structures of knowledge concerning innovative policy (Malerba, 2009, p. 33; cf. also Antonelli, 2011, pp. 3–59). The area of interest includes new policies in the area innovation connected with the

6 Those barriers were covered in details in further part of the study.

activities oriented at supporting prosumer attitudes and innovations supported by recipients (Von Hippel, 2009, pp. 327–336; cf. also Von Hippel, 2010, pp. 411–427).

An important area of research is describing the achievements of individual countries where innovative policy succeeds (Arvanitis, Sydow, 2009, pp. 231–247; cf. also: Hollenstein, 2009, pp. 248–271; Hotz-Hart, 2009, pp. 272–277; Soete, 2009, pp. 401–408; Tjatenberg, 2009, pp. 409–419). The focus here is on areas connected with the development of new technologies influencing the development of markets. It mainly concerns ICT (Greenstein, 2010, pp. 478–537). The areas of interests of innovation economics in the scope of innovation involve not only traditional sectors (Pardey, Alston, Ruttan, 2010, pp. 939–984), but also new areas, such as eco-innovation (Popp, Newell, Jaffe, 2010, pp. 873–935).

Before we move on to issues related to measuring and studying the actual processes, it is worth stopping and thinking about where innovation economics and its importance for the development of economics belongs, and for the development of interdisciplinary studies. The variety of paths these fields of studies have trodden shows the scale of cognitive challenge in terms of measurement. Special focus should be put on the role of research of innovation economics for the purposes of buildings microeconomic basis for the economy, as well as in terms of socio-economic growth and progress.

Innovation economics has a long history. It is also a discipline in which openness, creativity, and entrepreneurship must have their reflection in marketing and effectiveness despite high level of uncertainty and the related risk. The research into basic economic operators and public institutions involved in innovation processes, their qualities, changes and barriers for continuous growth, requires ongoing observation. Ontological research is also required to identify the main actors, their typical behaviours and decisions in both tangible and intangible matter.

Observations should focus not only on real processes, but also on the impact of economic policy instruments in conditions shaped under different types of national innovation systems (Weresa, 2014), and their importance for economies (Weresa, 2016) and the commercialisation of new products and services (Klincewicz, 2011). Studies should include the activity of international corporations investing in research and development (Poznańska, Kraj, 2015) and the impact of processes occurring on an international scale. It is important to study innovative potentials (NBP, 2016) and the opportunities to include them in the endogenization of monetary policy (Łaski, 2015). It requires development of international multidimensional comparative studies, such as OECD (2016). The need for new information solutions for innovative policy is growing. These include knowledge-based instrument[7]

7 The question of whether to apply big data and the search for new instruments to science and technology policies was included in the programme "The Blue Sky 2016 Forum" in Ghent, Belgium. This area comprises works performed in the Polish Academy of Sciences in the area of building knowledge based-instruments (Baczko, Kacprzyk, Zadrożny, 2011, pp. 129–140) while using, among others, the artificial intelligence method (Kacprzyk, Zadrożny, Baczko, 2013, pp. 91–107).

adjusted to the needs of entities participating in innovative processes.[8] They should help allocate production factors and ensure market, production and development effects for initiators of innovative processes, their performers and for operators building knowledge structures and value chains. They should contribute to the increase of well-being and satisfaction of people.[9]

A key role in management and monitoring is played by systematic research of innovative processes. They require specialised statistical analyses in both national and international systems. The system approach is a valuable basis for the development of the above-mentioned research and for the improvement of measurement. It facilitates the analysis in time of innovative processes including key subsystems and their interaction.

The system approach to innovation allows us to include the impact of external institutions on other participants of innovation process. It also allows us to include the transfer and diffusion of ideas, skills, knowledge, information and other signals. This implies that system analyses should be performed for the forms of knowledge transfer as well as socio-political and cultural conditions influencing innovation processes in that scope. It is particularly important to include the dynamics of innovative processes when knowledge is being built under the process of learning and interaction. This approach allows us to shape and assess innovation systems on regional, national and international levels.

With the system approach, it is possible to take into account institutional aspects, especially legal regulations, public policy on particular markets, and the roles of public authorities. It also facilitates the performance of multi-level research and measurements.

The area of these decisions is particularly responsible in the light of previously described innovative processes. Some allocations imply long periods and high risk. Developing allocation schemes, including key stakeholders (concerned operators), building new information and knowledge structures and institutional forms based on public-private partnership, is, in this case, burdened with high risk. The situation requires new forms of reducing this risk, decreasing information asymmetry and building new financial instruments to improve allocation.

The main reason behind the low effectiveness of pro-innovative structural EU funds and low innovativeness of enterprises is the current development phase of Polish economy, i.e. transitory stage between economy stimulated by efficiency

8 Studies indicate growing opportunities to use and develop such type of instruments in a form of innovation assessments, ranking lists and other forms of use for the needs of recipients (Baczko, Puchała-Krzywina, 2013). They can be used in a process of implementing intelligent specialisations, as shown by the World Bank Group report (2016), as well as in improving knowledge management structures in organisations (Wyrwicka, Grzybowska, 2010).

9 These issues are highlighted in the OECD Report (2015a). It is also compliant with the vision included in the foreword by Jerzy Buzek, President of the European Parliament, to the book *European innovation…* (2011).

growth (investment phase) and economy stimulated by innovation with the development paradigm set on maximisation of knowledge.

The level of development of 'catching-up' economy is not adjusted to the requirements of the absorption of external financial stimulators of creative innovativeness. Therefore, we should ask ourselves what restrains Polish enterprises on their way to economy with the development paradigm set on maximisation of knowledge; what makes it difficult to create motivation for enterprises to be more innovative and adaptive to current conditions of their functioning.

Conditions for innovation processes[10] may be economic, organisational, socio-political, but also psychological, sociological or historical. Users' requirements and the state of technical and scientific knowledge are also important. Among other conditions, significant are also those resulting from the company environment (micro and macro). These include, among others: scientific and technical institutions; institutions and organisations supporting and acting as intermediaries in innovation (business incubators, science and technology parks, guidance centres); entities dealing with technology and industry business, implementations, commercialisation of solutions; local and regional environment, local economic climate. Also important are: innovative policy and innovation system of a given country, institutional and market conditions, education system, institutional solutions. Factors shaping innovative processes on the level of the environment and enterprise, and legal factors among them (including legal and tax regulations) are also emphasised by the authors of the *Oslo Manual…* (2005). Innovations are also affected by the capacities of companies to obtain the rights to benefits resulting from their innovative activities. If companies are unable to protect their innovations from imitating competitors, their motivation to innovative activities will be lower. The role of human capital (education, qualification, experience, employment structure) is noted, inter alia, by K. Poznańska (1998; cf. also Janasz, Kozioł, 2007).

Another important factor is National Innovation System – NIS (Weresa, 2012). NIS encompasses various organisations, such as enterprises, institutions (financial, foreign policy, especially related to innovation and science) and consumer preferences. In discussing NIS, we can speak about cultural dimension, comprising a system of values that is common for a given territory, customs, and political dimension which concerns institutions and innovative policy (legal and educational system, stimuli and incentives of innovation policy. Poland is in a group of countries with developing innovation systems (catching-up NISs). It cannot catch up with the leaders, such as. Finland[11] (dynamic NIS). The institutional conditions

10 Some factors influencing the transition from the current development stage of Polish economy to economy stimulated by innovation will be more broadly specified in further part of this paper.

11 The key to build innovative position in Finland was the development of internal assets – local human capital, investments in education and national scientific and research base (Weresa, 2012). Innovation-oriented policy and developing new technology (creating, improving productive factors, such as knowledge, creativity, innovativeness). Institutional factors (funding

of the functioning of research and development area and education sector are key factors, as they indicate the methods and the strength of interaction among the other elements of innovation system. Experiences of other countries show that institutional solutions, including innovative policy, its tools and objectives, are the main catalyst for the process of technology accumulation in individual countries.

Institutional environment has overwhelming influence on the transition of a country to innovative stage of development. Among the institutional barriers we can enumerate both formal ones, which are manifested in institutions poorly adjusted to market economy, and informal, in the form of customs, tradition, culture, informal codes of behaviour (Starczewska-Krzysztoszek, 2007).

Research by PKPP Lewiatan shows that absorption of EU structural funds would undoubtedly increase after the reduction of the existing barriers, including debureaucratisation of the system, whereby "formal duties prevail over essential ones, and quantity approach prevails over quality (at the stage of applying for funds – low quality of project assessment, at the stage of implementation and settlement – prevalence of quantity indicators over essentials and quality of undertakings" and reducing the unpredictability of the "system as a result of information and organisational mess (no reliable schedules for contests, protracted application assessments)" (*Czarna lista barier…*, 2014).

Another important issue in the context of transition to economy stimulated by innovation is horizontal links – clusters and networks. Barriers related to the use of technology are a consequence of poor contacts and marginal cooperation with research and development sector. In Poland, this situation is cemented by a tradition of leaving regional and scientific circles in isolation, which adds to the poor understanding of the needs and interests of the other side. Regional authorities may implement ready solutions ignoring the opportunities for developing solutions in cooperation with intraregional R&D sector, but the effect will imply deepening of isolation of these sectors, low demand for research, and in consequence low exploitation of the internal potential or research and development area (Hadyński, pdf). The essence of local skill resource as innovation stimulator is indicated also by M.E. Porter (1990; Weresa, 2012).

Much information on the identification of innovation barriers is provided by innovation surveys conducted by GUS.[12] GUS's surveys demonstrated that

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of knowledge development, organisations supporting the generation and exploitation of knowledge, cooperation networks, informal institutions related to economic culture and social climate) were particularly important in building knowledge-based economy. Industrial policy was closely linked to scientific policy and technological development. It was based on the concept of sectoral groupings – segments of economy composed of co-dependent industries linked to one another with various connections, e.g. related to production, technology, R&D, and scientific and design organisations cooperating with these industries (Stachowiak, 2009).

12 The system of statistical surveys of innovative activity of companies conducted by GUS is based on international methodology called the Oslo system (after the title of methodological manual for statistical surveys concerning innovations, developed by OECD and Eurostat

nearly 15% of industrial enterprises and approx. 13% of service sector encountered problems linked to the lack of qualified personnel in 2008–2010 (*Działalność innowacyjna przedsiębiorstw w latach 2008–2010*, 2012), and in 2010–2012: 9.4% of industrial enterprises, 10.8% of service providers, respectively (*Działalność innowacyjna przedsiębiorstw w latach 2010–2012*, 2013). Poor adjustment of education system to market needs is also an obstacle in knowledge development. The qualifications of staff, both internal and external to the enterprise, are also important in this respect. Human capital plays an important role in the transition to the innovative stage of development, as it forms the basis of shaping the development, and its high quality is favours creation of innovations and new technologies – areas that stimulate further progress of human capital. The awareness of knowledge, competences and experience, i.e. qualities that define knowledge-based economy, is also significant. Oftentimes, however, the state of social awareness, particularly that of SME sector enterprises, regarding the acknowledgement of the role of technology, remains low. Therefore, the inability to absorb new ideas and related technologies, and exploiting that potential, constitutes a barrier for further progress (Hadyński, pdf; Porter, 1990). It is important to understand the expectations of consumers and to offer them exceptional solutions.[13]

Another important aspect in innovation is the way of motivating employees, referring, on the one hand, to financial stimuli such as bonuses, remuneration, penalties, and also other elements, for example, positive work environment, mutual friendships, relationships, trust. However, innovation growth in a company is not only dependent on motivational aspects. One of the most important conditions of innovativeness is facilitating employees to make contact not only with one another, but with the clients as well. The inspiration comes from the contact with external world, which means, that contact with employees from other departments are as important as contact with persons from outside the company or sector. It is important to develop a habit of tracking trends and interesting articles among employees, since new ideas are rarely coined from scratch, novelties are a combination of the elements of present-day knowledge, stitched together in a different way than previous ideas. One must also remember that the lack of direction in

– the *Oslo Manual*). The survey includes, inter alia, cyclical surveys concerning various aspects of innovative activity of companies in industry and service sector, based on a harmonised survey questionnaire developed by Eurostat under subsequent rounds of the international research programme Community Innovation Survey (CIS) – *Działalność innowacyjna przedsiębiorstw w latach 2004–2006* (2008).

13 Acknowledging new trends requires understanding the expectations and the behaviours of consumers, as well as technological changes. An example of response to the problems and expectations of consumers may be ICICI Bank in India, which, in its small team of 40 in their R&D laboratory, with members from different business and technological groups, performs experiments with new ideas. This combination of business experience and technology allowed them to understand the problems of consumers and offer exceptional solutions (Prahalad, Krishman, 2010).

searching new solutions is the most common barrier preventing businesses from introducing innovations (Miller, Wedell-Wedellsborg, 2013).

Decision on introducing innovations is also influenced by financial barriers. Survey on the innovative activities of enterprises[14] conducted by GUS show that economic factors, especially high innovation costs, were the inhibitors of innovation activity for both industrial and service sector enterprises in 2008–2010 (34.2% of industrial enterprises; 27.4% of service sector). This barrier was indicated as major one by all size classes of the surveyed enterprises. Other significant obstacles included no financial resources within enterprise or in a group of enterprises (31.8%; 24.1% respectively) and from external sources (26.9%; 21.3%). The most significant barrier in 2012–2014 was the lack of opportunities of funding innovations from external sources (*Działalność innowacyjna przedsiębiorstw w latach 2012–2014*, 2015). Financial barriers such as high implementation costs, limited access to credit, lack of own financial resources, and most of all excessively high taxes were, according to small and medium enterprises, main factors that hampered the introduction of innovations to enterprise in 2007–2009 (Mizgajska, 2013). Other studies, conducted by INE PAN (Puchała-Krzywina, 2013),[15] also demonstrated that in 2007–2011 financial barriers (lack of own financial resources[16] or funds from external sources, excessively high costs of innovations and R&D) were the biggest barriers to business innovativeness.

Other major barriers for innovation in the GUS surveys include market factors, which were more frequently indicated by industrial enterprises than service enterprises. Approx. 22% of industrial companies were concerned about uncertain demand for innovation, with the corresponding 18% among service enterprises. Uncertain demand for innovative products was also a significant factor impeding innovation activity under INE PAN survey (Puchała-Krzywina, 2013). Concurrently, approx. 20% of the companies were afraid of taking over the market by

14 The studies covered industrial and service enterprises of all voivodships included in the Statistical Survey Programme of Official Statistics for the following themes: 1.43.02 – Innovation in industry (PNT-02) and 1.43.13 – Innovation in services (PNT-02/u). "PNT-02 and PNT-02/u surveys were conducted under the international study programme Community Innovation Survey (CIS) pursuant to Commission Regulation No 1450/2004. (…) The results of both surveys are used for the assessment of innovative activity in EU EFTA countries and Scandinavian member states and are one of the main sources of the set of indicators developed by the Commission in order to implement economic, scientific and technical policy (European Innovation Scoreboard – EIS). Innovation survey results are utilised also by international organisations, such as OECD. Eurostat does not break down innovativeness into industrial and service businesses. Such a division was developed for domestic purposes". The innovation survey covered enterprises which employed more than 9 persons (*Działalność innowacyjna przedsiębiorstw w latach 2008–2010*, 2012).

15 Studies that followed the analyses of questionnaires submitted to INE PAN to the *List of 500 most innovative enterprises in Poland* (sample: 93 enterprises in 2011, 79 – 2010, 94 – 2009, 103 – 2008, 69 – 2007).

16 No financial resources within enterprise or in a group of enterprises.

dominating enterprises (21.1% industrial; 19.1% services). Approx. 15% of the companies were struggling with low demand for innovations. The businesses also pointed at barriers related to knowledge. Approx. 17% of industrial companies and 14.5% of service companies encountered difficulties in finding partners for cooperation in innovative activity – in 2012–2014, the ratio was only 7.4% for service companies (*Działalność innowacyjna przedsiębiorstw w latach 2012–2014*, 2015). Lack of information about technologies and markets was a serious problem for approx. 12% of the surveyed enterprises (*Działalność innowacyjna przedsiębiorstw w latach 2008–2010*, 2012).

Other GUS surveys confirmed the analyses concerning major barriers to innovativeness. GUS survey on innovative activity for 2010–2012[17] indicated that the major obstacles in their activity that had impact on decisions regarding that activity, included: no demand (23.7% industrial companies and 22.9% service companies indicated that barrier), insufficient funds (22.8% and 19.1% respectively), strong competition in product quality and product/brand opinion (21.9% and 24.3%) and high costs concerning access to new markets (20.4%; 17.2%). Strong price competition turned out to be the most significant barrier for over 40% of industrial companies and approx. 50% of service companies. Approx. 20% of both types of companies noted high costs of adjusting to government and legal regulations or to legal requirements, and approx. 17% – lack of support from the institutional support system for innovative activity. Approx. 16% industrial and approx. 19% service companies saw a problem in the dominant position of competitors in their markets (*Działalność innowacyjna przedsiębiorstw w latach 2010–2012*, 2013). Barriers most frequently indicated by enterprises in biotechnology sector R&D in 2013 included also **financial barriers**, including: *fund raising* (32.8%) – in 2014, the percentage of enterprises indicating that barrier dropped to 31.7% (*Nauka i technika w 2014 r.*, 2015), *innovation costs* (30.3%) – in 2014, the percentage dropped correspondingly to 29.4% (*Nauka i technika w 2014 r.*, 2015), followed by **formal barriers**, including: *legal regulations* – 19.7% in 2013 and 19% in 2014 (*Nauka i technika w 2013 r.*, 2014; *Nauka i technika w 2012 r.,* 2013; *Nauka i technika w 2014 r.,* 2015). More significant than a year before was the difficulty in acquiring qualified staff (18.9%). Cooperation with other operators also became more difficult (13.1%) The studies showed, however, that the surveyed companies had fewer issues with acquiring market outlets (7.4%). Less than 10% respondents for each sector pointed at client's response to new products, tax regulations and availability of information on new technologies.

As demonstrated above, many factors are impeding the innovative processes of enterprises. Some barriers are interconnected. Therefore, innovation barriers should be discussed in the context of complementarity and substitution. The variety of the perception of those barriers by different genotypes of innovative companies is

17 Survey covering enterprises of both sectors (industrial and services) in all Voivodships, employing more than 9 persons.

also an important issue. The complementarity and substitutability of barriers bear significant implications for innovative policy, as it shows which barriers should be eliminated. The complementarity of innovation barriers describes their interrelations, the process of their complementation and strengthening. Removing one barrier weakens the other which is complementary to the former. The substitutability of barriers, on the other hand, implies a different type of their interrelation. Given that such a relation between barriers exists, if one of them is removed, the other takes its function. This means that, under the conditions of barrier substitutability, removing one barrier strengthens the other – that which was not removed, which is the other way around under the conditions of barrier complementarity, where the activity of one barrier strengthens the other. In the latter case, elimination of one barrier automatically weakens the other one. Lack of financial resources in a company and poor availability of funds are strongly complementary in terms of cost barrier, i.e. perception of the barrier has increased if the company experiences shortage or has limited access to financial resources. Study shows that there are significant differences in the complementarity of barriers among individual innovators. In the case of regular innovators (those that introduced innovation ins two subsequent periods, i.e. in 2002–2004 and 2004–2006), nearly all barriers were complementary within barrier groups (economic, knowledge, or market related). As regards periodic innovators (introducing innovations only in one of the observed periods), the cost barrier was complementary not only to the financial barrier but also to knowledge barriers. Similarly, the barrier resulting from the domination of other companies on the market was complementary to other market barriers and some knowledge barriers (Wziątek-Kubiak, 2012).

Stimulation of innovations is influenced not only by institutional factors, but also soft, elusive, behavioural, and motivational ones, and also those concerning system of values, cultural, and related to social capital. The role of social and cultural factors was highlighted by J. Schumpeter (Weresa, 2012; Schumpeter, 1939).

## 5.2. Analysis of Results

The surveys conducted allow us to better understand the considerations of enterprises when applying for EU funds. The enterprises treated the obtained funds mainly as additional sources of financing, which allowed them to enhance those areas of operation which required extra funding (fig. 5.1).

The observed enterprises applied from EU funds to buy new equipment, undertake research activities, enter new markets and expand their production lines. Another important objective involved activities that allowed them to establish a network of connections with research institutions and other enterprises.

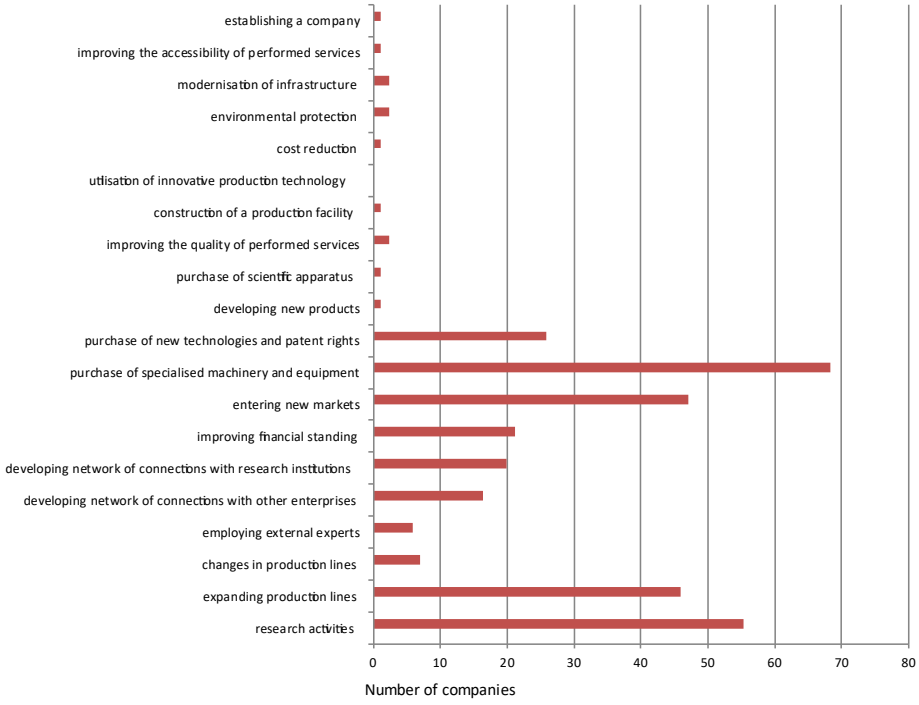


**Figure 5.1.** Reasons behind the application for EU funds
**Source:** author's interpretation of results based on the questionnaire result analysis.

Enterprises that applied for EU public aid with the objective to undertake research activities also noted excessively complex formal criteria for applying (next to bureaucratic and regulatory barriers). They mainly focused on excessively high taxes and social contributions (mean 4.2, mode 5), as well as lack of tax incentives and state aid or high costs of implementing innovations (4.07 and 5 respectively).

Companies that wanted to develop their networks of connections with other enterprises or research institutions emphasised that, apart from bureaucratic and regulatory barriers, taxes and social contributions are too high, and the period of verification of applications for payment and payment processing is too long. They have indicated that substantive criteria do not comply with the reality of business operations and are cannot be reliably verified during the application assessment, and also that formal criteria are too complex. Enterprises that wanted to further develop their networks of connections with research institutions emphasised the mismatch between the education system and the needs of labour market.

Companies whose objective in applying for EU public aid was improvement of their financial standing saw the biggest barriers in the existing institutional solutions. These companies focused on: excessive taxes and social contributions (mean 4.4., mode 5), lack of tax incentives and aid from the state (4.25; 5 respectively),

insufficient own funds (4; 4), high innovation implementation costs (4; 5), and long period of verification of applications for payment and payment processing (4.4; 5).

The surveys showed that some companies did not cooperate with universities and research institutes under projects co-financed from EU funds. This situation might have been influenced by the indicated, and in their opinion most important, barriers, such as bureaucracy, excessively complex requirements concerning submitting project proposals, formal criteria, and substantial criteria that fail to correspond to reality. Another factor might have been long period of verification of payment applications. These also companies emphasised the importance of financial barriers. For these companies the lack of adjustment of the education system to the labour market had large impact on actions undertaken by them, and at the same time indicated that they do not experience considerable lack of knowledge about the activities of scientific and research institutions.

Companies usually applied for EU public aid on their own. Less than 20% of them have partnered with research institutes, whilst the next most frequently listed group was domestic enterprises, and then R&D entities (fig. 5.2).

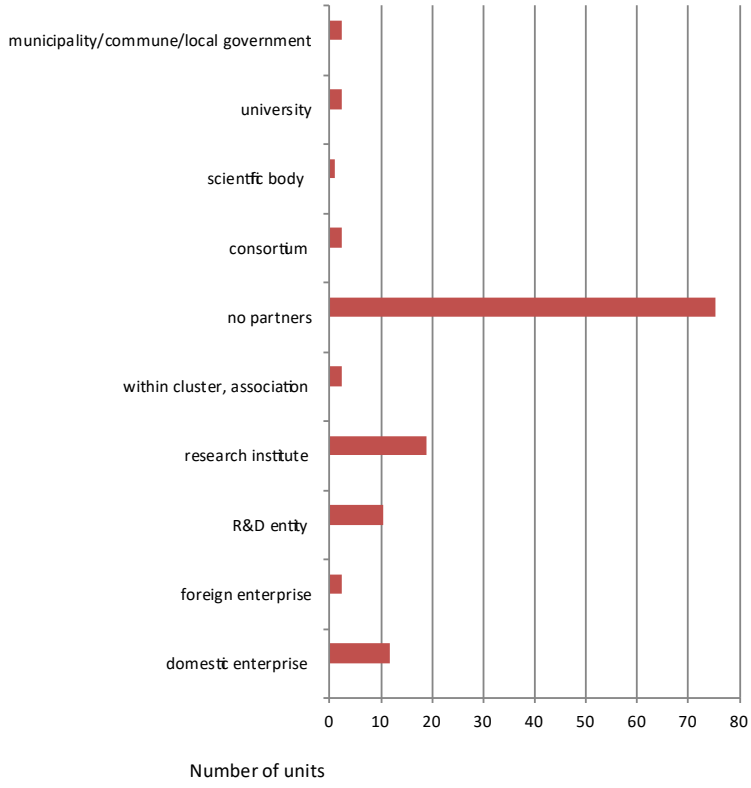


**Figure 5.2.** Partners of projects financed by the EU
**Source:** author's interpretation of results based on the questionnaire result analysis.

Only a small group of the surveyed enterprises submitted patent applications in 2013. Companies that did not submit any patents pointed at regulatory and bureaucratic barriers as the most significant. They also indicated, among others, the complex procedures of obtaining patents, unclear tax regulations, long period of verification of payment applications or processing of payment, and financial barriers, such as uncertain demand for new products. They also experienced lack of knowledge about the activities of scientific research bodies and technologies.

An considerable contribution to the characteristics of the companies and the identification of their types is brought by the analysis of the major components for question 29, indicating factors having impact on the innovativeness of enterprises and the effectiveness of utilising pro-innovative public aid from the EU. The first two variables derived from PCA analysis explain more than 30% of the observed variability (as reflected in further analytic schemes presented below).

The analysis involved 73 observations concerning question 29, of which 56 observations including a complete set of data, whereas in 17 of them missing data were supplemented with the mode value (most frequent value) for a given column. *The other observations and question 28 were dismissed from the analysis due to excessive shortage of data*. Emphasised is the concurrence of demand barriers for companies that are leaders in innovation and the companies with lower innovativeness rate. The barriers differ significantly only in the case of companies with negligible level of innovativeness (fig. 5.3).

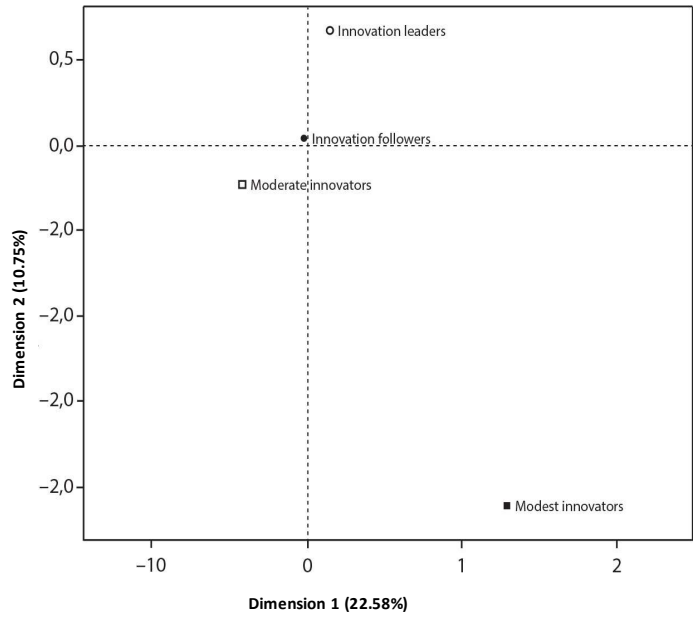


**Figure 5.3.** The distribution rate of the surveyed companies in innovative barrier assessment
**Source:** developed on the basis of INE PAN surveys in cooperation with Biostat company.

The analysis suggests that the first dimension of PCA correlates well with variables characteristic of the weaknesses and internal causes of insufficient innovative capacity of the surveyed companies in terms of the qualifications of executive and managerial staff, their poor creativity and attachment to supply approach to innovations and underrating the knowledge about consumer needs. The study also shows the role of acknowledging demand factors. It refers to such characteristics of the functioning of enterprises as low level of qualifications and creativity of the staff, i.e. factors determining the behaviour of enterprises, such as

- low qualifications of the research staff,
- low qualifications of the managerial staff,
- low qualifications of other employees,
- low creativity of the research staff in terms of undertaking innovative actions,
- lack of demand for new innovative products,
- low creativity of the managerial staff in terms of undertaking innovative actions,
- lack of knowledge about consumer needs.

The obtained results indicate the importance of the identification of barriers while specifying the characteristic traits of enterprises. These barriers refer to the group of innovative companies at innovative and transitional phases. Those companies are aware that the quality level of human capital, including the insufficient creativity of managerial staff, is a major barrier to innovativeness. It indicates not only the level of awareness of those companies, but also their needs in terms of training. It turns out that eliminating external barriers is not enough. Conscious effort must be taken to identify the specific internal gaps in human capital structure. Particularly important are specialised forms of training adjusted to innovative companies at different stages of development. Experiences gathered so far indicate the key role of this type of education. They should be based on practical projects and include the qualities of companies' innovativeness (Baczko, Puchała-Krzywina, 2013). The effect of such actions should be developing a community of experts with constantly updated knowledge on the changing standards of innovativeness and its new forms.

Companies in the innovative or intermediate phase are aware of the importance of the development of business models oriented at demand for products, the need to build strong relationships with their consumers and recipients, and monitoring their needs. Identifying demand-oriented companies fosters conditions for developing new forms of links between the recipients of products and services, and companies. This paves the way for the development of market, product, marketing and organisational innovations. It also offers opportunities to create the forms of links between recipients and company, and between employees and the users of products and services. This requires additional investments and staff training, but leads to developing intelligent organisations, open to information, able to use the Internet of Things and to create other forms of links with recipients. The subsequent phases of company evolution allow to include models of social communication

with recipients, take into account the creative role of the recipient and gradual change of the functioning models of enterprises and their objectives.

The second dimension is connected with two variables concerning an external barrier referring to the level of formality of regulations included in legal acts and the poor adjustment of legal regulations to company needs.

One should also note its negative correlation with such variables as: low creativity of the research staff in terms of undertaking innovative actions and the low creativity of managerial staff in undertaking innovative actions.

Applying the level of innovativeness as an additional variable in diagram 5.4 assures us that the variables which are also components of the second-dimension correlate with innovativeness level. The analysis utilised the results of statistical surveys developed in cooperation with Biostat company.

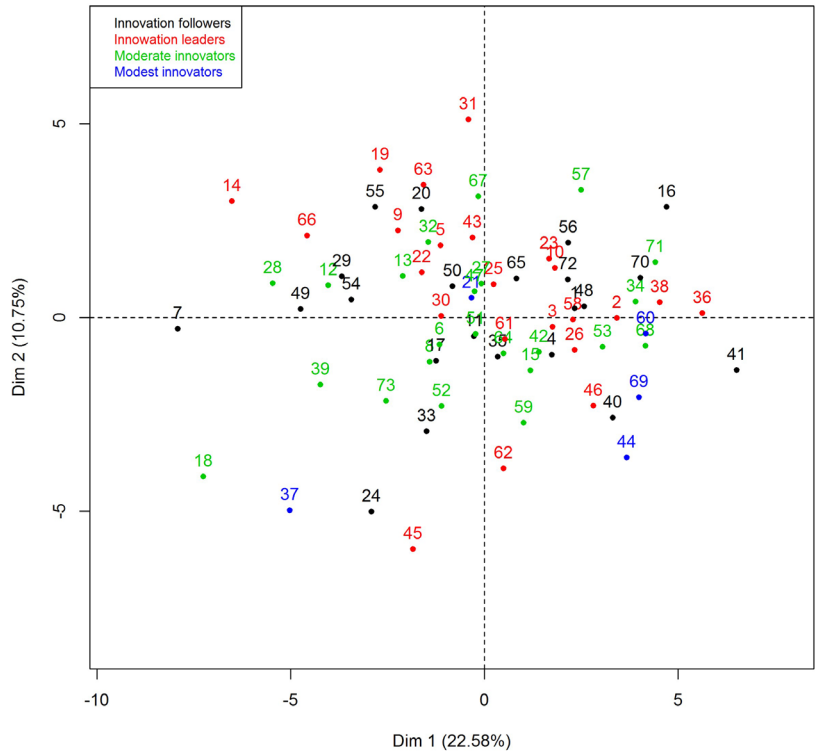


**Figure 5.4.** Individual enterprises in the two-dimensional space
Note: the numbers in the diagram correspond to the numbers of companies in the database.
**Source:** developed on the basis of INE PAN surveys in cooperation with Biostat company.

Results obtained in PCA were then used for hierarchical grouping, which allowed to distinguish four major groups, i.e.: *innovation leaders*, *innovation followers*, *moderate innovators*, *modest innovators*. Cluster 1 is dominated by companies classified as *moderate innovators* whilst cluster 2 comprise mainly *innovation leaders* (fig. 5.4).

This allows to build hierarchical structure of connections of companies that encounter innovation barriers (fig. 5.5).

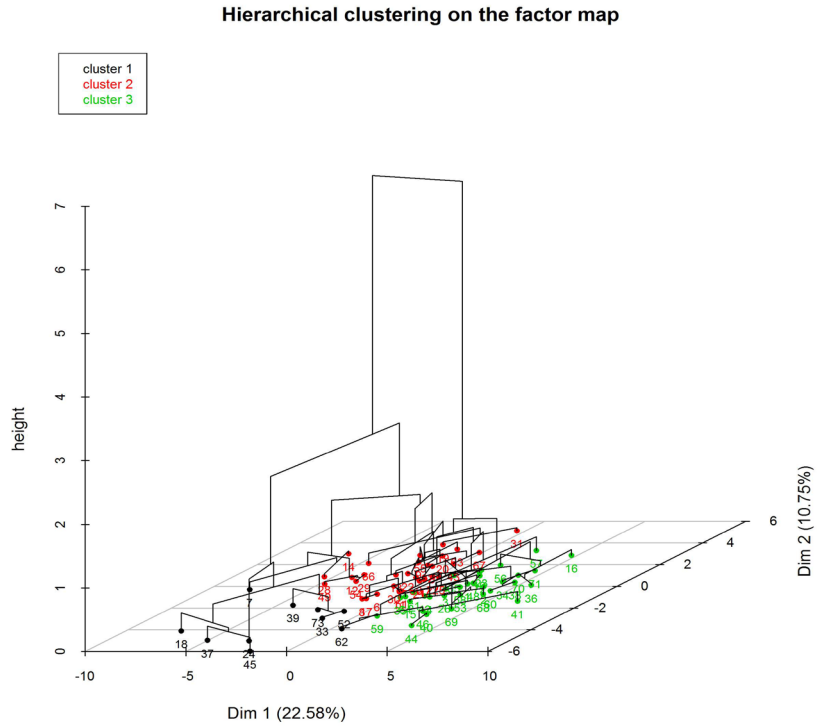


**Figure 5.5.** Hierarchical structure of connections of companies that encounter innovation barriers

Note: the numbers in the diagram correspond to the numbers of companies in the database.

**Source:** developed on the basis of INE PAN surveys in cooperation with Biostat company.

Next step involves developing a pie chart of correlations between barriers encountered by innovative enterprises.

The assessment of impact of individual barriers to the innovation capacity of company and the effectiveness of using pro-innovative public aid from the EU took 5 grade scale, where grade 1 indicated no impact of a given factor, and grade 5 a very strong impact.[18]

Analysis of the survey results demonstrated that the main barrier indicated by the enterprises was *bureaucracy* (mean 4.2).

18 The mean values assumed in the study indicate: within 1–2 – no impact, very low/negligible impact; 2–3 – low/moderate impact; 3–4 – high/strong impact; 4–5 – very high/strong impact. However, the observed sample is not representative, so the study can be treated only as signalling certain tendencies, and the conclusions must be approached with caution.

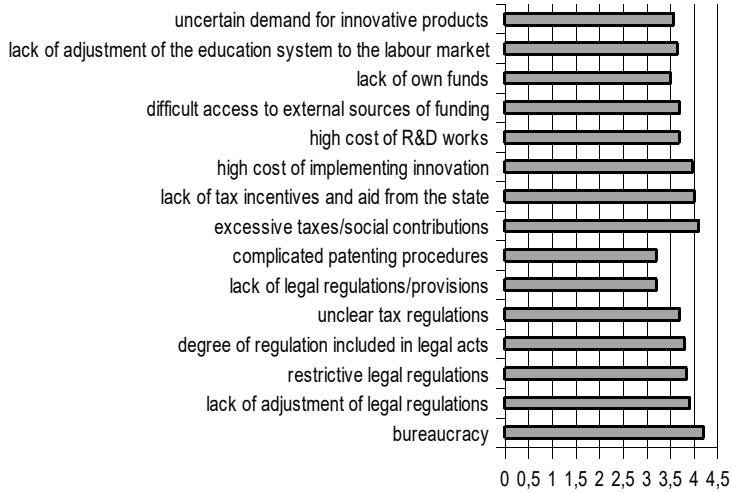


**Figure 5.6.** The largest barriers in the view of the surveyed enterprises
**Source:** own study.

It was also a factor which hampered to the highest degree the innovative activity of the youngest enterprises which had operated on the market for a period shorter than 5 years (the mean of 4.57; the mode of 5.0) and the oldest enterprises which had operated for over 25 years on the market (respectively 4.29; 4).[19] The youngest enterprises underlined foremostly that the legal regulations are too restrictive (mean 4.43; mode 5.0), and patenting procedures are too complicated (mean 4.0; mode 5.0) and that legal regulations are not adjusted to their needs (mean 4.0; mode 5.0). They also indicated a *high degree of regulations in legal acts* (mean 4.0; mode 3.0). For enterprises which operated on the market for over 25 years those factors were also important, though proportionally less important than for the youngest enterprises.

Research results of all surveyed enterprises indicated that *lack of adjustment of legal regulations to their needs* (mean 3.9) and *restrictive legal regulations* (3.8) were significantly important for their operation on the market. Those enterprises also underlined the importance of *formal* factors, concerning regulations in legal acts (3.8) and *unclear tax regulations* (3.7), lack of *legal regulations/provisions* (3.2) and

19 According to analysis of other groups of enterprises in terms of their operations on the market, the bureaucracy turned out to be a significant issue, but not the most significant. For the enterprises which had operated for 5 to 10 years, the most important barriers were *excessive taxes and social contributions* (mean 4.09, mode 5). For enterprises which had operated from 10 to 20 years – *difficult access to external sources of funding* and *high cost of implementing innovations* (respectively 4.14 and 5) and for those operating from 20 to 25 years – also *limited access to external sources of financing* (4.38; 5), excessive taxes and social security contributions (4.35; 5), *long period of verification of payment applications or processing of payments* (4.2; 5), *lack of adjustment of legal regulations to the needs of enterprise* (4; 4).

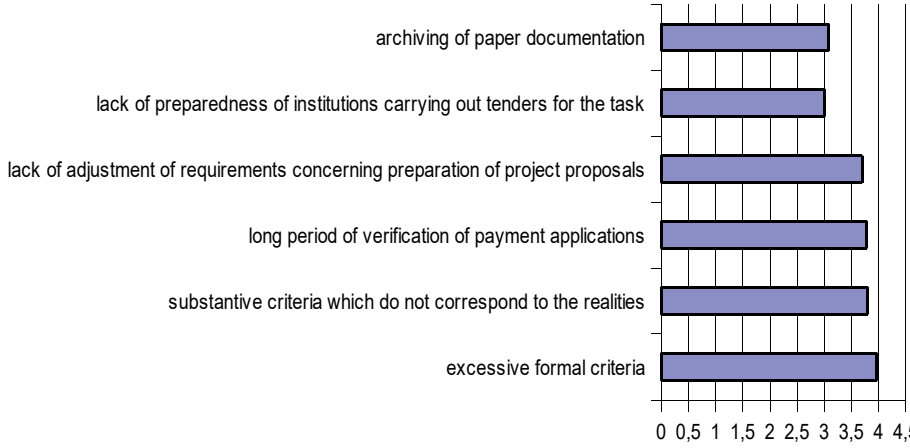


**Figure 5.7.** The most important factors related to the use of pro-innovative structural funds from EU
**Source:** own study.

*complicated patenting procedures* (3.2). Among factors connected with the *use of pro-innovative structural funds from EU* (fig. 5.7) which had their highest impact for their further activities, the surveyed enterprises foremostly indicated *excessive formal criteria* (3.97), *substantive criteria which do not correspond to realities of operating an enterprise and cannot be reliably verified during an assessment of an application* (3.8),[20] *long period of verification of payment applications or processing of payments* (3,78) and *excessive and mismatched requirements concerning preparation of project proposals* (3.7). Enterprises also indicated *lack of preparedness of institutions carrying out a tender to carry out it* (3.01) and *requirement of submission and archiving of paper documentation connected to applications for subsidies and implementation of projects* (3.08).

There were also financial obstacles among the further largest barriers. All surveyed enterprises indicated significant importance of: *too high taxes social security contributions* (the mean of 4.1), *lack of tax incentives and aid from the state* (4.0). Those two barriers were also in the group of analysed factors which were the most significant issues for the youngest enterprises (respectively the means of: 4.57 and 4.29, the modes of 5.0 each) and the enterprises which had operated on the market for the longest time (respectively the means of: 4.1 and 4; the modes of: 4 and 5). The further barriers indicated by all surveyed enterprises were: *high cost of implementation of innovations* (3.96), *difficult access to external sources of funding* (3.69),

20 Within that group of factors that aspect constituted the largest barrier for the youngest enterprises which had operated on the market for a shorter period of time than 5 years (the mean of 4.0; the mode of 4.0). The enterprises which had operated on the market for the longest period (above 25 years) also indicated that barrier – respectively 4.05 and 4. However for those enterprises the largest barrier connected with *use of pro-innovative structural funds from EU* were *excessive formal criteria* (respectively 4.16 and 5).

*high cost of R&D works* (3.68). *Lack of own financial funds* influenced their innovative capacity to a lesser degree (3.5).

The youngest enterprises acquired financial funds with more difficulty than the enterprises which had operated on the market for the longest time. *Lack of own financial funds and high cost of research and development works* were a more significant issue for them than for the oldest enterprises.

Other results of analyses carried out as a part of the project confirmed that the factors related to the institutional environment – i.e. high taxes and other financial burdens, inefficient bureaucracy, tax regulations, access to sources of funding, restrictive legal regulations – were the most inconvenient barriers hampering operation of an enterprise, factors which were also indicated in *The Global Competitiveness Report.*

Among further factors which according to the surveyed enterprises had significant impact on their innovative capacity, the enterprises indicated *lack of adjustment of the education system to the labour market* (the mean of 3.64) and *uncertain demand for (new) innovative products* (3.57). *Lack of demand for new innovative products* and *lack of partners for cooperation in the field of innovative activity* (respectively 3.24; 3.12) had a moderate impact on undertaking innovative activities by the enterprises

Among further factors related to knowledge/information, apart from *lack of adjustment of the education system to the labour market* the businesses indicated the importance of *lack of knowledge about technology* (mean 3.09) and *markets* (2.98) and about the *activities of scientific research bodies* (2.94) as well as about the *needs of consumers* (2.78) and *other businesses* (2.73). They also indicated *lack of information on available forms and mechanisms of aid, including on acquiring EU funds* (2.8). The oldest enterprises, rather than the youngest ones, treated those factors as relatively more important. Due to their long operation on the market they value the importance of information flow and knowledge about the needs of consumers or related to activities of scientific research bodies.

The survey revealed that the enterprises notice the role of insufficient knowledge on the needs of consumers, other enterprises, technologies or markets. Lack of demand for innovative products may be associated with a lack of knowledge about the needs of enterprises and a lack of knowledge about markets. They also notice the problem related to the quality of human resources, research staff and managerial personnel. However only few entities treated them as barriers for innovativeness. They emphasized more frequently *low quality of managerial staff than low quality of employees* (respectively the mean of: 2.8 and 2.6) and *low creativity of managerial staff* (2.86) and *research staff* (2.85) *in terms of undertaking innovative activities* than *low creativity of other employees* (2.58). At the same time for innovative enterprises, *inadequate education of potential employees* was a more significant obstacle than for Polish businesses in general. Enterprises which had operated for longer than 25 years on the market also valued the importance of qualifications among managerial staff, research staff and other employees, as much as creativity

in the aspect of undertaking innovative activities by those groups more than the enterprises which had operated for 5 years.

Informal factors such as: activities rooted in human consciousness, customs, traditions, informal codes of conduct, cultural factors, also have an impact on undertaking activities by the enterprises. The enterprises which had operated on the market the longest (for longer than 25 years) valued the importance of such kind of barriers more than the enterprises which had started their activity recently.

According to the surveyed enterprises *corruption* (the mean of 1.98) and *instability of governments* (2.1) had the smallest impact on undertaking innovative activities by the enterprises. The significance of those factors was emphasized more by the enterprises which had operated on the market for more than 25 years than the youngest enterprises (up to 5 years of operating on the market).

Among other factors influencing the innovation capacity and effectiveness of using pro-innovative public aid from EU the surveyed enterprises indicated the following factors: *lack of qualified people in all aid institutions, lack of funds for supporting R&D works* and *restrictive provisions concerning processing of project guidelines (indicators) which do not take into account dynamically changing external conditions.*

The surveyed enterprises had the opportunity to indicate activities in the institutional environment which would have an impact on eliminating the barriers for innovation which were the most inconvenient for them. It is very important because those enterprises know very well what they need the most to develop their innovative activity. According to the surveyed enterprises, the following actions should be undertaken: *Reduction of bureaucracy, elimination of redundant archiving of documents, shortening of time for verification of applications and payment of funds for the development of innovative project, simplification and development of clear substantive criteria for verification of applications for funding and payment, simplification of procedures of patenting and certification and normalization of innovative products, automation of application procedure.*

One of the claims concerned flexible approach of *financing institutions in order to implement substantive changes in projects during their execution, since the method of project execution and reaching the expected result cannot be always predicted at the moment of submitting an application for funding.*

The enterprises underlined, that in this respect *it is important to amend legal and tax regulations; introduce mechanisms concerning systems of incentives encouraging to carry out innovative activities; enabling easier access to loans and alternative sources of funding innovative activity. Solving tax and legal issues takes time, which limits working on development ventures.* In order to decrease barriers for innovativeness an amendment to the tax law is required, which would include tax exemptions for entities which implement innovative projects.

The enterprises feel that there is a scarcity of access to information on, among other things, possible innovative projects or possibility of obtaining funds from EU, as they emphasized the importance of *informing about available forms and*

*mechanisms of aid, including available sources of funds from the EU.* The importance of *preparedness of institutions carrying out tenders for the task* was also stressed. Attention was also brought to the importance of training courses *for beneficiaries in the scope of implementation and settlement of funding agreements.* Enterprises also lack competent people who could help them with submitting applications. According to them it is required to *change approach from fully controlled to advisory, oriented to assist with problem solving.*

The enterprises appreciate the value of cooperation with scientific research bodies. They indicated that activities meant to increase the cooperation should be undertaken. According to the surveyed enterprises, *secondary schools and universities should offer courses which are in demand*.

The enterprises also emphasized the value of the increasing *importance of the quality of services in specialized industries for evaluation of tender bids*, as *price as a sole (or the most important) criterion of a tender kills the need for innovation.*

According to the surveyed enterprises *deregulation and removal of administrative and tax barriers are required to unleash the potential of innovative enterprises.*

The surveyed enterprises were also asked what in their opinion would help to the increase their expenditure on research and development activities. They alluded first to financial activities. Changes in the tax law concerning tax exemptions for funding of innovative ventures are required in the opinion of the surveyed companies. As stated by one of the entrepreneurs: *The current tax system "punishes" entrepreneurs for R&D activity (innovative activity) – decrease of net profit.* The following actions, among others, were suggested: appropriate regulations and tax instruments, tax incentives and simple procedures of their settlement, preferential tax conditions for research and development activity and creation of a system of tax exemptions for enterprises which use results of their own R&D activities for their business activity and for the maintenance of scientific and research infrastructure, and also mobilisation of financial instruments which would encourage enterprises to increase expenditure on research and development activity. Increased possibility of funding operating costs, increase of the share of funding in projects, increase of expenditure of the national budget on science and *clear public support for private expenditure on R&D activity and increase of subsidies for very risky R&D activity* were indicated. According to the surveyed enterprises, it is important to *increase exemptions and profits for each zloty spent on R&D activity.*

According to the surveyed enterprises, *the majority of enterprises would decide to increase expenditure on research and development if an exemption allowing to decrease the tax chargeable on the activity was implemented.*

*Lower cost of development and implementation of R&D works, increase of programmes and size of funding for the development of prototypes, easier and cheaper access to scientific infrastructure* and *larger involvement of professional bodies of the state administration* were also proposed.

According to the surveyed enterprises, there should be *guarantee of assistance in implementation of technologies being developed* and *legal regulations which facilitate*

*cooperation with scientific bodies, to be selected with other methods than by provisions of the Law on public procurement.*

Increased cooperation between science and business, expansion of staff by employing people with proper qualifications and increase of employment for R&D works were also indicated.

At the same time, simplification of *procedures connected with applying for scientific projects and their settlement* was proposed. It was also suggested that the institutions assigning financial funds should *take into account the risk of failure of a project.*

***

Internal and external barriers faced by the enterprises caused an increase in transaction costs, and lack of use of innovative potential in the transitional phase contributed to a decrease in effectiveness of pro-innovative structural funds between 2007 and 2013.

The analysis of empirical data allowed to draw the following conclusions:

- The enterprises identify internal and external barriers to innovativeness. The ability to identify internal barriers and the assessment of their inconvenience may be a basis for grouping of innovative enterprises and become a basis for the development of instruments for establishment of various ways of influencing them.
- The surveyed businesses indicate the importance of the quality of human capital among the internal barriers, which necessitates implementing proper changes into the system of education and adjusting it to the needs of the businesses.
- Uncertain demand and lack of partners for cooperation within the field of innovative activities are treated by the enterprises as elements which require internal and external actions with particular focus on developing innovative environment and knowledge structures as a part of the National Innovation System.
- Funding of activity and lack of adjustment of institutional solutions to the needs of businesses are a major challenge for the surveyed enterprises. This challenge also includes excessive taxes and social contributions, excessive cost of implementing innovations, long period of verification of payment applications or processing of payments, and lack of tax incentives and aid from the state.
- Institutional and regulatory factors significantly impact functioning of the surveyed enterprises. These had larger impact on enterprises which started their

activity recently than those that had operated on the market for a longer time. The latter also had more problems with obtaining funds from external sources.

- The highest percentage of the surveyed enterprises (over 60%) was linked to the current conditions of business activity in Poland as typical for the third stage of development, over 12% indicated the transitional period between the second and the third stages of development, and over 18% – the second stage.
- The surveyed enterprises indicated different obstacles and barriers; however, the results showed that they assessed conditions of operation in Poland significantly higher according to *The Global Competitiveness Report*.
- Among factors influencing their innovative capacity the surveyed enterprises emphasized in particular the existence of bureaucratic and regulatory barriers, indicating primarily excessively restrictive legal regulations which are not adjusted to their needs, as well as unclear legal provisions.
- High cost of implementing innovations and R&D works, and difficult access to external sources of funding, as well as limited own funds are a very serious challenge.
- Excessive formal criteria, long period of verification of payment applications and excessive requirements concerning preparation of project proposals are indicated among the barriers connected with use of pro-innovative structural funds from the EU. Substantive criteria do not correspond to the realities of operating a business and it is impossible to reliably verify them during the assessment of an application.
- The results of the survey demonstrated that institutional, bureaucratic and regulatory barriers are not the only obstacles. There are also financial, information, knowledge and cultural barriers.
- In order to increase expenditure of enterprises on research and development activity, amendments in the tax law concerning exemptions for funding innovative ventures are required first and foremost. Lower costs of development and implementation of R&D works are also helpful in this respect.
- The majority of the enterprises faced the challenge of further development of ingenuity and innovative design, domestic and international activity in the field of industrial property and use of innovative market models and standards for their spread.[21]

The surveyed enterprises, as well as other enterprises in Poland, are in the transitional phase between the investment phase and the innovative phase and are at different stages of development. They have many specific characteristics in the sphere of expansion, effectiveness, financial condition, investment into research and development, intellectual property or connections with customers, suppliers, academies, institutes or financial institutes.

21 It especially concerns standards related to management of innovative processes and statistical standards developed by NESTI OECD. It requires, among other things, disseminating knowledge connected to Frascati Manual (OECD, 2015b) which has nearly 50 years of tradition.

As a result, the programmes introduced without a reflection are not adjusted to needs of the enterprises or their innovative environment. It also applies to European funds which are often addressed to recipients who operate in a mature market economy.

It is especially important for countries in the transitional phase. Poland is an example of such country. There are enterprises in Poland with various levels of product, process, organisational and marketing innovativeness. The most innovative enterprises take effort to expand, but they encounter many barriers resulting from the lack of adjustment of the institutional solutions.

Innovative expansion linked to taking risk, but institutions in the investment phase are not interested in taking risk, which causes increased transactional costs. As a result of their impact, the enterprises either give up on innovative activities or face very high transactional costs which allows the enterprises reach their goals, but only at a significantly lower level.

Overcoming this phenomenon is difficult but possible. However it requires advanced analyses, use of potentials which result from the possibility of decreasing asymmetry of public information; stimulation of social capital and identification and use of existing possibilities which are a result of internationalization of the economy; a presence in the European Union and possibility of cooperation with foreign business concerns present in Poland.

## 5.3. The Financial Zone of Innovative Enterprises[22]

### 5.3.1. Research Assumptions and Methods

The analyses presented in this part of the study were based on the reporting data of the surveyed enterprises for 2007, 2010, and 2013. It is assumed in the research that there is a positive correlation between innovativeness and the economic and financial standing, which has the nature of feedback. An improvement in the economic and financial standing fosters conditions for greater outlays for innovation, which, in turn, is conducive to enhanced standing. This applies not only to original innovations, but also to those of an imitative nature. (In accordance with the *Oslo methodology*, imitation is also regarded as innovation).[23] As

22 Subchapter 5.3 is authored by E. Mączyńska.

23 According to the *Oslo Manual* "An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations" (*Oslo Manual…*, 2005, p. 46).

confirmed by the experience of many enterprises and countries, imitative innovations can provide an important spur for development and a strong lever for economic growth. Enterprises whose innovative activity consists in assimilating innovations from outside may benefit from knowledge transfer or from the application of original innovations. For some types of innovation activity, "imitation costs are substantially lower than development costs, so that an effective appropriation mechanism to provide an incentive to innovate may be required" (*Oslo Manual…*, 2005, p. 35).

As demonstrated in previous research, the fact that imitative innovative activities predominate in enterprises is based in the distance between development and technology which separates Poland and developed economies. Therefore, the importance of pro-innovative policy of the state, supporting exploratory innovations. This is all the more important as "the ability of enterprises to appropriate the gains from their innovation activities is an important factor affecting innovation. If, for example, enterprises are unable to protect their innovations from imitations by competitors, they will have less incentive to innovate. On the other hand, if an industry functions well without formal protection methods, promoting these may slow the flow of knowledge and technology and lead to higher prices for goods and services" (*Oslo Manual…*, 2005, p. 114).

Thus, offering state aid to innovators is justified, which is confirmed by the results of various studies, including statistical and quantitative analyses, as well as qualitative studies. Statistical data do not confirm the crowding out theory, according to which such aid leads to the companies' substituting their own expenditure on research and development activities with funding obtained from the state. Furthermore, subsidising such activity increases the change and probability of companies' maintaining their innovation-oriented expenditures at a relatively high level (*Oslo Manual…*, 2005, p. 114). Thus, follows the importance of and justification for the external financial support. Therefore, in the presented research, differentiates between internal and external funds allocated for innovation.

## Basis for Analysis and Research Limitations

Also, this time, as in previous studies, it turned out that there are only a few areas which are so difficult to evaluate in quantitative and financial terms and, in general, to analyse economically and financially as innovations. There are several barriers to accessing data and identifying and isolating the financial effects of investing in innovation. This is compounded by difficulties in defining, identifying and measuring innovation, which is highlighted in the *Oslo Manual* which provides guidelines for collecting and interpreting innovation data. It underlines the limitations of the type of data which can be obtained in this type of research, especially statistical surveys (*Oslo Manual…*, 2005, p. 40–41). All the limitations listed in the *Oslo Manual* are also fully applicable to the research undertaken in the project in question. The inability to obtain many additional, comparable and reliable data on the financing of innovation processes in the surveyed enterprises constituted

the main research barrier. There were measurement problems related to the fact that innovation is a continuous process. Therefore, it is difficult to measure. The research corroborates the thesis presented in the Oslo manual that it is the case "particularly for firms whose innovation activity is mainly characterised by small, incremental changes as opposed to single, well-defined projects to implement significant changes" (*Oslo Manual…*, 2005, p. 40).

The *Oslo Manual* (2005, s. 40) defines innovations in rather general terms as "significant changes, with the intention of distinguishing significant changes from routine, minor changes". Meanwhile, in practice, many innovations boil down to a series of smaller changes. One significant barrier in research is the fact, which has been observed for years now, that the data concerning spending on innovation are not fully isolated in the accounting books or are recorded in a relatively individualised manner (adapted to the adopted accounting policy), which limits data comparability. This makes it more difficult to fully identify such spending and poses a significant risk of distorting the image of innovativeness.

Most analytical problems and barriers result from the spending on innovation and the obtained results being shifted in time, including those identifiable based on reporting data. This confirms the determinations which can be found in the *Oslo Manual,* stating "it is difficult for surveys to capture the timing of innovation activities, their implementation and their impact. Expenditures on innovation activities are intended to yield potential returns in the future. The outputs of these activities, from the development and implementation of innovations to improvements in innovative capacity to impacts on performance, are often not observable during the review period" (*Oslo Manual…*, 2005, p. 41).

The presented analytical barriers and gaps in available financial data, including problems with the completeness and comparability of data encountered during research, resulted in the necessity to reduce the sample (depending on the data type) to 4–6 enterprises in 2007, 6 in 2010 and 16 in 2013 when it came to analysing the economic and financial standing of the surveyed enterprises. Therefore, the main conclusions apply mainly to 2013, although the number of companies whose data were made available was far from satisfactory for that year as well.

In such circumstance it is difficult to make any generalisations; however, even individual pieces of data shed some light on innovativeness and knowledge spill overs. Furthermore, identifying research barriers related to statistics and reporting in this regard is also valuable in respect of information and recommendations. At the same time, however, when analysing results, one should exercise appropriate care in their interpretation and restraint in formulating not-fully-substantiated generalisations. The limited nature of the data does not warrant such generalisations.

## Research Methods and Tools

The analysis of the economic and financial standing of the surveyed enterprises took into account/considered the following issues: the size of the enterprise, profitability, debt, liquidity and the volume of spending on innovation.

The research assumes that both external and internal spending on innovation should translate into higher profitability, which, in turn, should contribute to an increase in this spending on innovation. This applies in particular to small and medium-sized enterprises (SMEs), which naturally are characterised by smaller possibilities of innovation funding. Therefore, as highlighted in the *Oslo Manual*, for them this increases "the importance of efficient interaction with other firms and public research institutions for R&D, exchange of knowledge and, potentially, for commercialisation and marketing (…) Finance can be a determining factor for innovation in SMEs, which often lack internal funds to conduct innovation projects and have much more difficulty obtaining external funding than larger firms. Surveys can provide data on the degree to which financial constraints affect the ability of SMEs to innovate" (*Oslo Manual*…, 2005, p. 39).

## 5.3.2. Basic Data and Financial Ratios of the Surveyed Enterprises

### Enterprise Size

The surveyed enterprises are highly diversified in terms of resources and their economic and financial standing, as well as the number of persons employed. The scale of differences between mean values and the median shows that differences between enterprises have developed in a way far different from the normal distribution, which is evidenced by the significant differences between the mean values and the median.

**Table 5.1.** Selected data characterising the enterprise size (in PLN thousand)

| Values | Total Assets | Fixed assets | Net profit/ loss | Revenues | Number of persons employed (FTEs) |
|---|---|---|---|---|---|
| Maximum | 8,174,586 | 6,917,133 | 319,161 | 2,199,370 | 2,393 |
| Minimum | 1,361 | 300 | -3,066 | 1,901 | 4 |
| Average | 726,440 | 603,977 | 32,321 | 251,310 | 428 |
| Median | 154,358 | 78,666 | 5,443 | 81,604 | 236 |

**Source:** own calculations based on survey data.

The data presented in Table 5.1 prove that the analysed entities there were enterprises from all categories: from micro, to small, medium-sized and large enterprises (according to the definition which came into force in the European Union on 1 January 2005).[24] Maximum turnover exceeded PLN 2 billion (according to the

24 According to this definition, the category of micro, small and medium-sized enterprises ('SMEs') is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not

definition of the SME it may not exceed EUR 50 million), and the balance sheet total exceeded PLN 8 billion (according to the EU definition, it may not exceed EUR 43 million).

### Profitability

The surveyed enterprises were characterised by instability and strong fluctuations in profitability. At the same time, profitability was lower than in the total economy. In 2013, net ROS in enterprises in the total economy amounted to 3.7% (*Rocznik statystyczny GUS*, 2014, p. 593), while in the surveyed group of enterprises it was negative (–2.2%). Therefore, the median of net ROS exceeded 7%. Differences between the mean and the median point to a significant variation in the profitability of enterprises, deviating from the normal distribution.

**Table 5.2.** Enterprise profitability

| Specification | Net return on sales (ROS) (%) | ROA Net return on assets (%) | ROE Net return on equity (%) |
|---|---|---|---|
| Maximum | 53.1 | 25.9 | 63.7 |
| Minimum | -95.7 | -54.6 | -129.9 |
| Average | 2.8 | 0.5 | -2.2 |
| Median | 4.2 | 3.2 | 7.3 |

**Source:** own calculations based on survey data.

### Spending on Innovation

The basic financial indicators of innovative activity include internal and external spending on innovation and the relationship between such spending and revenues.

**Table 5.3.** The relationship spending on innovation and revenues (%)

| Specification | Internal spending | External spending | Total spending |
|---|---|---|---|
| Maximum | 113.2 | 70.5 | 113.2 |
| Minimum | 0.1 | 0.1 | 0.1 |
| Average | 26.0 | 13.6 | 30.3 |
| Median | 2.5 | 0.3 | 2.6 |

**Source:** own calculations based on survey data.

exceeding EUR 43 million. (An extract from Article 2 of the Annex to Commission Recommendation 2003/361/EC, vide Commission Recommendation 2003/361/EC published in OJ L 124 of 20 May 2003, p. 36, see also: *Nowa definicja MŚP. Poradnik dla użytkowników i wzór oświadczenia*, 2006, p. 3).

Total spending on innovation in relation to revenues were greatly varied and ranged from 0.1% to 113%. The analyses indicate a significant variation of the financial innovation image of the surveyed enterprises. The differences between mean and median values prove that the distribution of the ratios characterising the enterprises is far from the normal distribution, expressed as a Gaussian function. This is due to a significant diversification of the sizes of the surveyed enterprises.

### 5.3.3. An Analysis of Correlation between Spending on Innovation and the Selected Economic and Financial Values

The very meagre database makes studying correlations between individual financial figures doubtful as to their validity. This is on, on the one hand, related to a short duration of the research, and, on the other hand, to the duration of spending on innovation and its "yield". The results of spending on innovation are usually observed later, sometimes after several years. In addition, the results do not always translate into the profitability of a given enterprise. Although, on the one hand, such a shift in time is a natural phenomenon, on the other hand, actions are necessary in order to reduce the distance between the time spent on innovation and the time when its effects are brought about. Despite these reservations, the correlation indicators were calculated. The results of these calculation are presented in Tables 5.4.–5.6.

Although data for 2007 apply only to 4–5 enterprises (depending on the data type), they indicate a strong positive correlation between profitability and spending on innovation. A similar direction of the relationship is also observed in relation to equity and the number of persons employed. A strongly negative correlation between spending on innovation and long-term debt is also noteworthy. Long-term debt is also characterised by a largely negative correlation which is, however, much weaker. This means that high (especially long-term) debt can constitute a barrier to increasing spending on innovation.

A positive correlation between profitability and spending on innovation recorded in 2010 was higher than in 2007. Most of the interrelations showed a similar direction as in 2007. Liabilities were an exception, and which correlated strongly positively (not negatively as in 2007).

A positive correlation between debt and spending on innovation may be due to the fact that when enterprises use EU funds as a source of funding for innovation, they are obliged to make their own specific contribution, proportional to EU grants. Meeting this condition may involve the necessity to raise loans to finance the own contribution or liabilities resulting from the implemented co-financed project.

This conclusion is substantiated by the intensification of spending on innovation characteristic of 2013 (cf. Tab. 5.3).

Correlation rates for 2013 demonstrate that the strength of interrelation between profitability and spending on innovation is becoming weaker. This can be caused by debt-servicing. This interrelation was positively correlated with spending on innovation in 2010, while in 2013, it was negative. This can mean the necessity to service the debt generated as a result of intensified innovative activities measured by the ratio of spending on innovation to revenues. Also, the correlation between the number of persons employed and spending on innovation changed from positive to negative, which would indicate that innovation is labour-saving.

**Table 5.4.** The indicators of correlation between spending on innovation and the selected economic and financial values – 2007

| Specification | Actual internal spending (excluding depreciation of fixed assets) | Total external spending | Total spending | Share in revenues | Share of external spending in revenues | Total share in revenues | |
|---|---|---|---|---|---|---|---|
| Current assets | 0.384 | 0.460 | 0.400 | 0.408 | 0.257 | 0.438 | |
| Fixed assets | -0.254 | -0.217 | -0.247 | -0.126 | -0.194 | -0.117 | |
| Volume of assets | 0.218 | 0.288 | 0.232 | 0.278 | 0.054 | 0.304 | |
| Gross profit/ loss 2007 | 0.741 | 0.734 | 0.740 | 0.625 | 0.558 | 0.632 | max |
| Net profit/ loss | 0.738 | 0.733 | 0.738 | 0.622 | 0.551 | 0.630 | |
| Liabilities and provisions for liabilities | -0.007 | 0.074 | 0.010 | 0.037 | -0.331 | 0.067 | |
| Capital and reserves | 0.559 | 0.602 | 0.568 | 0.637 | 0.583 | 0.653 | |
| Long-term liabilities | -0.855 | -0.860 | -0.856 | -0.928 | -0.930 | -0.928 | min |
| Current liabilities excluding special funds | -0.254 | -0.182 | -0.239 | -0.188 | -0.465 | -0.163 | |
| Average number of employees in FTEs | 0.443 | 0.451 | 0.444 | 0.583 | 0.586 | 0.583 | |

Table 5.4 (cont.)

| Specification | Actual internal spending (excluding depreciation of fixed assets) | Total external spending | Total spending | Share in revenues | Share of external spending in revenues | Total share in revenues | |
|---|---|---|---|---|---|---|---|
| Number of persons employed | 0.455 | 0.464 | 0.456 | 0.594 | 0.597 | 0.594 | |
| Net revenues from sales and equivalents | 0.211 | 0.282 | 0.226 | 0.030 | -0.301 | 0.069 | |
| ROS | 0.702 | 0.630 | 0.688 | 0.677 | 0.775 | 0.652 | max |
| ROA | 0.637 | 0.636 | 0.637 | 0.505 | 0.439 | 0.511 | |
| ROE 2007 | 0.572 | 0.578 | 0.574 | 0.432 | 0.346 | 0.440 | |
| Max | 0.741 | 0.734 | 0.740 | 0.677 | 0.775 | 0.653 | |
| Min | -0.855 | -0.860 | -0.856 | -0.928 | -0.930 | -0.928 | |
| Average | 0.286 | 0.312 | 0.291 | 0.279 | 0.168 | 0.291 | |
| Median | 0.443 | 0.460 | 0.444 | 0.432 | 0.346 | 0.440 | |

**Source:** calculations based on survey data.

**Table 5.5.** The indicators of correlation between spending on innovation and the selected economic and financial values – 2010

| Specification | Actual internal spending (excluding depreciation of fixed assets) | Total external spending | Total spending | Share in revenues | Share of external spending in revenues | Total share in revenues |
|---|---|---|---|---|---|---|
| Current assets | 0.74 | 0.67 | 0.74 | 0.88 | 0.71 | 0.89 |
| Fixed assets | 0.69 | 0.43 | 0.69 | 0.78 | 0.35 | 0.78 |
| Volume of assets | 0.73 | 0.56 | 0.74 | 0.88 | 0.54 | 0.88 |
| Profit before tax | 0.90 | 0.29 | 0.90 | 0.91 | 0.15 | 0.91 |
| Net profit/loss | 0.89 | 0.31 | 0.89 | 0.89 | 0.16 | 0.89 |

| Specification | Actual internal spending (excluding depreciation of fixed assets) | Total external spending | Total spending | Share in revenues | Share of external spending in revenues | Total share in revenues |
|---|---|---|---|---|---|---|
| Liabilities and provisions for liabilities | 0.76 | 0.58 | 0.76 | 0.84 | 0.56 | 0.84 |
| Capital and reserves | 0.71 | 0.53 | 0.71 | 0.91 | 0.52 | 0.91 |
| Long-term liabilities | 0.56 | 0.95 | 0.57 | 0.52 | 0.97 | 0.52 |
| Current liabilities excluding special funds | 0.32 | 0.51 | 0.33 | 0.29 | 0.51 | 0.29 |
| Average number of employees in FTEs | 0.69 | 0.29 | 0.69 | 0.77 | 0.06 | 0.77 |
| Number of persons employed | 0.70 | 0.29 | 0.70 | 0.78 | 0.07 | 0.78 |
| Net revenues from sales and equivalents | 0.53 | 0.83 | 0.54 | 0.52 | 0.92 | 0.52 |
| ROS | 0.61 | -0.27 | 0.60 | 0.60 | -0.31 | 0.60 |
| ROA | 0.30 | -0.32 | 0.30 | 0.33 | -0.35 | 0.33 |
| ROE | 0.44 | -0.24 | 0.43 | 0.47 | -0.26 | 0.47 |
| Max | 0.90 | 0.95 | 0.90 | 0.91 | 0.97 | 0.91 |
| Min | 0.30 | -0.32 | 0.30 | 0.29 | -0.35 | 0.29 |
| Average | 0.64 | 0.33 | 0.64 | 0.68 | 0.31 | 0.69 |
| Median | 0.69 | 0.31 | 0.69 | 0.77 | 0.25 | 0.77 |

**Source:** calculations based on survey data.

**Table 5.6.** The indicators of correlation between spending on innovation and the selected economic and financial values – 2013

| Specification | Actual internal spending (excluding depreciation of fixed assets) | Total external spending | Total spending | Share in revenues | External share in revenues | Total share in revenues |
|---|---|---|---|---|---|---|
| Current assets | 0.032 | -0.108 | 0.035 | -0.251 | -0.273 | -0.267 |
| Fixed assets | 0.020 | -0.097 | 0.026 | -0.223 | -0.246 | -0.236 |
| -0.017 | 0.022 | -0.099 | 0.028 | -0.227 | -0.250 | -0.241 |
| Profit before tax | -0.001 | -0.108 | 0.009 | -0.277 | -0.258 | -0.286 |
| Net profit/loss | -0.006 | -0.109 | 0.005 | -0.283 | -0.259 | -0.292 |
| Liabilities and provisions for liabilities | 0.013 | -0.103 | 0.011 | -0.223 | -0.260 | -0.250 |
| Capital and reserves | 0.026 | -0.097 | 0.036 | -0.229 | -0.246 | -0.236 |
| Long-term liabilities | 0.000 | -0.098 | -0.002 | -0.239 | -0.255 | -0.268 |
| Current liabilities excluding special funds | 0.018 | -0.116 | 0.002 | -0.238 | -0.288 | -0.280 |
| Average number of employees in FTEs | -0.017 | -0.149 | -0.024 | -0.411 | -0.365 | -0.450 |
| Number of persons employed | -0.014 | -0.148 | -0.021 | -0.409 | -0.365 | -0.447 |
| Net revenues from sales and equivalents | 0.014 | -0.134 | -0.001 | -0.278 | -0.308 | -0.316 |
| ROS | 0.060 | -0.095 | 0.046 | -0.597 | -0.8751 | -0.581 |
| ROA | 0.051 | -0.056 | 0.035 | -0.642 | -0.964 | -0.690 |
| ROE | 0.069 | 0.022 | 0.044 | -0.580 | -0.963 | -0.678 |
| Max | 0.069 | 0.022 | 0.046 | -0.223 | -0.246 | -0.236 |
| Min | -0.017 | -0.149 | -0.024 | -0.411 | -0.365 | -0.450 |
| Average | 0.019 | -0.100 | 0.015 | -0.274 | -0.281 | -0.298 |
| Median | 0.018 | -0.103 | 0.011 | -0.245 | -0.259 | -0.274 |

**Source:** calculations based on survey data.

It is characteristic of all the analysed years that spending on innovation is particularly strongly and positively correlated with the financial results and profitability of enterprises.

Studying the correlation between spending on innovation and the selected economic and financial figures – despite the problematic results (mainly due to the heterogeneous and very limited database for individual years) – was considered purposeful, as it made it possible to demonstrate whether and to what extent such correlations are identifiable. Nevertheless, the complexity of innovative processes translates into the complexity of their evaluation as regards the present correlation and effectiveness. It would suffice to indicate there that some types of innovation can have a negative impact on the financial results of enterprises. This applies, for example, to costs related to environmental protection, incurred by companies. Such spending, which has been already highlighted in earlier research, bring macroeconomic benefits, for the general population, the environment, as well as those of a microeconomic nature, i.e. in the form of profits made by enterprises. Therefore, there appears a complex problem of a holistic assessment of the effectiveness of innovation, taking into account external effects and costs. Such an evaluation should be among the crucial factors for macroeconomic innovation policy and innovation support policy. Creating conditions for the intensification the use of the potential of the wikinomics with "networked power" and "networking" of social communication, serves as a grounds for increasing the rationality of the aforementioned policy at the microeconomic level, including in the enterprise sector, as well as at the macroeconomic level (Tapscott, Williams, 2008). Thus far, in Poland, this potential has not been tapped, which constitutes a barrier to enhancing the implementation of innovation in the economy (which was also pointed out in previous research).

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- The research demonstrated significant barriers and limitations to the possibility of identifying the direct impact on innovation on the financial standing of enterprises.
- These limitations become greater the shorter the analysed period of measurable effects and the smaller the database. This is important, especially as, due to the effects occurring later in time, spending on innovation may temporarily result the financial standing of the company becoming temporarily worse, which took place in 2013, i.e. when spending on innovations were intensified.

- The research indicates upward trends in spending on innovation in relation to revenues from innovation. At the same time, the research indicates a significant variation of the financial innovation image of the surveyed enterprises.
- The surveyed enterprises were characterised by significant differences in profitability. Nevertheless, median profitability was higher than in the total economy. Significant differences between the median and mean values of profitability indicators are also noteworthy. This confirms the diverse situations of companies in terms of their financial results. The scale of differences between mean values and the median shows that differences between enterprises have developed in a way far different from the normal distribution.

## 5.4. The Internet and Digital Technologies in the Operation and Strategies of Enterprises[25]

As demonstrated in the first part of the book, change in the modern economy and the operation and innovativeness of enterprises are determined largely by the technological breakthrough resulting from the information revolution, which, at the same time, results in the civilisational breakthrough, manifested mainly in industrial civilisation being replaced by a new economy and a new, not yet defied, model of this economy, a model of digital information civilisation, based on the wikinomics and macrowikinomics. At the same time, the shrinkage of industrial civilisation in favour of a new model of economy, results in the institutional solutions, mechanisms, regulations, economic priorities, and business strategies, typical of the industrial era, being maladjusted. Also, the risk of the exacerbation of the symptoms of unbalanced economic, social and economic development increases under such conditions. This creates grounds not only for the average income trap, but also for an increase in the risk of secular (permanent, perpetual) stagnation (discussed in the first part of the book). Such a risk is increased by low or especially zero or even negative real interest rates and the propensity of companies and investors to maintain liquid cash instead of investing it. This decreases the opportunity for an investment boom and the invigorating increase in interest rates. Therefore, the discrepancy between the real and potential growth of business production and GDP and the discrepancy between real and potential development, increase. When analysing this phenomenon, the terminological regime is crucial. Ignacy Sachs proposed to limit the use of the term "development" only to those situations, in which it is possible to observe progress in three dimensions – economic, social and ecological.

25 Subchapter 5.4 is authored by E. Mączyńska. The results of previous analyses, including those published in Mączyńska (2008, pp. 245–262) and in: Mączyńska (2012a, b), are also used here.

**Table 5.7.** Economic development and growth – primary categories

| No | Growth and development categories | Economic domain | Social domain | Ecological domain |
|---|---|---|---|---|
| 1 | Wild economic growth | + | – | – |
| 2 | Socially favourable growth | + | + | – |
| 3 | Environmentally beneficial growth | + | – | + |
| 4 | Development | + | + | + |

**Source:** Sachs, 1996, p. 44.

Socio-economic development, understood as the symbiosis of economic, social and ecological domains, constitutes a challenge for all entities of the socio-economic life, which is difficult to bring about. At the same time, the degree to which this challenge is met moulds the environment and the operational conditions for enterprises. The analysis of the potential of information technologies and the Internet indicates the presence of synergistic interdependencies in the functioning of the economic growth – social progress – ecological progress relations. Understanding those interdependencies fosters the optimisation of strategic decisions taken by enterprises, including those concerning innovative projects. The identification of these interdependencies, obtaining positive synergies, and eliminating or at least limiting negative synergies, is conditional on, among other things:

- adjusting enterprise strategies to global trends and phenomena determined by the digital revolution related to information technology,
- tapping the enterprises' creating and innovative potential through network communication,
- reformulating the enterprise management model towards applications facilitated by the macrowikinomics. This is even more important given the fact that, as demonstrated by Don Tapscott and Anthony D. Williams, the Canadian researchers of the Internet, in their *Macrowikinomics: Rebooting Business and the World*, "the world has reached a critical turning point: reboot all the old models, approaches, and structures or risk institutional paralysis or even collapse. It's a question of stagnation versus renewal". Tapscott and Williams state that owing to the Internet "the old industrial models are all being turned on their heads. There is now a new engine of innovation and wealth creation and a powerful new force that radically drops collaboration costs and as such enables communities to collaborate on shared concerns, endeavours, and challenges" (Tapscott, Williams, 2011, pp. 14–16). This is facilitated by wikinomics, which as a science and art of mass business collaboration, has become macrowikinomics, i.e. the application of wikinomics and its basic rules in all fields of social life and its institutions.[26]

26 Tapscott and Williams highlight that "Just as millions have contributed to Wikipedia — and thousands still make ongoing contributions to large-scale collaborations like Linux and the human

New information technologies and macrowikinomics create "online" conditions for new areas and forms of entrepreneurship but also new forms of cooperation between economic operators and the authorities, including local ones. The list of those forms and areas is long and is becoming longer and longer, also as a result of the internet revolution, including cloud computing, thanks to which all data are accessible from anywhere. The enumeration below is merely a basic exemplification of the potential of information technology and macrowikinomics:

- They facilitate the development of global horizontal links conducive to greater freedom and decentralisation of activities and their relocation, which is a significant challenge and opportunity for local authorities in terms of attracting entrepreneurs to their regions. At the same time information technologies limit the drawbacks of vertical links based on various business hierarchies (this has given rise to the terms of vertical and horizontal capitalism). In the Internet-based economy the boundaries between sectors and institutions become blurry, which forces entities to move away from the hierarchical model of vertical links and fundamental changes in the system of values and political culture, which, at the same time, promotes transparency, efficiency and speed of decision-making. This creates an opportunity to overcome the silo approach, characteristic of sectors in Poland, to management and decision-making, which manifests itself in, among other things, still low willingness to cooperate despite differences and the propensity to act as if things which did not affect you were not worth dealing with.
- New technologies facilitate quick transfer of knowledge and information on a global scale, which creates favourable conditions for new projects and creating new fields of economic activity, as well as releasing reserves in activities aimed at multiplying the public good and preventing waste of resources. "There is nothing so useless as doing efficiently that which should not be done at all" (unfortunately, there are many examples of such unnecessary work, especially in overly bureaucratic systems with unbearably extensive scopes of various, counter-productive reporting).
- Information technologies makes it possible to implement solutions from social networks in real life and business, which can create unprecedented potential, resulting from the combination of dispersed social knowledge and creativity. For some regions, especially those affected by migration, nomadism and the syndrome of "corporate gypsies" and the empty nest syndrome, establishing and benefiting from network links with the "diaspora" can constitute a strong stimulus for the development of local entrepreneurship. Exploiting this potential is an important challenge for local governments.

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genome project — there is now a historic opportunity to marshal human skill, ingenuity, and intelligence on a mass scale to reevaluate and reposition many of our institutions for the coming decades and for future generations. … Why not open-source government, education, science, the production of energy, and even health care?" (Tapscott, Williams, 2011, p. 16).

- Information technologies create prosumers (persons who are both consumers and producers) and thereby release new production capacity.
- They facilitate the development of crowdsourcing, i.e. the utilisation of the knowledge, ideas and inspirations originating from the crowd, thus the suggestions made by ordinary people.
- They facilitate the development of crowd founding, i.e. obtaining funds from the "crowd", which, in turn, streamlines breaking down financial barriers to various local projects.
- They create conditions for an effective linking of local entrepreneurship with global business, local enterprises with operators from other countries and regions of the world.
- They create conditions for leapfrogging, i.e. transitioning to the top phases of technological advancement while omitting intermediate phases through which innovators had to go through before.
- They create conditions and need for the creation of a "Facebook" for the government and local authorities, and, as a result, for the development of the state-local government-business-society relation.
- Information technologies foster the monitoring of various threats and creation of tools and systems for early warning against crises and socio-economic dysfunctions, and thus increase the chances of avoiding bankruptcies. In the case of bankruptcy, improve the possibility of taking actions aimed at giving a second chance to bankrupt entities.
- Information technologies drive social innovation, such as those conducive to the identification, efficient shaping, and utilisation of regional resources and values, including public space and landscape architecture. The last two factors are often undervalued. Public space and landscape architecture can multiply economic growth. In practice, however, they enjoy too little interest or are seen only as costs without potential for profit and multiply assets.
- Information technologies make it possible to combat the lack of vigour and limitations typical of government and management based on the obsolete industrial model. The possibilities connected with information technologies stand in contrast to the torpidity of typically industrial structures and traditional decision-making procedures.
- They make it possible to prevent the potential of seniors, which unfortunately still is the case in Poland, by creating the conditions for the development of silver economy, i.e. an economic focus on the elderly.
- They allow to mitigate the discontinuity syndrome and to reconcile opposing trends: durability and tradition vs. the globalising volatile world of the economy of instability.
- Information technologies stimulate the development civic initiatives and civil society, as well as make the dysfunctions of the present democracy, including lobbying, less severe. They make it possible to prevent other antidemocratic phenomena which have the symptoms of "golf" relations (Stiglitz,

2010; Buchter, 2009), the "American revolving door" and "amoral familism", destroying the social capital, as noted by Joseph E. Stiglitz (Sztompka, 2007, p. 257 and Sztompka, 2016).
- They facilitate the effective monitoring and analysis of social initiatives and the evaluation of their usefulness.
- They create conditions for the development of zero marginal cost societies, the Internet of things[27], and the sharing economy (Rifkin, 2016).

Furthermore, macrowikinomics and information technology create conditions for the development of the blue economy. This new field facilitates a synergistic link between the green economy and macrowikinomics. The blue economy creates eco-friendly opportunities for reformulating the economic development model (as described for example in *The Blue Economy, 10 Years, 100 Innovations, 100 Million Jobs – Błękitna gospodarka, 10 lat, 100 wynalazków, 100 milionów miejsc pracy* by Gunter Pauli (Pauli, 2011)). These 100 innovations include technologies which make it possible to replace expensive titanium, used extensively in medicine, with silk.

The Internet and information technology should be treated in such conditions as the *sine qua non* condition for the development of enterprises, and their creativity and innovativeness. As demonstrated in research, the Internet still has not been used to its fullest potential as a basis for the formation of the development potential of enterprises. While the vast majority of respondents (89%) answered the question "Do the Internet and information technology foster creativity and innovation?" positively (Table 5.8), this sees little support in practice. At the same time, nearly 70% of the respondents answered the question: "Does the enterprise use crowdsourcing?" (Table 5.9).

**Table 5.8.** The Internet and information technology versus creativity and innovation

| Question | Answer | Number of answers | % |
|---|---|---|---|
| Do the Internet and information technology foster creativity and innovation? | Yes, to a significant extent | 75 | 89.3 |
| | Yes, marginally | 5 | 6.0 |
| | Yes | 2 | 2.4 |
| | The Internet is a threat to creativity and innovation | 1 | 1.2 |
| | The Internet facilitates imitative innovation | 18 | 21.4 |
| | It is hard to say / I don't know | 1 | 1.2 |

**Source:** survey results.

27 *Internet of Things – IoT, also referred to as the Internet of Everything* (IoE) expresses the potential of internet networks linking entities, people, processes, and databases. This makes it possible to heat up rooms (thanks to internet remotely controlled sensors) or transfer information on various processes, changes, and statuses, as well as about various e.g. health-related risks (Rifkin, 2016).

The respondents do not see the Internet as a threat to creativity (only one respondent pointed to such risk – Table 5.8). At the same time, while more than 20% of the respondents see the Internet as a factor which is conducive to innovative innovation (Table 5.8), in practice most enterprises (more than 70%) do not use crowdsourcing, which is a source of knowledge typical of digital technologies and associated with virtually no cost (Table 5.9).

**Table 5.9.** The Internet and crowdsourcing

| Question | Answer | Number of answers | % |
|---|---|---|---|
| Does the enterprise use crowdsourcing? | Yes, to a significant extent | 3 | 3.6 |
| | Yes, marginally | 8 | 9.5 |
| | Yes | 58 | 69.0 |
| | I don't know what it is | 7 | 8.3 |

**Source:** survey results.

Only three respondents (less than 4%) state the use of crowdsourcing by enterprises, and more than 8% of the respondents do not know what crowdsourcing is (Table 5.9).

The survey results presented in Tables 5.8 and 5.9, while very general, indicate the symptoms of the enterprises lagging behind and changes therein being maladjusted to the conditions and potential of information evolution, wikinomics and macrowikinomics. This potential is expressed, first and foremost, in the creation of information networks as tools and innovation stimuli.

At the same time, the information revolution can increase the risk of innovative concepts being intercepted, which is undesirable and manifests itself in the free-rider problem. The free rider is an entity (a natural or legal person) who benefits from goods or services (in this case innovation) and does not incur the costs of their production, or benefits from such goods or services to the extent exceeding their cost share. While this problem usually applies to public assets, as a result of the development of information technology, it can be more and more often observed as regards the enterprise sector. One of its symptoms is brain drain. This phenomenon can become intensified under free global market conditions and the dynamics of information technology. The fact that foreign countries and enterprises can attract the most qualified people, can have a negative impact on the development of innovation in affected businesses. As demonstrated in the surveys, this problem does not affect the majority of the surveyed enterprises (nearly 55%). Still, it affects more than 20% to a significant extent and nearly 20% to a marginal degree (Table 5.10).

**Table 5.10.** The Internet and brain drain

| Question | Answer | Number of answers | % |
|---|---|---|---|
| Has your enterprise been affected by brain drain? | Yes, to a significant extent | 17 | 20.2 |
| | Yes, marginally | 18 | 21.4 |
| | Yes | 46 | 54.8 |

**Source:** survey results.

The degree of institutional maladjustment is conditional on the level (stage) of economic development – the greater the extent to which the actual stage of development differs from the stage driven by innovation, the greater the degree in question. New technological trends, and especially the Internet of Things (IoT), are opening up completely new opportunities for utilising production capacity and social capital. It brings about the sharing economy, which is completely different from the previously dominant business models applied. This changes not only the operating conditions of enterprises and their environment, but also the way of life of people and social relations. Internet platforms facilitate the development of various forms of service and manufacturing activity, including prosumer activities and activities with near zero marginal costs (Rifkin, 2016). This allows the development of the sharing economy, which is often referred to as uberisation (in reference to the transport services provided by UBER). The symptoms of the sharing economy can be already observed not only in transport, but also in the tourism and hotel industries, as well as in other fields. This poses new challenges for companies in terms of intensifying the creation and use of the potential of innovative technologies and adapting to them. Any delay in this regard can be very costly for businesses and have far-reaching consequences, including the risk of bankruptcy. The results of the surveys indicate that the surveyed enterprises are not sufficiently prepared for new trends and technological challenges.

Therefore, the development of the institutional infrastructure of innovativeness is becoming so much more important. According to studies, carried out e.g. by the National Bank of Poland, the solutions and regulations in this respect have not been effective enough. As illustrated in analyses, the innovation support system in Poland is too fragmented. There is no institution which would be clearly responsible for coordinating support for innovation, i.e. a body responsible for coordinating the work of individual ministries and agencies. This points to the need for establishing a body responsible for coordinating the work of individual ministries and agencies (*Potencjał innowacyjny*, 2016, p. 223 et seq.). The establishment of the Innovation Council in 2016 can be regarded as a step in this direction. As a target the Council will act as an inter-ministerial coordinator of government policy for innovation support. It will also be responsible for, i.a., initiating actions aimed at active support for innovative activities, creating incentives to increase expenditure of enterprises on R&D, and including pro-innovative solutions in the public procurement system.

Against this background, increased importance should be attached to the thesis that strengthening the pro-innovativeness of enterprises and the economy requires a change in the role of the state in favour of an state which is active in shaping an innovative ecosphere and stimulates innovativeness, taking into account the long--term perspective and long-term social benefits aimed at improving the quality of life. Thus, the importance of long-term strategic visions oriented towards stimulating socially beneficial innovation and identifying the risks of apparent, harmful and undesirable innovation leading to anomalies, erosion of ethics and trust.

Changing the role of the state and increasing its activity will also stem from the phenomena of digital exclusion, illiteracy and the "specter of uselessness" associated with certain innovations. While the development of the sharing economy mitigates these threats, for this to be the case, it is necessary for the state to welcome the strengthening of this trend. This is all the more important because the literature points to the symptoms of the "twilight of capitalism". This is brought to light by, among others, Jeremy Rifkin who formulated a thesis on the emergence of a new hybrid socio-economic system which combines the features of capitalism and the sharing economy. Such opinions can be also found in Polish publications, including those by Zbigniew Madej.

A fragment of his publication under the telling title *Megasystemy są śmiertelne* ("Megasystems are Mortal") may be used as the final conclusion addressing the political basis for innovation. He highlights that "history is written by future generation, and it is them who will determine the dividing line between capitalism and some post-capitalist formation. While we can nowadays say that we are introducing a new model of capitalism, the future experts will debate whether it already had some post-capitalist characteristics, or may explicitly state that it, indeed, was post-capitalist. This has already been the case on many occasions. It was not until modern times that the entire chain of great political formations, recently referred to as mega systems, was determined. People lived for centuries in family-based communities, in slavery and feudalism, not knowing these names and not demarcating any boundaries" (Madej, 2014). This was also the case with capitalism. Therefore, the questions "How the economic theory will generalise the modern experiences related to the ongoing evolution of capitalism?" and "Which directions of its transformation will prevail and dominate the socio-economic reality in individual countries and the global economy?" appear. The questions are open-ended in nature. While only the future may bring the finals answers to them, the development of the sharing economy and zero marginal cost society can bring us closer to such answers.

Chapter 6

# The Role of Research Sector in the Transition towards Innovation driven Economy

## Introduction

Knowledge obtained through scientific research has always been used in economy. An inquiry into two subsequent stages of economic development shows considerable differences between them in the expectations of economy towards scientific research. These differences are reflected in the mutual relations of scientific and economic institutions. It is therefore not only the mutual expectations that differ, but also "model" relations between businesses as economic institutions and universities as scientific institutions. The notion of university used herein is to symbolise the entirety of various research units. These include above all institutions of higher education, research institutes and research and development (R&D) centres.

The history of economic progress led economists to distinguish between the development stage[1] in which the competitiveness of individual businesses and economies was contingent on the number and value of real investments and the stage in which competitiveness of individual businesses depends on the amount and importance of the product, process (technology) and organizational innovation. In the first stage investments increases the production potential and effectiveness, forming the economy which is called here the investment driven economy. The second stage is called the innovation driven economy. As for competitiveness in the innovation driven stage is acquired through gathering new knowledge, this stage is also known as knowledge based economy. Demand of businesses for permanently new knowledge transforms in the demand for new formula of research institutions, and this is giving the rise for replacement Humboldian (traditional) university by modern university.[2]

1 See Chapter 1. Polish economy in view of the development stages.

2 Even though the majority of academia acknowledge "Humboldtian" as the name of the university model to replace the medieval university, there is a continuing controversy

The study showed that the period of investment driven economy corresponded to the prosperity of Humboldtian research units, whereas the period of innovation driven economy falls together with the ascendancy of modern university. It is, however, not a coincidence, but a mutual adjustment of economic and research institutions in respect of their structure, strategy, and motives. This is also proved by the characteristics of both types of units presented in the paper, highlighting their mutual expectations at different stages of economic development. It is the primary objective of this chapter to show this particular correlation. It presents premises which support the thesis that it is not possible to attain the stage of knowledge economy – the innovation economy – without any adjustments of the research industry to the conditions of the modern university model.

The secondary objective of this chapter is to present empirical evidence i.e. data which illustrate the relations between economic and research institutions, and which demonstrate that their close collaboration is necessary for economic development. That is to say, if businesses as economic institutions build their competitive advantage on innovation while research units do not initiate the transition towards the modern university model, the ensuing development is only temporary at best and does not necessarily lead to knowledge economy level. It is not the intention of the author to claim that it is the economic progress that induces the model change in research units nor is there any empirical evidence to support this, as there is a considerable number of factors leading to this change. The point of these considerations is that Poland is currently undergoing a temporary development of economy which is evident from the relations between economic and research institutions. The process also involves knowledge brokers that link producers of research evidence to businesses as users of research evidence, as well as entities responsible for funding such intermediation.

## 6.1. Research Sector and Investment driven Economy

Both the investment driven economy and knowledge economy stages are variations of capitalist economy. Its leading economic entity is a private business in pursuit of maximising its surpluses through the proper use of the factors of production of goods or services. The knowledge required to that end may be gained in an imperceptible manner at the investment driven stage. This means

surrounding the model embodied by contemporary educational and research units. It is namely debated whether it should be referred to as the second- or third-generation university. This paper focuses on the modern university.

that a business does not necessarily have to be aware of research institutions in which the said knowledge is produced and which operate beside economic entities. Businesses obtain the knowledge required for their operation from employees who had received education in research institutions. Apart from that, businesses can purchase knowledge in the form of patents, licenses and consultation from their business partners. They may also obtain the knowledge published free of charge as a public good in the form of scientific papers presenting research results. Knowledge management in business falls outside the scope of this paper. This knowledge ensures optimal reliability of both the product and the technology side of manufacturing process. In other words, it ensures a high probability of achieving the results as planned in a normal mode of operation. The fact that the process of obtaining knowledge is not visible for the business also results from the knowledge financing methods. The cost of knowledge production falls within various branches of public finance which finances the operation of many research institutions. For businesses, the cost of gaining knowledge is hidden in the salaries of experts or business services such as licensing or consultation. Yet this stream of knowledge does not have a certain fundamental value which would allow for determining its price. The price for a new technology patent for a product to be launched, paid by business to the author, does only pertain to the current commercial status of the given technology, product or design. It does not reflect the social cost required for its production in any way.

Research institutions, also referred to as universities heretofore, operate in the market alongside with businesses (economic institutions). Regardless of the actual name of the institution and its scope of research, a university shall mean any entity conducting scientific research i.e. exploring the laws of nature and human societies. The Humboldtian university emerged in the research sector approximately at the same time when the concept of business as described above appeared in the investment economy. Usually the term was used by experts who studied the advancement of human activity in this area. They deemed it to be the evolutionary successor of the medieval university. The Humboldtian model of university, today also referred to as the traditional university, attracted particular attention at the turn of the 20$^{th}$ and 21$^{st}$ century. At that moment, it became clear that the traditional model was becoming obsolete. Its successor was an institution of different and original features (Jóźwiak, 2002, 2012; Sztompka, 2014; Wissema, 2005, pp. 104–105). In the traditional university model, as it is often stressed, the university has two functions: scientific research and education of students. Those who engage in scientific research are driven by curiosity of the world. At the university, issues such as the future employment of students, practical application of the knowledge produced, and any other consequences of scientific discoveries are of little importance. Freedom of scientific research is a major academic freedom. The results of research of state-funded universities are regarded as a public good for everyone to use free of charge. They are published in books and scientific journals. Research and educational activity is usually categorised according to the individual areas of

knowledge and concentrated in separate faculties and departments. Humboldtian universities are national institutions which educate students of a given country or nation in their own language. Contact and cooperation among scholars and students from other national or foreign universities is rather rare.

Knowledge produced at universities is the main source of progress and changes in capitalist economy. But for this to happen, this knowledge must be transformed and commercialized. The following sequence of dependencies may be drawn here: firstly, a scientific discovery is made, i.e. laws and principles concerning a specific aspect of reality are formulated in the research sector. This knowledge is then commercialized, i.e. used to design inventions and examine them for their technical and commercial viability. It is only then that these designs are authorised for commercial production and launched on the market. This sequence of events may, of course, take different forms and configurations in practice. I will continue to address that issue throughout the analysis. For instance, an inventor may design a new good out of their intuition and not on the basis of their university knowledge, whereby the design can inspire university researchers to explore new laws etc. The knowledge commercialization process is of profound significance. This paper seeks to confirm that it is different methods of knowledge commercialization that allow for assigning the two stages of capitalist economy development (investment and innovation economy) to the two university models: the Humboldtian university and the modern university. The commercialization of knowledge is examined to a wide extent rather than limited to simple buy-sell transactions between the producer or distributor of knowledge and its user.[3] It comprises a series of processes during which new knowledge is transformed into new products and technologies and perfected until these are technically reliable and acceptable by users.

At the stage of investment driven economy, knowledge commercialization occurs outside of the economy sector, but also outside the research sector. Inventiveness of various kinds is typical of amateur enthusiasts who transform various ideas and discoveries into product designs or methods of their manufacture. Such issues as time, expenditure or the likelihood of success are not of importance for them. In fact, most inventors are not successful. Technical encyclopaedia mentions relatively few people who did achieve spectacular success, such as H. Bessemer, T. Edison, or M. Tesla. The majority, however, disappeared without a trace, struggling with the burden of technical and market uncertainty which was placed on their projects. Economic entities buy a finished project intended for commercial use. The price they pay for the project probably only covers a small part of material

3 This corresponds to the definition of commercialization e.g. pursuant to the Law on Higher Education of 27 July 2005, "Journal of Laws", No. 164, item 1365. In fact, this act defines two types of commercialization. One of them is direct, which means the results of research, development works or know-how is sold, in particular on the basis of a licensing, leasing or letting agreement. The indirect commercialization involves taking up or purchasing shares for the purpose of implementing results of research, development works and related know-how, or preparing them for implementation

input and work of the inventors. If this stage was to be omitted in deliberations on the relation between producing knowledge and creating products, it would allow for a model of an automatic relationship between the science which creates knowledge and economy which uses it and disseminates it (Kowalski, 2013, pp. 104–105; Audretsch, Lehman, 2006, p. 193).

Over the last 250 years of the present capitalist economy, science and economy co-existed next to each other during more than 200 years and were mediated by amateur inventors. They had the resourcefulness of business people and the curiosity of people of science. In the economically developing world, this period saw a significant increase in the specialized R&D sector. The increase was measured by the number of employees and the amount of non-personal expenditure. The role of the hobbyist/inventor diminished while the importance of research conducted in industrial laboratories grew (Gomułka, 1998, pp. 35–41). Indeed, enterprises have created powerful research facilities. Employment and non-personal expenditures of these enterprises rank high in economic statistics. From the technological perspective, the economy has produced several generations of substantially different goods which were the result of technological breakthroughs.

## 6.2. Research Sector and Innovation driven Economy

The term "knowledge-based economy" became popular in the 1970s–80s. This coincided with the launch of new range of products as a result of the discovery of silicon semiconductors and the communication and information revolution. With time, it became clear that the application of these (and other) novel solutions in the economy increases the value of a company in terms of surplus much more than traditional investment and upsizing. This led to the belief that the new knowledge and innovations contained in the ongoing investments (and not the investments themselves) are becoming the basis of competitive advantages of individual business entities and countries in which new knowledge is being developed and new technologies are being created. As this awareness is spread, the demand for commercially suitable innovative projects grows.

The traditional amateur inventors are unable to react to this demand because they cannot afford sufficiently large expenditures required for generating the desired stream of new inventions. As amateurs, moreover, they work according to their natural pace, incompatible with the corporate regimes which are essential in the current economy. The response to the new demand of the economy is the emergence of a new type of enterprises – innovative companies. Often called spin-offs, spin-outs, innovation incubators or start-ups, these usually small enterprises

work quickly and engage in risky projects. Their funding source has a special place in the financial sector of economy referred to as *venture capital*. It is the innovative companies that are currently commercializing knowledge, thus mediating between universities and the businesses which use it. Upon making an invention, they sell it, or they sell themselves to larger companies which seek technical or organizational innovations. A market is being created for innovative products or innovative companies. These companies are the ones which present universities with new challenges and pressure them to adapt the mode and scale of scientific discoveries to the needs of an innovative economy.

But universities not only respond to the expectations of innovative companies regarding the pace of scientific discoveries and bringing them closer to economic use. They commercialize the acquired knowledge themselves. In this way, they become competitors of innovative companies. The consequence of these activities are direct connections between enterprises and universities. This gives rise to the transformation of the university with its aims and structures. The Humboldtian University turns into a modern university.

During the last decades of the 20th century, universities faced the need to adapt to the new social situation. In many countries, social mobility became widely possible through education. This meant a rapid increase in the number of higher education candidates. As they entered universities, these had to modify and extend the education pillar of their activity. Almost at the same time, they were expected to adapt the other pillar, i.e. scientific research, to constantly provide streams of new knowledge as the "fuel" for the growing stream of innovation in the economy. It was also supposed to start commercializing this knowledge. This concerned not only academic knowledge regarding nature laws, but also knowledge which had already been, at least partially, commercialized. Universities which take up this challenge essentially divide the existing scientific research into two lines of activity: knowledge production and knowledge commercialization. This is manifested in the establishment of university units responsible for selling the results of university work directly to economic institutions or institutions which indirectly put this knowledge to practice. They operate beside the units involved in the publication of scientific papers.

Today's universities can receive more funding for their activities than they used to. First of all, the holders of public funds increase funding in exchange for increased educational and research activity. Secondly, the students themselves (partially) pay for education, expecting that it will be adapted to their future occupation. Thirdly, business entities pay universities for their commercialization of knowledge. Companies also sometimes participate in financing universities in their scientific discoveries within the framework of "corporate social responsibility".

If a contemporary university is to be an actual modern university, then it must change to a much deeper and wider extent. It will be namely expected to exhibit an extended scope of responsibilities and to perform these duties partly "for money". Moreover, the model of the modern university itself is still *in statu nascendi*.

Nevertheless, there are features of the new university model formulated by specialists which can be easily associated with the new role of knowledge in the economy.

First of all, as mentioned above, the commercialization of inventions is the new third pillar of university functions, alongside the research and education function which results from the Humboldtian model. Secondly, universities gradually take over the role of international technology flow centres, associated with the function of knowledge commercialization. This results in the third trait, namely English as the modern lingua franca of university communication. By definition, the university today is international, in contrast to the Humboldtian university which was national. Fourthly, the internal structure of universities is changing. At the core of the Humboldtian university structure was the faculty. Now, this is being replaced by a structure based on interdisciplinary teams focused on research topics and projects, which enter cooperation with organizations and external institutions. Fifthly, the methods of evaluating people, teams and entire universities are changing. It is anticipated that the supposedly temporary and increasingly controversial criteria based on the number of works and publications will soon give way to expert assessments and criteria which reward the value of inventions made. And finally, the way the academia responds to stimuli and incentives is changing. Previously focused on tasks assigned by the university, researchers are now more inclined to pursue tasks entrusted by external university clients (Jóźwiak, 2012; Wissema, 2005, pp. 104–105).

The existing image of the connection between the economy and science implied that it is economy that initiates changes in the nature of these connections. In pursuit of maintaining and improving their competitive position, companies are to introduce innovations to production and management. They expect research units to make new discoveries and commercialize them, as well as to undergo transformation themselves. Such an image is probably justified when it comes to the development of enterprises which are the leaders of global economic competition and when the changes described take place spontaneously. However, it does not really matter whether the initial changes occur in the enterprises and the transformation of universities follows them, or perhaps the opposite is true. The issue is much more complicated in the context of countries where the technological progress is intermediate or even slow, as in Poland. When such countries attempt to increase the innovativeness of their economy, the bodies responsible for economic policy face the decision whether to rebuild the research sector so that business entities may find a sufficient supply of (commercialized) inventions, or perhaps to reconstruct the economy so that it creates a demand for research which would gradually transform research institutions according to the modern university model.

One of the main differences between the investment driven and innovation driven economy is the speed of technical and organizational changes. In the innovation driven economy, the rates of these changes are high and cannot be measured by various indicators used for worldwide statistic compilations of economic entities and economies of different countries. The economy immediately employs

the results of scientific discoveries made at universities. There are no stocks of unused commercialized and un-commercialized new knowledge. Moreover, it also puts pressure on the creation of new discoveries and new knowledge applicable in the economy. Universities and enterprises are mediated by new institutions which have replaced former amateur inventors. They consciously accept extraordinary risk associated with knowledge commercialization. The special compensation for this risk is included in the price of innovative projects. Innovative companies and universities participate in the market of innovative projects. The existence of this market guarantees or at least creates the opportunity to include in the price the labour costs and non-wage expenses incurred in their production. It is likely that production costs are higher in an economy driven by a steady influx of innovation than in an investment driven economy. In that economy, there was no market for innovative projects, so a project would cost as much as the patent fee or the price negotiated with an individual transaction between the inventor and the entrepreneur. (The currently increased costs of innovative projects are compensated by the increased revenues achieved thanks to the better competitive position of businesses which introduce innovations).

Innovative companies offer innovative projects which often result from the commercialization of scientific discoveries made in research units i.e. universities. Amateur inventors at the time of investment-based economy more often commercialized their ideas not confronted with university knowledge. In this sense, the importance of knowledge produced in universities increases in the innovation driven economy. The role of knowledge stock collected in businesses is also growing and changing. To maintain their competitive position, they require to introduce quick technical and organizational changes. Thus, they are forced to stay in permanent contact with institutions which produce and commercialize knowledge. They themselves must also participate in these processes. This is where they receive support from research and development units which have existed and grown in enterprises for many decades. And so, a lasting and permanent relationship between the research and economy sectors is established. Businesses acquire the characteristics of research institutions and vice versa. It is the enterprises or, to a greater extent, the entire economy sector that bears the costs of maintaining knowledge stock in enterprises and using them. Ultimately, it also pays for the operation of innovative companies and research – at least for that part in which results of scientific discoveries are transformed into innovative products, technologies, and methods of organization. In the stage of innovation driven economy, these costs vanished in the institutional structure of the time. It does not mean, however, that they were not a burden for the people who lived and worked at that time.

Incidentally, some scholars who study the characteristics of modern universities hold the opinion that the innovation driven economy, can make universities lose their identity. Until now, the university did not associate the rate and scale of its discoveries (the knowledge produced) with the amount of funds it received for the purpose of its activity, regardless of its model. In the phase of innovative economy,

universities in the entire world are currently expected to assume the function of knowledge commercialization and compete with innovative companies on the market of innovative projects (Sztompka, 2014). This may drive them to replace their discovery activities, which has so far been conducted "out of curiosity of the world", with the inventive activity. Tests of scientific discoveries will be replaced with testing of inventions, encouraged by the money flowing from the economy.

## 6.3. Polish Science and Economy in the Transitional Stage of Economic Development

Upon the analysis of the practical relations between enterprises and research units in Poland, this part of the paper seeks to identify the current position of the Polish economy, i.e. whether it is closer to the investment economy or the innovation driven economy. This section deals with the following four aspects of the analysis: it examines the existing legal bases of current relations between research and economic institutions and the actual operations of institutions which maintain such relations; it presents the expectations of both parties regarding the relationship between the research sector and the economy as confirmed by previous studies; finally, it presents the results of research carried out by the authors of this book on the relationship between enterprises and research units.

It is difficult to clearly determine why the efforts of research units to put the results of their research to practical use have been included in the criteria for the evaluation of research units in Poland. It might have been the need to clearly understand the scope of their operation, which would then be used for a more convenient scheme of distributing funds for research. It could have also had a more ambitious objective resulting from understanding the future role of research units in the construction of a knowledge economy. Regardless of the motives, it can be assumed that the analysis of subsequent provisions of these criteria helps determine the trend in relations between research units and enterprises.

In general, the principles and way of operation of research institutions (majority of them – in Poland – being public entities, financed from public funds) are defined by two types of regulations. The first type are laws that stipulate the substantive scope and general principles of activity of particular types of research units, higher education institutions, science institutes (PAN, the Polish Academy of Sciences, and PAU, the Polish Academy of Learning), research institutes and scientific-research facilities, their connections outside the research sector, internal structure etc. Such regulations are relatively long lasting as the average duration period of an act amounts to about 25 years. However, every act is subjected to continuous amendment from the moment it is passed until it is replaced by a new act.

Pursuant to the regulations which have been in force over the last twenty-five years, the activity of a basic research unit comprises "conducting scientific research and development work, adapting research and development work for the purpose of practical application, and implementation of results of research and development work" (Ustawa z 30 kwietnia 2010 r. o instytutach badawczych – Act of 30 April 2010 on Research Institutes, Article 2).[4] This act precisely regulates the method of managing research results which are "subject to commercialization". In the chapter on the principles institute economy (Article 16 point 5), the act provides as follows: "In order to commercialize the results of scientific research and development work, an institute may carry out activities in the field of technology transfer, disseminate science findings, raise funds for statutory activities, establish capital companies (upon prior consent of the supervising minister), take up shares in those companies and earn revenue from them". This concept is reiterated in laws regulating the operation of all sorts of research units. It is a cautious attempt to regulate the business activity of a public research unit, authorizing it to cooperate as well as to compete with business entities. Another law (Ustawa z 30 kwietnia 2010 r. o zasadach finansowania nauki – Act of 30 April 2010 on the Principles of Science Financing) regulates the procedure for research units to obtain public funds. It establishes two main sources of funds: funds granted by the minister to entities "for the purpose of maintaining the research potential of a research unit" and funds distributed by the National Centre for Research and Development (NCBR) and the National Science Centre (NCR) via competition for "strategic research and development programs".

From the point of view of a research unit, it is the criteria for the amount of resources granted to a unit periodically that are of major importance as they determine its scientific potential and subsequent attempts to receive funds for scientific purposes (by means of the competitions). These matters are determined by the law which belongs to the second type of the above-mentioned regulations. The regulations which are currently in force stipulate the parametric evaluation of research units. They predetermine the criteria for the assessment of research units and simultaneously create certain incentives for their specific research procedure. These regulations are therefore of primary importance for the relations between research units and enterprises and other economic entities. As they define the amount of funds received by research units, they are, in fact, more important for their activity than the acts mentioned above.[5]

4 In a similar way, the research obligations of universities and scientific institutes of the Polish Academy of Sciences are regulated by relevant laws. See. Act of 30 April 2010 on the Polish Academy of Sciences, as well as the Act of 22 July 2005 – Law on Higher Education, Article 4, which regulates the research obligations of higher education institutions.

5 From 2001 to 2013, there were five different versions of the parametric evaluation of research units in Poland. Joanna Jakuszewicz list all of them in her PhD thesis devoted to this problem (Jakuszewicz, 2015, p. 125).

In the Polish legal order, the legal acts which determine these criteria are the ordinances of the competent minister. It can be argued that it was only in the ordinance of 2015 that presented these criteria in a way which encourage research institutions to assume responsibility for the practical use of the produced knowledge and to enter a direct cooperation with enterprises. In order to meet the criterion of material effects of the research activity performed, a research unit should earn "revenue from research results or development works conducted in the unit implemented by other entities" or "revenue from the sale of a product resulting from the implementation of the results of scientific research or development works in the research unit" (Ordinance of the Minister of Science and Higher Education of October 27, 2015, p. 11). These ordinances replace the earlier regulations regarding the production of material effects of research activity. These were previously calculated indirectly, for instance as the amounts of gross remuneration of the research unit employees (personal and non-personal expenditure) not included in the financing of statutory and educational activities. It also encompassed the cost incurred by the (evaluated) research unit for the purposes of own research, development work, development of research infrastructure, purchase and production of scientific and research equipment and software for research purposes". (Ordinance of the Minister of Science and Higher Education of 1 August 2012, Article 11.1). If the Ordinance of 2015 was used in the practice of evaluation of research units and in the distribution of funds among them pursuant to that evaluation, research units would have taken the first step towards a modern university.

During the time elapsed between the research conducted and discussed in this book and the current publication of this book, a legal act appeared in Poland, which cannot be omitted in the discussions about the relations between the sphere of science and economy, namely the new version of the Law on Higher Education and Science, dated July 20, 2018. Can this Law be treated as a second step towards a modern university, or as a breakthrough or as a step more resolute than the previous ones? There is no research on the practical meaning of this law from the point of view of the subject of this book, so there are no grounds for deriving documented conclusions about its practical meaning. In addition, some quite significant executive regulations re still missing. Finally, some institutional arrangements of the Act, not necessarily directly related to the research activity of the university caused a certain shock in the academic environment, the effect of which is even to extend the work on the statutes to decide on the university bodies and other important details of their functioning. In view of the above, at this point (mid-May 2019), I cannot – I think – talk about the new regulation more than mentioning initiatives that look promising from the point of view of shaping the relationship between science and economy within the Polish innovative system. The following can be considered as such: the division of universities into vocational and academic schools and the opportunity to launch an initiative: a research university, a clear definition of direct and indirect commercialization with incentives for these two processes, more explicit than in previous regulations specifying the financial conditions of research

activity and simply commercial, although without certainty that practical decisions will, for example, have to fit in differently designed decisions of the Public Finance Act. In addition, it must be remembered that the world literature on the economy of innovation recognizes the university – science relationship as a permanent problem, nowhere to be solved. In conclusion, I would describe a new version of the law on higher education as a decisive step towards a modern university, modern from the point of view of shaping the science-economy relationship.

In Polish economic practice, it is considered important and useful to have special intermediaries in establishing relations between research units and enterprises. The institution of the technology transfer centre (CTT) is supposed to be such an entity. About ten years after the first centres of technology transfer appeared in Poland, their tasks were analysed in a study (Dzierżanowski *et al.*, 2005).[6] The fragments of this analysis concerning the practical role of technology transfer centres proved valuable for this paper. They stated that the dominating sources of revenues of the examined centres were grants and subsidies from public authorities (at the EU and national level) (Dzierżanowski *et al.*, 2005, p. 14). The authors of the analysis and the report claimed that the declared goal of CTT was (and still is?) to inspire cooperation between research and practice, as well as to help in obtaining technologies. Its main objectives include training activities, mediation in acquiring technology and consulting. These centres very rarely keep databases of projects for which sources of financing are obtained. In her report discussing the results of CTT research, Elżbieta Wojnicka, the author, notes that "the centres surveyed admitted that much more technology transfers which they facilitated were business-to-business transfers. The organization of research and business in Poland rarely leads to real solutions such as implementation of innovation (…) [Centres] pointed out that foreign enterprises are not interested in contacting the Polish scientific community, which is a significant problem" (Wojnicka, 2005, p. 93).

The content of this *Report* highlights three issues which deserve a comment. First of all, the research covered a period of time when there were no particular conditions which would encourage enterprises to increase their innovation activity. Poland at that time was on the verge of entering the EU, long before the "financial perspectives" providing EU support and a substantial inflow of funds aimed at stimulating innovation in Poland began. Secondly, the authors of the report themselves admitted that there was not really much to say about CTT. Centres which were to popularise projects developed at universities did not have "anything to transfer" because universities were not interested in commercializing the results of their research due to an improper system of incentives (Dzierżanowski *et al.*, 2005,

6 The research was conducted by IBnGR in May-August 2004. The studies encompassed, among others, 38 Technology Transfer Centres existing at that time, usually operating at other research units, universities, agencies, and financed mainly from public funds, including European Union funds. They performed their services mostly free of charge, sometimes for a fee, and served several dozen clients a year.

p. 32). Thirdly, CTT could perform an auxiliary function as transition institutions to fill the gap made by the lack of incentives and inability to act exhibited by the actors of the innovative economy, i.e. enterprises, research units and innovative companies. Or they could remain a permanent element of the change towards the innovative economy, in which innovative activity is regulated and controlled by same body financed from public funds. Nevertheless, the analysis of their activity shows that their long-term role in the economy is not clear until now.

## 6.4. Business and a Research Unit – Mutual Expectations

Verbal attempts at convincing Polish entrepreneurs about the values of innovative economy lasted more than a dozen years. It has been a few years now since they endorsed the concept of innovators. The conditions are suitable for examining what expectations economic entities have of science as well as what expectations Polish research units have of the economy. This task was undertaken by the authors of the study *Conditions for effective cooperation between research institutions and businesses*[7] (Bąk, Kulawczuk, 2009). Considered from the perspective of research units, their cooperation with enterprises creates a complex image presented below. Only 12.5% of the scientists surveyed said that the units they represented had ever been offered to cooperate from an enterprise. Another 12.5% of the respondents answered that they often receive proposals for such cooperation, whereas 75% of them admitted that they receive proposals for cooperation occasionally or rarely (Kulawczuk, Kulawczuk, 2009, p. 25).

According to the scientists, the subject of the cooperation proposal was:

- Delivering a presentation during a training organised in the company – 50% of responses.
- Invitation to joint research and development projects – 35%.
- Joint organisation of a conference or seminar – 32%.
- Joint application for innovation support funds – 18%.
- none – 12% (Kulawczuk, Kulawczuk, 2009, p. 26).

They indicated the following as the object of the actual cooperation with the companies:

- Advice or expert report provided by the research unit – 75% of responses.
- Organization of student internships and apprenticeships – 50%.

7 The study group encompassed 213 representatives of science from 13 provinces and 202 entrepreneurs from 3 provinces, representing companies of different size. For full results of these studies, please refer to the abovementioned publication. This paper only reports selected results. The given values have been summed up and rounded.

- Participation in a conference organized by the company – 40%.
- Participation in training organized by the company – 37%.
- Implementation of a joint project – 35% (Kulawczuk, Kulawczuk, 2009, p. 30).

Requested to evaluate the results of cooperation, 30% of the respondents rated the effects to be none or minimum. Only slightly over 20% of respondents indicated that the cooperation has brought noticeable results and the solutions provided by the research units are actively used by enterprises.

At the same time, they expressed their opinion on the minimum level of financial benefits that would justify entering cooperation with enterprises:

- Unit budget increase by over 20% – 31% of responses.
- Budget increase by 10% – 23%.
- Budget increase by 5% – 14%.
- Budget increase by less than 5% – 8% (Kulawczuk, Kulawczuk, 2009, p. 50).

Within the study, the authors queried the representatives of enterprises about the cooperation with research units. Asked about the frequency of direct cooperation proposals submitted by research units, 45% of the business representatives claimed that they had never received such a proposal. 3.5% of respondents said that they often received a cooperation proposal from research units, whereas 50% stated that they occasionally or sometimes received proposals for cooperation from research units (Bednarz, Szcześniak, 2009, p. 55).

In answer to the question about the subject of the proposed cooperation submitted by research units, the enterprises indicated the following:[8]

- Request for the organization of student internships and apprenticeships – 31% of responses.
- Invitation to conferences and symposia – 34%.
- None in particular – 43%.
- Financing requests – 31%.
- Joint projects – 5% (Bednarz, Szcześniak, 2009, p. 57).

The information on the cooperation of enterprises with research units obtained during that research is rather revealing. It showed that 66 of the (medium and small) enterprises surveyed had not cooperated with research units in the field of research and development "yet". 27% of enterprises had cooperated with them once or sporadically on a small scale (in respect of consultancy, technical report, etc.). 1% of enterprises claimed that a research unit had cooperated with them institutionally on a project they ran, and 5% of the enterprises had invited a researcher to work in their research and development team (Bednarz, Szcześniak, 2009, p. 58).

When asked about the subject of the actual cooperation between the enterprise and the research unit, representatives of enterprises indicated the following (the percentage refers to responses obtained from all enterprises surveyed):

8 The publication cited divides the responses according to the company size, i.e. "large" and "medium and small" enterprises. The replies quoted herein came from representatives of medium and small enterprises as they prevailed in the surveyed group of enterprises.

- Organization of student placements and internships – 46% of responses.
- Participation in conferences and symposia – 31%.
- Consultancy or expert report carried out by a research unit – 30%.
- Joint project – 7% (Bednarz, Szcześniak, 2009, p. 60).

When asked about the effects of cooperation with research units, 63% of representatives of small and medium enterprises indicated no or minimal effects. No company stated that it had benefited greatly from the cooperation (2% of representatives of large enterprises did), while 40% of respondents declared sporadic and small effects of cooperation (Bednarz, Szcześniak, 2009, p. 65).

To state the minimum level of financial benefits that would justify cooperation with a research unit, the enterprises expressed it in terms of a percentage of the revenue:

- 14% of enterprises required a profit increase of over 20%,
- 22% of enterprises – by 20%,
- 33% of enterprises – by 10%,
- 13% of enterprises – by 2% (Bednarz, Szcześniak, 2009, p. 58).

The authors of the study also asked the representatives of both potentially co-operating parties about personal contact with the representatives of the other party. The answers of the scientists surveyed showed that more than 75% of them had met the owner or manager of the company, whereas 10% said that they did not know any representative of the company personally (Kulawczuk, Kulawczuk, 2009, p. 32). However, when the representatives of enterprises were asked the same, 45% of them claimed that they had not met any of the research unit employees personally. Just over 30% said they knew the head of the research unit or its R&D staff (Bednarz, Szcześniak, 2009, p. 61).

If the findings of that study on the expectations of entrepreneurs and research units in relation to one another were to be treated without leniency as representative for the relations between the Polish research and economic sectors, the following conclusions could be drawn. At the end of the first decade of the 21st century and after several years of increased innovation schemes with help of public funding, Polish enterprises are unaware that they could receive support from research units in the implementation of innovation strategies. It seems as if the engineers employed in these enterprises had not studied in research units and were not familiar with the research activities of their lecturers (which is largely true). Research units which enter cooperation with enterprises represent a very traditional kind of university. This is the basis for their expectations, training, internships and apprenticeships for students, platform for presenting and, if necessary, testing the results of their own research. Both parties set out rather stringent terms of cooperation, yet the decision-makers are quite easy-going and uncritical – in many cases, the parties came into contact through mutual acquaintances. Given these conclusions, it is difficult to anticipate any rapid changes which would provide conditions necessary for attaining the stage of innovation driven economy.

## 6.5. Cooperation between the Research Sector and Economy in Poland

The research team prepared a survey addressed to enterprises with the intention of, among others, obtaining an answer as to whether and to what extent the Polish economy meets the conditions of an innovation driven economy. The survey contained several questions exploring the issues of working relationships between enterprises and research institutions in Poland, universities, research institutes including the institutes of the Polish Academy of Sciences and units with the status of an R & D (Research and Development) unit. This section presents the responses of a total of 85 companies. It seeks to confirm the hypothesis that the role of the research sector in Poland is changing, whereas individual research units are beginning to co-shape the innovative activity of enterprises in various ways.

The survey concerned the conduct of enterprises within their cooperation with research institutions, as well as the evaluation of this cooperation. For the questions regarding the realities of cooperation with research institutions, the answer was in principle suggested by the authors of the questionnaire, as these were mostly "yes" or "no" questions. In such cases, the inference was based on a fixed number of "yes" and "no" responses and their relation to the entire population of the surveyed enterprises. Without detailed justification, I assumed that an occurrence may be regarded as frequent and well-established (although not standard) if half of the sample size responded affirmatively to a question about the occurrence of a phenomenon. For the standard state to occur, the number of "yes" (or "no") responses must reach ¾ of the sample size. In situations where "yes" is the reply of more than 15% of units from the tested sample, the examined phenomenon exceeds the stage when the condition happens occasionally and starts to be treated as quite frequent. When the answer "yes" is obtained from less than 15%, of the respondents, the phenomenon or the situation is considered rare or accidental. In the case of the questions about the significance of a given condition or situation, the companies were asked to grade the analysed situation on a scale of 1 to 5 points, with the number 5 meaning "very important" and the number 4 meaning "important". In drawing conclusions from these "grades", I assumed that situations or conditions with grade 5 and 4 are important to the given company, whereas situations or states with grade 1 are irrelevant. In answering the questions, only exceptionally did the enterprises rank the suggested or their own answers based on their significance. In principle, each variant of answers was assessed separately.

Because the circumstance in which this cooperation was or was not taking place was defined by efforts of enterprises to obtain financial assistance from European Union funds, the first question in the questionnaire, which drew my attention in the context of this chapter, was the question of profiles of the partners with whom a company applied for public aid from the EU. Of the surveyed companies

listed below: research and development units were indicated by 7 enterprises, research institutes by 16 of them, and 5 enterprises indicated both. In addition, 2 enterprises listed research institutions without a closer profile as partners, and 4 enterprises listed universities (tab. 6.1). Considering each group of research institutions separately, when applying for public aid only a partnership with research institutes can be considered a situation that "happens occasionally"; a partnership with other research institutions did not exceed the threshold of "accidentality". On the other hand, if cases of partnership with research institutions when applying for public aid from the EU are to be regarded as a single class, considering that there were 24 companies altogether in such a partnership (which is close to 30% of the sample), this phenomenon may be deemed frequent. Scientific and research institutions were significantly more frequent partners of enterprises in applying for state aid than other domestic enterprises, which were mentioned only by 10 units from the sample under study. In answer to the question on their partnership in implementing projects co-financed from EU funds, 52 companies replied that they cooperated with universities, which means that this is a frequent situation on the part of companies. 39 companies indicated research institutes as a subject of cooperation and 40 companies indicated researchers in this context (some of the surveyed enterprises indicated that they cooperated with two or three types of research institutions – therefore the quoted numbers cannot be summed). The numbers above show that partnerships with research institutions in the implementation of innovative projects are significantly more frequent than partnerships with these entities when applying for public aid. While the partnership of enterprises and research institutions in the implementation of innovative projects is a standard in the surveyed group (since it occurs in 80% of the surveyed population of enterprises), the partnership with research institutions only happens seldom when applying for help from the EU. Corresponding to the questions about partnership in applying for public aid and partnership in the implementation of innovative projects financed from this assistance is the question of the purpose of applying for public aid. In answer to this question, 47 companies indicated the start of research as the purpose of applying, 15 – the development of a network of links with scientific units, and 22 – the purchase of new technologies and patent rights.

To conclude the thread about the activity of enterprises in the situation when it became possible to obtain financial assistance in innovative activities, I will present the assessment of the benefits of this assistance.

**Table 6.1.** Frequency of partnership between enterprises and research institutions when applying for financial assistance from the EU and implementation of innovative ideas with its participation

| Number of enterprises/ type of partnership | R & D units | Research institutes | Universities | Research units | Researchers |
|---|---|---|---|---|---|
| Partnership when applying for financial aid | 7 | 16 | 4 | 2 | – |
| Partnership in the implementation of innovative projects | – | 39 | 52 | – | 40 |

**Source:** author's interpretation of results based on the responses to the survey.

Companies were asked to rank their answers according to their importance. While analysing the answers, I was looking for traces of the relation of enterprises to the entities of the broadly understood research sector. My goal was to find evidence that they are becoming a constant element of the environment to which business entities turn in the situation of crises and challenges. It turned out that none of the surveyed companies ranked cooperation with scientific units, or any help or inspiration on their part, as the most important benefit obtained as a result of undertaking EU-funded activities. Some companies ranked the benefits of opportunities for establishing contacts and cooperation with research units, universities, institutes and foreign scientists at the second and third level (two cases). These statements can be interpreted as cracks on the seemingly and historically impenetrable barrier dividing the two spheres of human activity, i.e. economic and research.

The wider aspect of cooperation between enterprises and research institutions has been presented in the question whether the companies surveyed had entered agreements with universities and research institutes in the years 2007–2013 and, if yes, what were their effects (tab. 6.2). In terms of numbers, universities were dominant as contract partners. Of the 69 companies that answered the question about contracts with universities, 54 confirmed the conclusion of a total of 108 agreements, which resulted in the implementation of 126 projects. 33 companies replied to the question about agreements with research institutes, 32 informed about the conclusion of 76 agreements with institutes for the implementation of 108 projects.

**Table 6.2.** The number of enterprises which concluded agreements with research institutions in the years 2007–2013

| Number of | Respondents | Having agreements | Agreements concluded | Projects implemented |
|---|---|---|---|---|
| Collaboration agreements with universities | 69 | 54 | 108 | 126 |
| Collaboration agreements with research institutes | 33 | 32 | 76 | 108 |

**Source:** author's interpretation of results based on the responses to the survey.

25 enterprises informed about having contracts with both universities and research institutes. If it is assumed that companies that did not answer questions about contracts with research institutions did not have such contracts, then – if for a total of 85 enterprises there are 54 cooperation agreements with universities, and 32 companies have such agreements with research institutes, taking into account that some of them have agreements with both universities and institutes, there are 61 companies that have agreements with research units – it must be said that the conclusion of contracts with universities by the examined companies has become a frequent situation. Maintaining institutionalized contacts between research units and enterprises is slowly becoming the norm (standard), regardless of which side initiates the collaboration. In response to the part of the question regarding the effects of contracts concluded, enterprises generally described the technical features of a jointly implemented process or product. Only in a few responses were the effects more generally characterized, informing about the joint patent application agreements, about the sharing right to the invention or the contract for the employment of several university graduates.

On the other hand, the situation regarding cooperation between enterprises and research units highlights the companies' response to the question about the sources of innovation projects and the significance of these sources (tab. 6.3). In terms of numbers, the most popular answer was the staff, indicated by 45 enterprises. 28 companies pointed to their own R&D facilities as a source of projects. Public R&D institutions were indicated by 27 respondents, whereas 10 enterprises indicated commercial R&D institutions. To summarize this part of the study, it can be noted that the standard procedure of the enterprises surveyed is to search for innovation ideas among their own employees and their own facilities (in total, 73 indications out of the 85 enterprises surveyed). Innovative projects suggested by R&D facilities – whether public or commercial – ranked second in terms of numbers (37 projects indicated in total), although the use of this source was quite frequent. Asked about the source of ideas for innovative projects, the companies also assessed the importance of various sources of projects. "Company's own sources", i.e. own

employees and own R&D facilities, were rated very important by 50 enterprises (31 and 19 respectively) and important by 13 enterprises (7 and 6 respectively). 63 companies in total appraised this source as significant. Only two companies rated this source as irrelevant. R&D units were estimated as a very important or important source of innovation for 19 enterprises. 16 of these assessments concerned public R&D institutions. Only 3 companies ranked commercial R&D facilities as relevant. In total, 6 enterprises considered these sources to be irrelevant. This distribution of grades was confirmed in the question (asked in a different context) about the importance of different sources of ideas for product and marketing innovations in the enterprise. A total of 79 companies answered this question. The answers included the assessment of such sources as: company's own R&D facilities, national R&D centres and foreign R&D centres. The first of these sources ranked first as the employees of company's own R&D facilities were listed as a very important source by 22 companies. 13 companies recognized it as an important source, which gives a total of 35 companies. A national and foreign R&D centre was assessed as very important source of innovative ideas by 3 and 4 enterprises respectively. It was considered important by 11 and 13 enterprises respectively (17 and 14 in total).

**Table 6.3.** Sources of innovation ideas in the enterprises surveyed

| Sources of ideas | Number of respondents | Importance rank 5 | Importance rank 4 | Important source (rank 5 + 4) | Irrelevant source (rank 1 + 2) |
|---|---|---|---|---|---|
| Company's own employees | 45 | 31 | 7 | 38 | 1 |
| Company's own R&D facilities | 28 | 19 | 6 | 25 | 1 |
| Public R&D facilities | 27 | 5 | 11 | 16 | 2 |
| Commercial R&D facilities | 16 | 2 | 4 | 3 | 4 |

**Source:** author's interpretation of results based on the responses to the survey.

Not necessarily in connection with the use of financial assistance from the EU, the relations of businesses with research institutions are more generally illustrated in the answers explaining why companies use services of external R&D units. The survey suggested several responses or asked respondents to provide their own arguments. The reason that the services of external R&D centres are cheaper than company's own facilities or performing the service independently was indicated by 35 enterprises. 37 companies admitted that it is easier to settle costs when using external services. A number of companies indicated that external services are more professional and easier to acquire in the technical (40 respondents) or legal perspective (35). Asked about the importance of these arguments, the companies

surveyed considered the following factors as very important and important in their use of external R&D services:

- Lower price of external R&D services – 3 enterprises;
- Easier cost settlement – 11 enterprises;
- Technical ease – 16 enterprises;
- Legal ease – 6 enterprises.

The answers, not suggested in the survey, in the survey show a pragmatic approach of enterprises in their contacts with research institutions. Two of them replied that it was "very important" for them to be able to use the assistance of R&D units in developing a new project. One enterprise stressed that it did not have to sustain its own facilities and another one underlined that it may have access to specialist equipment this way. The latter is also manifested in the answers which state that it is not possible to obtain specialist services in another way (4 statements ranked this argument "very important") or that the company's own R&D facility does not perform research required (2 statements ranked this argument "very important"). Finally, one statement pointed out that a company must demonstrate an independent assessment of its project.

A larger number of companies commented on why they do not use the services of external R&D facilities than why they do use it. This means that there are more companies that do not use the services of external R&D facilities than those which do in the sample of 85 enterprises. Of the answers suggested, 51 respondents indicated that "there is no need" for that. This corresponded to individual statements that "we have our own staff and own capabilities", "R&D does not understand what business needs", "the enterprise has been discouraged", and, finally, 'universities only produce degrees". 44 enterprises said that they did not use external R&D services because of "insufficient level of competence", whereas 49 companies "had not been presented with such a proposal". 47 enterprises stated that "there are bureaucratic barriers difficult to overcome", 49 enterprises selected the answer that there are legal barriers inhibiting them from using the services of R&D, and for 47 enterprises the services of such units are "too expensive". As to the importance of the arguments indicated, the most important was the argument that there is "no need" for such services. It was ranked "very important" by 20 respondents and "important" by 10 respondents, receiving 30 high grades altogether. The remaining arguments for both using and non-using external R&D services were rated as very important or important by around ¼ of the evaluators.

It is, however, the answers to the questions about the condition of science-business relations in years 2010 and 2013 that provide information about the actual situation of enterprises in the field of conducting or commissioning research and development activities, as these regard the issue of R&D expenditures at that time. The enterprises surveyed reported that 8 of them conducted research or development activities in 2010, to reach the number of 21 in 2013. In 2010, 5 companies commissioned research and development works. In 2013, their number increased to 14 (tab. 6.4).

**Table 6.4.** Number of enterprises which run their own R&D facility and which commission R&D research outside the company

| Number of enterprises | 2010. | 2013. |
|---|---|---|
| Run their own R&D facility | 8 | 23 |
| R&D works commissioned | 5 | 14 |

**Source:** author's interpretation of results based on the responses to the survey.

The last question, which created an image of the cooperation of the enterprises of the sample under study with research units, concerned cooperation in the implementation of innovative projects with various institutions and business entities. Distribution of grades given by the company to cooperation with scientific networks and government agencies (PARP, NCBR and ARP) within clusters is of particular importance. 79 companies responded to this question. The highest score was obtained by government agencies. Out of the total number of 77 replies, 30 companies consider these agencies to be very important and 2 to be important, which gives a total of 32 "very important" and "important" grades. 13 companies assessed this cooperation as "irrelevant". Clusters and scientific networks gained a similar number of overall replies, i. e. 57 and 58. The structure of replies was also similar: in the case of clusters, there were 3 "very important" and 7 "important" grades, and in case of scientific networks – 3 "very important" and 6 "important" grades. The number of "irrelevant" grades was the same in both cases and amounted to 41, which is a crude assessment, given the reports and behavior of enterprises may be perceived in various specific situations concerned. The assessment of the cooperation of enterprises with various units of the financial sector was normally assessed as irrelevant and it is not of importance for this analysis.

The problem of cooperation between enterprises and research units is, finally, related to the fact that companies use the services of knowledge transfer. The survey included the question whether companies cooperate with knowledge brokers or other intermediary institutions in the transfer of knowledge. 85 companies answered the question. 80 of them said that they had not had a proposal of a knowledge broker or another intermediary (to mediate between the knowledge sector and the economy). 4 out of 80 companies had been presented with such an offer but they did not accept it. One company had received and accepted a proposal (the name of the broker was mentioned). The effect of this contact was scantly recorded as knowledge and networking. These responses gave rise to a rather peculiar situation. If we recognized that they reflect the real situation in 2013 (and the fact that the enterprises surveyed were better than the average of the sample representative for the whole population is quite convincing), the answers would provide a very negative assessment of all the efforts made and the plethora of words spoken about the institutions facilitating the transfer of knowledge in the economy and between the research and economy sectors.

The survey was also to elicit the general assessment of the business environment in relation to the innovative activity (without specifying who constitutes this environment). The question about the significance of non-cooperation was a fragment of a more complex question about the impact of various (listed) factors on the innovative capacity of the company and the effectiveness of using public aid from the EU. 74 companies commented on the lack of partners. 17 of them stated that this was a meaningless factor, 15 rated the factor as important and only 3 – as very important. In total, there were 18 – 4- and 5-grade answers and 17 – 1-grade answers. That means that almost 80% of companies assesing their business environment's importance recognized it as a factor of little or no importance.

The enterprises were also asked to provide independent (i.e. not suggested) statements regarding issues which should be changed and improved in the institutional environment in order to eliminate the most onerous barriers to innovation and which would help in increasing enterprises' expenditures on research and development activities. Answers to the latter are more interesting from the point of view of business relation with research sector. It is understandable that enterprises sought solutions in their potential partners. The suggestions expressed were ordered as first, second and third in terms of their validity. The most general, not to say vague, were the first suggestions. Two claims can be distinguished: "access to knowledge and information of these institutions" and "adjustment and targeting of higher education programmes". Proposals submitted as the second and third were more precise and concerned the structural reconstruction of the research sector, a change in the nature of connections between research sector and economy, as well as financial matters.

The structural reconstruction of research sector would involve the following (second- and third-rank proposals): "change in the way scientists are promoted, promotion for implementation, not for publications and titles", "abolish habilitation!", "Proposals from universities and research centres, availability of external resources for this purpose". As to the changing the nature of connections between research sector and economy, the following demands were formulated: "wider dissemination of innovative solutions by the research and development sector", "facilitating access to institutions offering R&D services", "institutional connections of research staff and groups of university students with enterprises", "cooperation between enterprises and universities". The financing of innovations was referred to in the following proposals: "more emphasis on the development of specialized venture capital institutions" and "facilitating the commercialization of R&D results". The demands quoted might not be the best in terms of phrasing, but they are certainly in line with the development of the most innovative economies in the world.

To conclude the description of the existing "connections" between research sector and enterprises, this paper will also touch upon the financing of innovative activities. The objective is to check whether the reports of enterprises concerning their relations with the research sector contain any reference to the hypothesis that it is them that ultimately bear the costs of research necessary for the emergence

of innovation in a knowledge economy, in which innovation becomes the main method of enterprise development. At the earlier stages of the development of the economy, research was conducted by the research sector as a public good or by inventor-amateurs without remuneration, and costs of innovation were invisible were invisible and not covered in the institutional structure of that time.

In this context, the companies' assessment of the impact of these factors on the innovative capacity of the company and the effectiveness of the public EU aid is also noteworthy. It is contained in a segment of questions concerning the significance of four circumstances: scarce availability of external sources of financing – circumstance A, lack of own financial resources – circumstance B, high costs of innovation implementation – circumstance C and high costs of R&D works – circumstance D. The above-mentioned areas were rated by an average of 74 companies. Circumstance A was deemed very important and important by respectively 28 and 16 companies, that is 44 companies in total. B was considered significant by 44 companies which produced 26 – 5-grade and 15 – 4-grade evaluations. Circumstance C was rated significant by 52 companies (32 – 5-grade and 20 – 4-grade evaluations). Circumstance D was of importance for 46 enterprises (23 – 5-grade and 23 – 4-grade evaluations). These issues were considered irrelevant by 3, 8, 4 and 6 enterprises respectively. Given the fact that the enterprises surveyed often consider (on average) the situations listed as significant for their innovativeness, it may be argued that there are some new financial problems identified at the level of management which result from the transition to a knowledge economy. The information about how companies deal with these problems is provided in their answers to the question about sources of financing for innovative projects. The enterprises were asked to formulate the answers separately for the three years indicated: 2007, 2010 and 2013. About 59 enterprises claimed they financed innovation from their own funds. As many as 65 enterprises received financing from various EU funds. Loan was a source of funding for 17 enterprises, while 7 enterprises obtained funds from the National Centre for Research and Development. 2 enterprises received a refundable credit and 2 companies financed innovations with the assistance of private investors (business angels). Although several companies reported the (frequent) use of crowdfunding as a fundraising tool in response to another question, there was no mention of it at this point. As regards the conclusions drawn from the number of enterprises using different sources of financing in these particular years, it can be concluded that the picture is quite clear.

With approaching to the present time, the number of enterprises using different funding sources for innovative projects is increasing. The cases of financing sources used by few companies are not taken into account as these sources are not important for the development of the general picture (tab. 6.5).

**Table 6.5.** The main sources of financing investment projects as indicated by enterprises

| Number of enterprises using the source of financing | 2007. | 2010. | 2013. |
|---|---|---|---|
| Company's own resources | 27 | 37 | 53 |
| EU funds | 16 | 34 | 49 |
| Bank credit | 4 | 9 | 11 |
| NCBR grant | 4 | 6 | 6 |

Note: The numbers of enterprises in the rows and columns of the table do not add up. Some enterprises have used several sources of funding in the specified years; some have used one source in several or all of the years specified.

**Source:** author's interpretation of results based on the responses to the survey.

EU funding was used by 16, 34 and 49 enterprises in the years 2007, 2010 and 2013 respectively. 25, 37 and 53 enterprises used their own funds, and 4, 9 and 11 enterprises took loans. The relatively short period and unrepresentative sample of enterprises in relation to the entire population do not allow for deriving any conclusions from numbers cited as to the development of any financing trends. It can only be generally stated that the companies surveyed (and perhaps Polish enterprises in general) are learning to be innovative and to seek sources of financing.

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In conclusion, in this chapter there was investigated the situation of a group of Polish enterprises surveyed in the years 2007–2013. Within the scope of the problem defined as the relations of enterprises with research sector when undertaking and implementing innovative projects, the general picture was as follows.

The enterprises surveyed typically had the support of some partners – various research units in the implementation of investment projects. Less frequently, they applied with those partners for assistance from UE funds.

In general, the enterprises surveyed reported that they had entered agreements with research sector for the implementation of a much larger number of projects than those financed from EU funds. In response to another question, they assessed their contacts with research sector negatively, stating that they did not need to establish such contacts or that the competences and motivations of these units were inadequate for them. On the whole, enterprises and research sector have a negative image of each other as partners in business. In this respect, the results of research conducted at INE PAN (Institute of Economics at the Polish Academy of Sciences) are very close to the results obtained in the studies presented here, conducted by the Research Institute for Private Enterprise and Democracy.

The sources of innovative ideas for enterprises, according to their reports, were found mainly at their own employees and their own R&D facilities (external research units were regarded as secondary sources).

Among the units of their business and regulatory environment, the enterprises rated the cooperation with units such as PARP, ARP or NCBR the highest. They noticed high costs of implementing innovations and conducting research. In this context, they mentioned the lack of (financial) funds and difficulties in finding external sources of financing of their (innovative) undertakings. In the years 2007–2013, the use of a company's own funds, loans and EU funds increased significantly. Funds from venture capital funds, funds from other unconventional sources, as well as NCBR grants are still very rare as a way of financing innovative projects in the enterprises surveyed.

Comparing the research results of research sector and enterprises reported in the previous paragraph and studies on the behaviour of enterprises conducted for the purposes of this project, with all reservations as to their representativeness and other features, it can be concluded that it is currently the research sector that is delaying Poland's transition to innovation economy, or at least it does not support the Polish economy to a sufficient extent.

# Summary and Recommendations

The results of the analysis conducted have been compiled below.

1. On the basis of Porter's theory of economic development and the theory of development stages, it can be argued that the Polish economy is currently in the transition stage between the investment economy and innovation economy.

   This is reflected in the characteristics of both of these development stages. At the stage of investment economy, enterprises imitate state-of-the-art technologies available on the market. They import the technologies, finance them by means of joint ventures or foreign investments, license, modify, adapt and eventually accommodate them, to further improve them subsequently with new competences gained for that purpose. Yet even after absorbing and upgrading foreign technologies these companies are one generation behind the world leaders. It is typical of this stage that the production consumes a considerable part of the capital whereas the cost of labour constitutes a large portion of the total cost. With continuing low standard of living, the demand is limited. Its structure is defined by consumer preference. Companies mostly compete with each other on price. The major economic challenge is to align the state priorities with the current development stage.

   What is characteristic of the innovation economy is that enterprises create their own technologies. The innovation stage is manifested in the advancement of machine industry, which allows for the growth of process innovation. Thanks to the higher level of social and human capital development, broad horizontal connections are established between enterprises and the science sector. As the relationships with the R&D sector and other entities deepen, companies expand their specialization, division of labour, flow of knowledge and competences. Their products, manufacturing processes and marketing can achieve a global level. The criterion for their development strategies is to maximize knowledge. As they switch from cost strategies to diversification, companies form international and invest in marketing solutions.

   The transition from the investment to innovative economy is the most difficult of all transitions between development stages. The features of the stages clearly show that the Polish economy is currently in the transitional stage.
2. This was evidenced in the quantitative study of determinants of the Polish economic development at present. In terms of innovation, Poland belongs to

the third of innovator groups, i.e. *moderate innovators*. It ranks 43 out of 144 countries in the global innovation index. By using the methodology of the World Economic Forum, it was possible to identify 17 factors which bring Poland closer to the innovation stage of development. Majority of these factors reflect the development of telecommunications and ICT services as well as a high level of education of the society. There is, however, no crucial factor which would determine the advancement towards the innovative stage. At the same time, 22 factors were identified as a key barrier to Poland's achievement of the innovative stage. In the period of our research they contained: budget deficit, public debt, level of domestic savings, public trust in politicians, consumer preferences, the ability of the country to prevent brain drain, availability of venture capital, scientific progress of the country.

An empirical analysis conducted using the model of innovation level of the companies surveyed as well as the IUS methodology showed that 28% of companies can be described as *innovation leaders*, 27% – *innovation followers*, 35% – *moderate innovators, and* 9.4% – *modest innovators*.

It is particularly interesting how individual companies of the surveyed sample regarded the development stage of the Polish economy. 1.2% of the respondents said that the current stage is the first stage of development. 7.3% indicated the transition stage between the first and the second stage. 18.3% replied that Poland is in the investment stage, whereas 12.2% of entities indicated the transition stage between the first and the second stage. Surprisingly, 61% of the respondents believed that the Polish economy has already entered the third stage of development. This was probably due to the nature of the sample, as it encompassed innovative companies which have received help from the EU development funds.

3. The most important external barrier inhibiting Polish enterprises from innovative activity in the conditions where they absorb structural funds from the EU is the growing threat of secular stagnation which occurs in advanced countries. Due to globalization, unfavourable demographic changes (ageing population), income asymmetries, as well as threats associated with politics, civilisation and culture, this threat is growing. These phenomena are determined by institution- and system-related factors. In Poland, the risk of secular stagnation accelerates the process of premature de-industrialization. Consequently, unemployment is increasing while the market is being taken over by stronger economies. Preceding the construction of a democratic system, the de-industrialisation has become one of the reasons for the weakness of the state and political instability. It has also inhibited the growth of the innovative capacity of the economy.
4. On the basis of the generalised theoretical syntheses of institutional and resource economics, it is possible to identify and empirically verify the most important internal obstacles to the transition of the Polish economy to the innovative stage of development. The main barrier is the lack of appropriate

institutional infrastructure for the functioning of business entities. Major impediments also include the overregulation and excessive restrictiveness of legal norms, legal loopholes, instability of regulations, high transaction costs, information asymmetry and investment risk.

Other endogenous factors are the lack of coherence in regulatory systems with cultural conditions and the value system. One of the main obstacles limiting the effectiveness of state aid for innovation in the transitional phase of development is the immaturity of social capital. This means low level of interpersonal trust, limited openness to horizontal cooperation, as well as industry, information and research links allowing the inflow of new knowledge.

The growth of companies' innovativeness is limited by such factors as malfunctioning organizations which are to allocate structural funds, loose links between the knowledge sector and enterprises, and a minor role of knowledge brokers who are to mediate the flow of knowledge from the R&D sector to enterprises.

At the same time, however, there are signs of successful changes in the development of Polish companies, such as:

- Increased scope of cooperation between enterprises and universities (mostly) and research institutes.
- Although innovation financing sources remains traditional in their structure, there has been a slow progress towards a gradual increase in external energy sources, including EU assistance funds and bank credit.
- Structural funds stimulate some changes in the orientation of business development strategies. Companies slowly shift from cost strategies to a diversity strategy, and from the maximizing efficiency to maximizing knowledge. The study proved that it is the institutional, cultural and mental conditions which accompany the transitional stage of the development of the Polish economy that do not allow for a breakthrough in the innovative capacity of companies or an increase in the quality competitiveness of the economy, even though the economy has received significant pro-innovation funds from the EU for that purpose.

5. The transitional stage of economic development determines the demand and supply determinants of the course of innovation processes. The main feature characterizing the demand aspect of these processes is the prevalence of consumer preferences focused on product functionality.

The share of foreign brands in the domestic market is rather modest and so domestic companies have ample room for manoeuvre in respect of innovative activity. Due to low consumer purchasing power (average level of income), however, they are not that eager to acquire new solutions available on the market. This, in turn, reduces the innovative tendency of companies.

The survey showed that consumers in the markets on which the observed companies operate make their purchasing decisions mainly on the basis of price. Functionality of the product is the second factor, while its symbolic

features rank last. Thus, the cost-effective competitive strategies and the low propensity of companies to build the brand are still dominant in the transition stage. In advanced countries, where consumer preferences concentrate on the symbolic values of the product, the answer to this demand are development strategies of enterprises aimed at competing on design, social responsibility, and care for the environment.

For the companies surveyed in the economy of the transition stage, it would be easier to achieve a competitive advantage in markets where the consumer highly values symbolic characteristics of products. Yet they choose not to compete with foreign entities directly, but still primarily in respect of price and utility value. This determines their relatively low innovative capacity.

Within the study, the companies where asked what state actions could promote the increase of this capacity. Should the state influence existing attitudes of companies or modify these attitudes towards accelerating the transition process to an innovative economy? The answers to these questions can be found in the analysis of the supply factors determining the transition to the knowledge economy. I also present the obstacles which inhibit the implementation of quality pro-innovation development strategies of the surveyed companies.

6. The paper on supply determinants of innovativeness is of particular value attributable to the systematization of broad literature on the evolution of the innovation theory at the turn of the 20th and 21st centuries, its main trends and its significance for the development of economic theory.

   The identification of supply determinants of innovative processes in the transitional stage of development focuses on the analysis of the ways companies adapt to demand constraints and various barriers restraining the effective use of EU funds. The companies surveyed identified internal and external obstacles to their innovative activity, which allowed for categorising these entities and defining the instruments for stimulating their innovative propensity. The study underlines the key importance of demand barriers, lack of partners for innovation cooperation, financial (limited access to bank loans), institutional and regulatory obstacles, tax mania, and the costs of preparing and implementing R&D works.

   Operating at the intermediate stage of development, the enterprises surveyed do not use external public assistance effectively because mechanically implemented programs are not adapted either to their needs or to the circumstances. EU schemes of asset allocation are often tailored to the needs of beneficiaries operating at a different stage of development. In the transition economy, enterprises exhibit different levels of innovative capacity. The most innovative companies make efforts towards expansion, but they encounter many barriers as the institutional solutions need certain adjustments. Innovative expansion requires a high-risk propensity, but enterprises operating in the investment stage of development are not willing to take it. This increases transaction costs and

reduces their readiness to undertake high-risk innovative projects. When faced with high transaction costs, enterprises achieve their less ambitious (quantitative) development goal by implementing cost strategies.

The analysis of the supply factors of enterprises' innovation is complemented by the observation of the financial aspect of the companies surveyed. The study showed a limited possibility to evidence the direct impact of innovative activity on the financial condition of enterprises, as the results depend on the period of observation. Innovative investment expenditures have a delayed effect. At the moment they are incurred, they do deteriorate the financial condition of companies (on the basis of the data from the year 2013 in the study). Importantly, the study noted an upward trend in the relation of innovation expenditure to revenues from innovation. The general picture of innovation of the sample, however, is very diverse. There was also a significant variation in the profitability level of the companies surveyed. Yet it should be emphasized that the median of this indicator is higher than in the total economy. Significant differences between the median and average values indicated significant differences in the financial results of the entities surveyed.

7. At this point of examining of the supply conditions of innovative processes, it should be emphasized that the innovative stage of development, firm and solid in the advanced countries, is heading towards a new model of market economy in the period of rapid technological progress, i.e. towards a digital information civilization. The paper poses the question to what extent the companies surveyed regard the Internet and information technologies as an instrument of improving their creativity and innovation capacity. The analysis showed that these tools are not quite used yet to explore and reach the development potential of those companies. The vast majority (89%) appreciated the importance of the Internet for innovative activities, but for 21% IT and the Internet were essential for introducing imitative innovations. At the same time, almost 70% of the sample did not use crowdsourcing, whereas 8% were not even familiar with that notion. From these data it is clear that even innovative Polish companies have not been able to follow the information revolution.

   It is worth noting, however, that this revolution entails in such dangers as intercepting innovative concepts (free rider problem) and human capital flight of highly qualified employees (brain drain). Most of the companies surveyed (55%) were not concerned by this problem. However, 20% of respondents stated that it affected them to a significant extent and about 20% were concerned to a minimal extent. A new business model is being born in the information age, i.e. the economy of sharing. The operating conditions of companies and their environment are changing. Online platforms allow the development of various forms of service and production activities with almost zero marginal costs. The study showed that the companies surveyed are not prepared for these new trends and technological challenges.

8. An important result of the study is the key role of the research sector, including universities and their relationships with enterprises, and their impact on the innovation of companies in the transitional stage of development. When companies start building their competitive advantages on innovative activity and do not have support from a modern research sector, the economy has little chance of achieving the innovative stage of development.

   Two models of university are distinguished in the history of science development. These are the Humboldt university (traditional) and the modern university. In the investment economy, the company acquires knowledge in an almost imperceptible way. Universities operate alongside enterprises. The knowledge resource necessary for them is obtained from educated employees through the purchase of patents, licenses, consultancy or scientific publications, as research results are disseminated free of charge as a public good. The costs of knowledge production in the science sector are borne by the state. The traditional university model focuses on its two functions, i.e. research and education of students. Knowledge produced in universities is the main source of progress and changes in the market economy. However, it requires processing and commercialization.

   Along with the breakthrough of civilization as well as the technological and communication revolution, knowledge has become the competitive advantage of enterprises. The demand for innovative projects has increased. Traditional universities could not afford the large expenditures necessary to generate a stream of new inventions. The response to the new demand of the economy is the emergence of a new type of enterprises – innovative companies. They commercialize knowledge in the same way research units do. These companies are the ones which present universities with new challenges and pressure them to adapt the mode and scale of scientific discoveries to the needs of an innovative economy. Universities begin to compete with innovative companies for knowledge commercialisation.

   The characteristics of the *new university model* in the innovation economy are as follows:

   - Knowledge commercialisation becomes another pillar of universities, next to research and education.
   - Universities take over the function of international centres of knowledge transfer.
   - The language of communication is English. As opposed to the Humboldtian model, this university is international.
   - The internal structure of the university is different. The structure shifts from faculties to interdisciplinary teams focused on research topics and projects, which enter cooperation with foreign institutions.
   - Employees are not evaluated based on the number of their works and publications, but by means of expert assessment and criteria promoting the value of their inventions.

- Changes are introduced to the incentive system of employees. Previously focused on tasks assigned by the university, researchers are more inclined to pursue tasks entrusted by external university clients.

From the analysis of the expectations of the research sector and enterprises as well as relations between enterprises and research units in the Polish transition economy it is clear that Polish companies expect the support of research units in the implementation of innovation strategies to a very limited extent. Research units (universities) follow the traditional model of university and build their relationships with enterprises by means of trainings, student internships, or presenting the results of their own research. This is still a rather weak foundation for an innovation economy.

Upon synthesizing the situation in the companies surveyed in respect of their relations with research units over the years 2007–2013, the following may be concluded:

- The enterprises surveyed typically received support in the implementation of investment projects from some partners in the form of various research units. Less frequently, they applied for financial assistance from EU funds with those partners.
- Much more contracts with research institutions were concluded for the implementation of other projects than those financed from the structural funds.
- The reasons for the companies' limited contact with research institutes were admittedly limited competences of these institutions and improper motivation to cooperate.
- The companies underlined high costs of implementing innovations and conducting R&D works.
- Venture capital funds, grants from NCBiR and other external unconventional sources do not really contribute to the innovative activity of companies.
- Most of the respondents implemented projects together with universities. Partnership with a university is more frequent than with research institutes.
- Establishing contacts with foreign research centres was pointed out as a benefit of cooperation with the research sector.
- Maintaining institutionalized contacts between research units and enterprises is gradually becoming more common. These connections give rise to joint patent applications, joint rights to inventions, and the employment of university graduates.

The condition of cooperation between companies and the research sector is evidenced in the answers regarding the sources of ideas for innovation. Employee initiatives are of the greatest importance here (63 companies). Company's own R & D facilities rank second (19 companies), followed by public R&D units (11 companies) and foreign research centres (13 companies). Most

entities, however, do not use external R&D services. In addition to their low assessment of the competence of these centres, companies argue that "universities produce academic degrees" and, moreover, these services are too expensive. It is worth adding, however, that the number of enterprises using their own R&D facilities and commissioning research has increased 2.5 times in the 2007–2013 period. Only one enterprise has used the intermediary services in the transfer of knowledge.

The analysis showed that it is the research sector, including the existing university model, that is delaying the progress of the Polish economy's towards innovative development at the moment.

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Boosting the innovative propensity of Polish companies in the transitional stage of economic development requires the following:

- The tools for the implementation of a long-term strategy of economic development must be identified.
- Apart from indicating the directions of the long-term development preferences, the state is to ensure stability, coherence and transparency of the institutional environment of enterprises.
- The extended development perspective and the relative stability of regulations, while reducing the risk of developmental (including innovative) decisions, may induce enterprises to deviate from short-term action plans.
- The task of the state is to reduce the fiscal burden of both business entities and consumers. This would reduce the limit on the demand for innovative processes. Increasing the purchasing power of consumers may change the structure of their market preferences. It could lead to a shift in their preferences, i.e. from the product's functional characteristics to its symbolic features. This structural change in the demand could become a major stimulus for the innovative propensity of enterprises and accelerate the transition to an innovative economy.
- The change in the demand structure, increasing the propensity of consumers to acquire innovations, could be facilitated by purchase subsidies, high admission standards as to user safety, information and education schemes directed at promoting modern attitudes. For this purpose, one could organise contests to support the positive perception of national brands of innovative producers.
- The awareness of consumer preferences and the possibilities of changing them is essential. It will allow for more precise determination of the supply

innovation policy, increasing the effectiveness of public aid, more adapted to the demand structure and the possibilities of its changes.

- Improving the quality of the institutional infrastructure of company development may reduce their transaction costs and accelerate their shift from price competition and cost strategies.
- Stimulation of innovative processes calls for reduced bureaucracy and streamlining the mechanisms for allocating pro-innovative EU funds as well as expanding the scope of repayable allocation.
- In addition to EU support, it is necessary to broaden the scope of high-risk funds as an innovation financing source (VC, PE, Business Angels).
- Following the example of advanced countries, it is necessary to pursues the work on the National Innovation System (NSI). One of its fundamental components is the education system. It requires profound changes and adjustments to the needs of the innovative economy at all levels of education. Educational programmes should be aimed at the independence of analytical thinking, creativity, openness to cooperation, and mutual trust. The new education system and the stability of institutions can improve the low level of social capital, which is one of the key barriers to innovation. Such system would also overcome the second barrier to the innovative economy, i.e. the quality of human capital.
- Modern universities should become an important pillar of NSI. They should become the centres of producing new knowledge and streaming it into the economy. Apart from research and educational functions, the basic direction of their activity should be the commercialization of the knowledge generated. It is necessary to move away from the traditional model of university and move to the modern university of innovative economy. These universities will take over the functions of creators and brokers of knowledge as well as international centres of knowledge transfer. Close links between universities and enterprises will help to reduce the information gap between these entities and improve the flow of new knowledge. Strengthening these connections requires changes to the incentive system of research employees. A system of incentives motivating them to perform tasks set by universities should be replaced with a motivation system oriented towards the tasks set by university's external contractors. The modern university is a research centre which also stimulates the development of the innovative ecosystem in its surroundings. It is therefore necessary to change the criteria for employee evaluation, i.e. to move away from quantitative assessments towards a qualitative assessment of the results of their work.

In conclusion, the transition of the economy to an **innovative stage of development** requires **fundamental institutional changes, constructing a National Innovation System and building the social capital**.

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# List of Tables


Table 1.1 GDP thresholds per capita and sub-index weights used to include individual countries into particular stage of economic development ..... 23
Table 1.2. Factors bringing Poland closer to the innovation-driven stage of development ..... 28
Table 1.3. Key inhibitors for achieving innovativeness-driven stage of development by Poland ..... 29
Table 1.4. The biggest inhibitors to running business ..... 33
Table 1.5. Variables used in innovativeness model ..... 34
Table 1.6. Classification of the innovativeness level ..... 36
Table 1.7. Indicators distinguishing the sample of researched innovative enterprises ..... 36
Table 1.8. Variables implemented in creating stage of development model 38
Table 1.9. Classification of development stages ..... 40
Table 3.1. Selected human capital in Poland ..... 70
Table 3.2. Selected human capital indicators in 2012 ..... 71
Table 4.1. Selected characteristics of the market of greatest importance to the surveyed enterprises ..... 95
Table 4.2. Consumer-perceived significance of the factors presented below in the product market of greatest importance for enterprises ..... 98
Table 4.3. Significance of utilitarian features and image-related (symbolic) features for the consumer in the given market ..... 99
Table 4.4. Domestic consumers' inclination to purchase market novelties in the product market of the greatest importance to the enterprise ..... 100
Table 4.5. Source of ideas/inspirations for product and marketing innovations ..... 100
Table 4.6. Price segment targeted by the offer of the enterprise ..... 102
Table 4.7. Assessment of the product offer of the enterprise by the consumers ..... 102
Table 5.1. Selected data characterising the enterprise size (in PLN thousand) ..... 142

Table 5.2. Enterprise profitability ..... 143
Table 5.3. The relationship spending on innovation and revenues (%) .... 143
Table 5.4. The indicators of correlation between spending on innovation and the selected economic and financial values – 2007..... 145
Table 5.5. The indicators of correlation between spending on innovation and the selected economic and financial values – 2010..... 146
Table 5.6. The indicators of correlation between spending on innovation and the selected economic and financial values – 2013..... 148
Table 5.7. Economic development and growth – primary categories ..... 151
Table 5.8. The Internet and information technology versus creativity and innovation..... 154
Table 5.9. The Internet and crowdsourcing..... 155
Table 5.10. The Internet and brain drain..... 156
Table 6.1. Frequency of partnership between enterprises and research institutions when applying for financial assistance from the EU and implementation of innovative ideas with its participation..... 176
Table 6.2. The number of enterprises which concluded agreements with research institutions in the years 2007–2013 ..... 177
Table 6.3. Sources of innovation ideas in the enterprises surveyed..... 178
Table 6.4. Number of enterprises which run their own R&D facility and which commission R&D research outside the company..... 180
Table 6.5. The main sources of financing investment projects as indicated by enterprises..... 183

# List of Figures


Figure 1.1. Analysis of dispersion ..... 42
Figure 1.2. Particular enterprises in two-dimensional perspective ..... 43
Figure 1.3. Pie table showing correlation between aggregated variables .... 44
Figure 5.1. Reasons behind the application for EU funds..... 126
Figure 5.2. Partners of projects financed by the EU ..... 127
Figure 5.3. The distribution rate of the surveyed companies in innovative barrier assessment..... 128
Figure 5.4. Individual enterprises in the two-dimensional space ..... 130
Figure 5.5. Hierarchical structure of connections of companies that encounter innovation barriers..... 131
Figure 5.6. The largest barriers in the view of the surveyed enterprises ..... 132
Figure 5.7. The most important factors related to the use of pro-innovative structural funds from EU..... 133