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## ПЕРСПЕКТИВИ ІННОВАЦІЙНОГО РОЗВИТКУ ГАЛУЗЕЙ УКРАЇНИ У ПРОЦЕСІ ІНТЕРНАЦІОНАЛІЗАЦІЇ ЕКОНОМІКИ

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Значні можливості ефективного використання потенціалу вугледобувних підприємств України стримуються недовикористанням інноваційних розробок. Спрямованість зовнішньої політики України на вступ до Європейського Союзу вимагає певних пріоритетів розвитку промисловості країни та її галузей на основі інноваційного потенціалу. Виявлені тенденції інноваційної діяльності в країнах ЄС уможливили позиціонувати Україну у цьому процесі. В роботі реалізована наукова ідея про використання оцінки впливу природних факторів на результати діяльності підприємств як інструмента управління дифузією інновацій у вугільну промисловість країни. Це дає можливість оцінити перспективність залучення інновацій.

**Ключові слова:** інтернаціоналізація економіки, галузі України, інноваційний розвиток.

## PERSPECTIVES OF INNOVATION DEVELOPMENT OF UKRAINIAN INDUSTRIAL BRANCHES IN ECONOMY INTERNATIONALISATION PROCESS

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Effective usage of considerable potential of Ukrainian mining enterprises is being hampered because innovative ideas are not implemented. As Ukrainian international policy is EU oriented, the country's industries should be developed on the basis of innovative potential priority. Based on the established tendencies of innovative activity in the EU countries, the position of Ukraine in this process was determined. A scientific idea of using assessment of impact of natural factors on the enterprise's performance as an instrument of implementing innovation diffusion into mining industry of the country is realized in the paper. This enables determination of perspectives of attracting innovations.

**Key words:** internationalization of the economy, industry of Ukraine, innovative development.

**Problem formulation and analysis of current research output and publications.** A country's social and economic growth can be achieved largely due to active implementation of innovative ideas into scientific potential of enterprises.

Numerous studies determined (The official site of the President of Ukraine) the following characteristics of scientific and technical development of Ukraine on the present stage:

- technical and technological lagging behind the developed countries of the world;
- high level of resource-intensiveness (energy, material, fund and labor consumption) of the production process;
- low level of labor productivity;
- scientific work largely aimed at military needs;
- certain isolation in terms of international scientific and technological exchange;
- non-rational use of country's scientific and technical potential etc.

As for the main branches of Ukrainian industry is concerned, scientific and technical policy should facilitate the transformation of technological and production structures, usage of advanced technologies for structural reconstruction of the economy in general and solving social and economic problems of the society.

Fuel and energy complex, metallurgical complex, machine building, chemical and building industries and forestry should be referred to as the main branches of industry in Ukraine. They account for 87% of basic production assets, 78% of employment and almost 78% of gross industrial product (about 58% of gross national product). This determines the importance of these industries for the country's economic development.

Mining complex accounting for over 36% takes special place among the main industries.

Taking into account the fact that Ukrainian international policy is aimed at EU membership, we can say that further development of the country should be intensified according to clear objectives and priorities of development based on the innovative potential of the country [1].

In this respect analysis of the tendencies of innovative activity in the countries of the European Union in comparison with the current situation in Ukraine is of the most immediate interest for optimization the ways of raising innovative potential of the main branches of Ukrainian economy as a whole and mining industry in particular.

European Union is an integrated association of 27 countries with different level of economic development. This difference allows for common tendencies of development in the sphere of innovations to be combined with individual way of development in every single country.

General trend of encouraging innovations is manifested in creating a common European research and innovation environment, expansion of vertical and horizontal coordination of innovative policies, strengthening local innovation policy and constant increase in financing scientific research and development [7]. All abovementioned shows that the EU countries have a coordinated strategy in the sphere of innovative development. This has enabled the appearance of common internal market of innovations and, consequently, quicker diffusion of innovations between countries and companies in the EU.

Within the common strategy every country has its own innovative systems which differ in their ways, methods and means of governmental control of innovative activity, including intensity and ways of supporting interaction between scientific, industrial and educational components [7].

Well developed countries (Germany, the Netherlands, Belgium, Austria and others) have taken up the most rapidly growing and therefore the most perspective segments of innovative technologies and world market products. This allows them to maintain a high level of innovation activity.

**Article objectives.** The purpose of this article is to realize the scientific idea of using assessment of impact of natural factors on the enterprise's performance as an instrument of implementing innovation diffusion into mining industry of the country.

**Presentation of main materials.** Innovation activity is a complex characteristic of business which includes its intensity, timeliness and ability to raise enough potential of necessary quality and quantity. It is defined as percentage of enterprises engaged in innovation activity to the total number of enterprises in the country.

The level of innovation activity of enterprises in the EU was calculated on the basis of statistical data for 2009 [1; 2] (Fig. 1). The same strategy was used for Ukraine.

As the result of the research all countries were divided into 5 groups according to the level of their innovation activity:

- Group 1 is represented by Germany which level of innovation activity (60%) is the highest in the EU
- Group 2 consists of the Netherlands, Belgium, Austria, Portugal, Finland, Sweden and Luxembourg. The level of innovation activity in these countries is in the range of 40-50%
- Group 3 unites countries which level of innovation activity is between 30 and 40%: Norway, the Czech Republic, Spain, Italy, Estonia, France and Lithuania.
- Latvia, Hungary, Slovakia and Romania belong to Group 4. Innovation activity in these countries is 20-30%
- Countries with the lowest level of innovation activity (less than 20%) were included into Group 5 (Greece – 13%, Ukraine – 12.8% and Bulgaria – 5%).

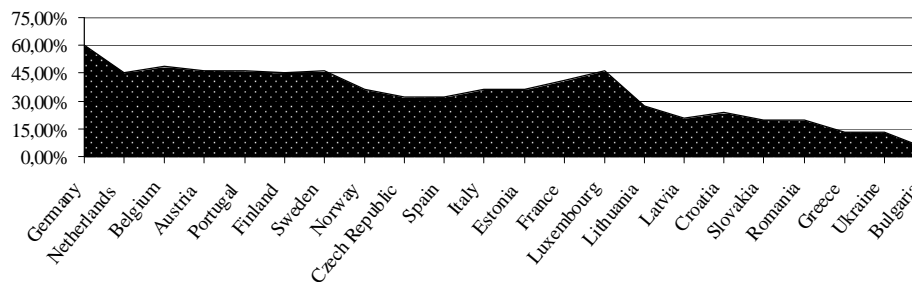


Fig. 1. Level of innovation activity in the countries of the European Union and in Ukraine

As we can see, Ukraine is one of the least developed countries as for the level of innovation activity.

A detailed analysis of innovation activity of Ukrainian enterprises showed that the total number of industrial enterprises that put innovations into practice during 2004-2009 went up by 23.2 (from 958 to 1180). In spite of this in the beginning of 2010 the level of innovation activity of Ukrainian industrial enterprises is still low at 12.8%. The common tendency is the next: decrease of implementation of new technological processes by 32.5% and a slight rise in the number of commercial productions of innovative goods (by 8.5%). The dynamics of implementing innovations at Ukrainian industrial enterprises in 2004-2009 is shown in the Fig.2

The analysis of the innovations spheres Ukrainian business entities developed showed that the majority of enterprises spent money on purchasing automobiles, facilities, equipment, other fixed assets and covered other capital costs associated with implementation of innovations (7% of total industrial enterprises or 767 units). Only 0.8% of all industrial enterprises or 90 companies spent money on buying new technologies and 2.9% of enterprises or 324 business entities carried out research and development (<http://mpe.kmu.gov.ua>).

The structural analysis of implementing innovations in manufacturing sector showed that such industries as chemical, petrochemical and machine building were the most active in this process. The greatest number of innovative products was produced by machine building industry (average of 43.4%), food industry (19.5%), chemical and petrochemical industries (12.4%) and the smallest – in mining and extraction industries (1,5%) [2].

According to the report made by the experts of The Directorate-General for Economic and Financial Affairs of European Commission, the level of innovative activity of a country depends on its industrial structure [7].

These data were used to develop the diagrams of industrial structure of each of the countries under consideration. The diagrams show the industrial structures of the countries which were earlier grouped according to the level of innovation activity (as shown in Fig. 2). The branches of industry were classified according to the EU standards [7]:

- Mining industry which includes mineral resource industry, oil and gas industries;

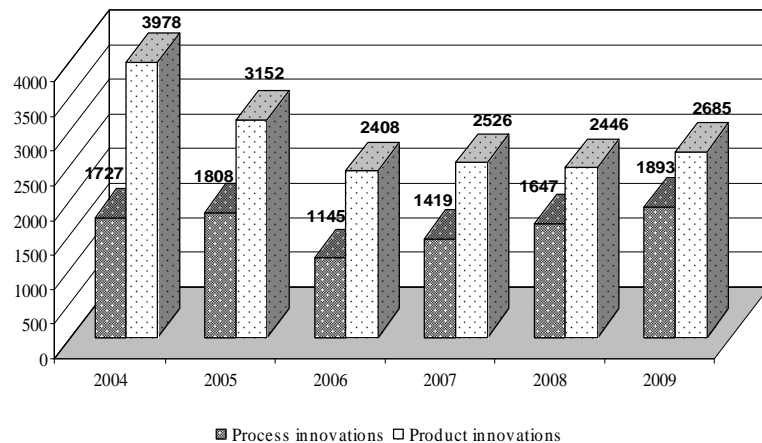


Fig. 2. Dynamics of implementing innovations at Ukrainian industrial enterprises in 2004-2009, units (based on Sobkevich, 2010)

- Manufacturing industry: machine building, metal-processing industry, construction, chemical, light and food industries;
- Transport and communication services;
- Computer and other business services;
- Other industries.

To conduct comparative research, a similar classification of Ukrainian industrial structure was made based on the data given by the State Committee of Statistics for 2009 (Fig.3).

The results of the research showed that in Germany manufacturing industry accounts for 42.57%, while mining – for only 0.43%, computer and other business services are rather developed (15.95%) as well as transport and communications (17.72%). In Austria manufacturing industry accounts for 48.86%, while mining for only 0.8%. In Spain mining industry has a share of 1.09%, manufacturing accounts for 60.93%, transport and communications – 10.36%, computer and other business services – 3.79%. In Ukraine the share of mining industry in the industrial structure of the country is 11.39%, manufacturing accounts for 64.37%, transport and communications – for 5.58%, computer and other business services – for only 1.08%. As we can see, the share of mining industry in Ukraine is 10-15 times exceeds this level in other countries, which directly affects the lower level of innovation activity in the country.

The research branch structure of Ukraine in the period of 2010-2012 revealed it's identity to the structure at the beginning of 2010, which allowed us to conclude that there are positive trends in the economy during this period of time.

Prior to studying the innovation activity of Ukrainian mining industry, the structure of innovation diffusion methods should be analyzed. Business enterprises can act in two ways: generate innovations or adopt them from outside.

The analysis of levels of generation and adoption of innovations in the countries of the EU and Ukraine was carried out (Fig. 3). The innovation generation coefficient was calculated by determining the share of enterprises that generate innovations independently in the total number of businesses performing the innovation activity in the country.

The adoption coefficient was determined by the number of enterprises that adopt innovations in the total number of businesses performing the innovation activity in the country. It was taken into consideration that innovation adoption occurs if it was designed either in cooperation with other enterprises or by other enterprises independently.

The countries of the EU have a common tendency to “generate” innovations; their index of generation largely prevails over that of adoption (Fig.4).

In Germany (Group 1) business enterprises aim mainly at “generating” ideas than at adopting (level of generation is 37.2%, level of adoption is 22.8%)

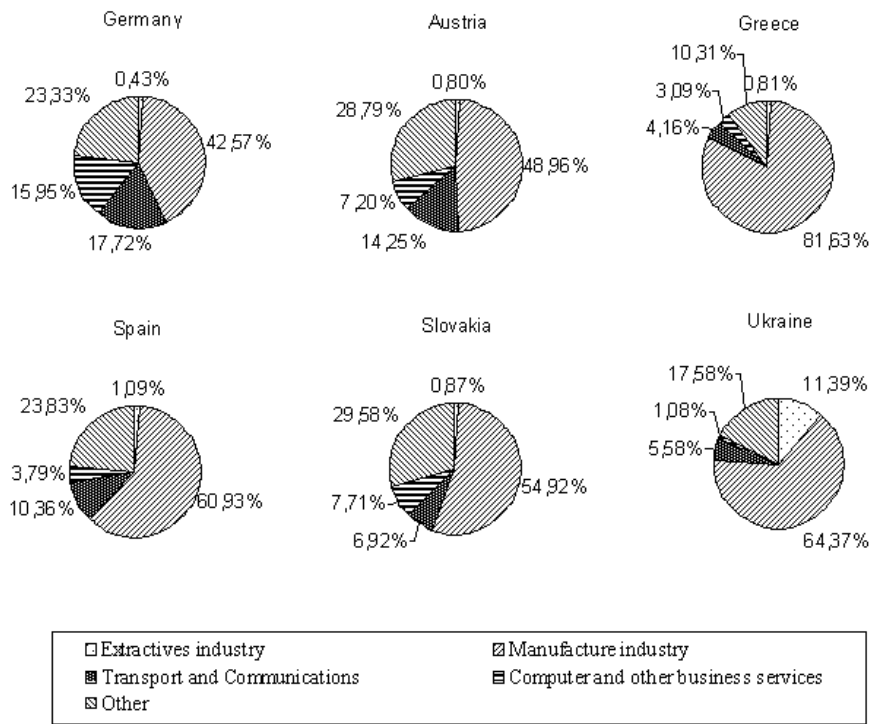


Fig. 3. Industrial structure of the economy of European countries (based on [1])

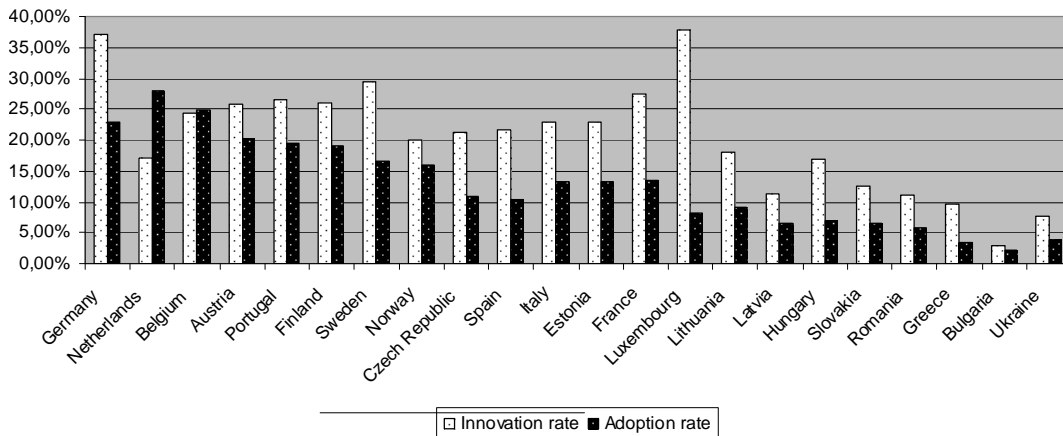


Fig. 4. Level of generating and adopting innovations in the countries of the EU (based on [7; 2; 6])

Maximum value of the level of innovation generation in the countries of Group 2 ranges from 17.1 to 37.8%.

In Group 3 France has the highest level of generating innovations – 27.4% (adoption level is 13.6%). In the countries of the fourth group generation level is 11-12.5%, adoption level is 5-6%.

The countries of the fifth group have the lowest level of generating and adopting innovations (2.8% and 2.2% correspondingly).

In Ukraine percentage of enterprises generating innovations is 7.15%, percentage of enterprises that adopt innovations is 3.85% [6].

Nowadays branches of the mining industry develop under complex and sometimes contradictory influence of socio-economic and natural factors. The product of the mining industries is mineral raw materials which are non-renewable unlike other natural resources. This natural characteristic is functionally important. It predetermines the necessity for each mining enterprise to expand in space extending the period of its operation. The level of economic and technological progress determines the degree and boundaries of enterprise expansion in the area.

Non-renewable nature of mineral raw materials dictates the necessity for each enterprise to deepen their development. But at certain depths it becomes technically difficult and makes no economic sense to continue working by both open-cut and underground method of extraction. So the enterprise has to be closed or restructured in the way that enables its future operation.

Real situation is much more complicated than the principal scheme offered above. Not only natural but also social, economic and environmental factors affect the state of affairs.

Ukrainian mining industry is characterized by a number of features some of which are favorable for further development, some have a hampering effect.

Among favorable features the following can be named: large deposits of coal of different ranks suitable for generating electric and thermal energy for technological needs; close proximity of coal, iron ore and other mineral deposits; proximity of large fuel- and energy intensive manufacturing plants and consumers of metal (metallurgical, chemical, machine-building and other enterprises); developed infrastructure; large industrial potential of working mining enterprises.

Unfavorable features are the following: difficult and extremely difficult mining and geological conditions; low coal content; the necessity to extract black coal and anthracite only by underground method; poor condition of mines that work for a long time without reconstruction which resulted in deterioration of their engineering characteristics; large-scale wearing of main assets, especially equipment; low level of mechanization in cargo-handling, transportation and auxiliary processes.

The general characteristic indicating the condition of mining complex is its structure in respect of the operation period since construction and after last reconstruction. The increase of this period increases the complexity of extraction and, consequently, the cost of reconstruction.

Nowadays there exist 167 working mines and 4 quarries in Ukraine. 102 of them have production capacity of 600.000 t/y, 32 – from 600 to 1million t/y, 33 – more than 1 million t/y. Operation period of 50% of all mines reaches 50 years, out of which 74 mines (33%) are being exploited more than 50 years, 38 (17%) – for more than 70 years. In the last 30 years only 34 mines were opened (about 15% of the general number of working mines). For the 50 years' period only 30.1% of all working mines were reconstructed; over the last 25 years – only 10%. This means that 90% of mines that were reconstructed work for more than 30 years after the reconstruction. We can say that during such long period the reconstruction has become obsolete and the mines need a new one.

At the present stage of the mining industry development mining enterprises whose work was considered economically non-feasible are being closed down. At the same time in the course of economic reforms in Ukraine some decisions are being taken about transformations in the mining industry. Hence, starting from 2013, only the mines that prove their feasibility will continue the operation [9]. On the basis of the analysis of all factors influencing the work of mining industry, the reconstruction of 40 mines of 18 mining corporations is considered to be a top priority. Among them there are 9 mines which produce the most valuable and scarce ranks of coal (coking, fat, non-baking coals). They are situated mainly in Donetsk-Makeevskiy and Central regions, which are characterized by extremely difficult mining and geological conditions due to the great depth of working.

In this respect an important decision should be made on whether generation or adoption is the best way to attract innovations. It is largely determined by the specific character of a coal mine as a complex manufacturing system. This issue should be addressed in detail.

Ukrainian coal extraction enterprises are concentrated in three regions: Donetsk, Lviv-Volynian and Dnepr coal basins. In the first two basins black coal and anthracites are extracted, in the Dnepr coal basin – brown coal. There are 21 geological industrial areas in the Donetsk coal basin but mines operate in only 14 of them. The regions are characterized by similar mining and geological conditions and coals of definite ranks. All mines are divided in certain connections to the boundaries of geological industrial areas, so some mines are characterized by great diversity of mining and geological conditions. The thickness of seams range from 0.8m to 1.8m; the seams dip at different angles – low, shallow, sloping and steep; temperature conditions range from difficult to very difficult; the level of danger is very high; gas presence is excessive.

Mining and geological conditions of the Lviv-Volynian basin are difficult due to the small and unstable thickness of seams, instability of rock, high methane content of coals and rocks and necessity of specific shaft sinking methods. The thickness of industrial seams ranges from 1.5m to 6m. Their area and thickness are unstable; the depth varies from 10 to 150m, which enables open-cast mining of a considerable amount of deposits. Mining and geological conditions of operation are rather complex due to high level of watering of loose water-bearing sands.

Technological coal deposits are mainly concentrated in 5 regions: Donetsk-Makeevskiy (44% of all industrial deposits), Krasnoarmeyskiy (16.3%), Central (10%), Almazno-Maryevskiy (8.3%) and Lugansk-Krasnodonskiy (9.8%). The most valuable and scarce ranks of coal (coking, fat, non-baking coals) are mainly situated in Donetsk-Makeevskiy and Central regions, which are characterized by extremely difficult mining and geological conditions due to the great depth of working.

Energy coals are extracted in all regions, while anthracites can be found in two of them, Chistyakovo-Snezhnyanskiy (Donetsk region) and Krasnoluchsko-Antracitovskiy (Lugansk region).

A number of natural factors affecting the choice of methods of mining and means of mechanization and their specific character doesn't allow to directly adopt innovations generated for certain deposits in Ukraine and other countries.

The degree of natural factors impact on the production process of some mines allows for a forecast to be made about the expediency of generating innovations for their development. If the enterprises are unable to considerably improve their economic results due to difficulty of mining and geological conditions, it is rational not to waste investment funds on generating or adapting innovations.

On the basis of the developed method of assessing the degree of influence, quantitative estimates for determining the directions of Ukrainian mine restructuring were obtained.

The expenses associated with the most serious natural factors affecting the increase of production costs were calculated for each mining enterprise. The ratio of these expenses to a ton of production gives us the portion of the production cost that depends on natural factors. The calculations showed that this figure is different for every mining enterprise. On the mines of the Donetsk region, for example, due to great depth and excessive gas presence, the portion of the production costs is high for such processes as whole mine ventilation, mine workings ventilation and excavated rock temperature. On the contrary, due to the relatively big thickness of the seams and low watering, the portion of the cost of these processes is low. The situation on the Pavlogradugol mines is almost opposite: the part of the cost connected with the seam thickness and watering is high, the part of the cost depending on the depth of extraction, gas presence and geodynamic aspects is low. So, to get the unbiased assessment of the natural factors impact, that is to obtain the part of the production costs that depends on the natural factors, we have to compare a single mine production costs with industry average figure.

This method enables us to draw a fairly grounded conclusion that on the Pavlogradugol mines, for example, average 16% of overall production costs are connected with the impact of natural factors, so, to raise the efficiency of operation, innovations can be implemented for 84% of the costs. Whereas on the Dobropoliueugol mines as much as 30% of the production costs are connected with natural conditions, on the Donetskugol mines this figure is even bigger – 45%.

If the part of the production costs connected with unfavorable natural conditions of mining is very high, the economic expediency of additional investment in innovation projects is questionable. On the other hand, such approach is not universal and requires additional expert evaluation of innovation projects offered for generation or adoption. This is explained by the fact that there are some technical solutions aimed at decreasing the impact of natural factors on the production processes which can improve the operating efficiency of the mining enterprise. As a result, it can join the list of mines recommended for restructuring.

**Conclusions and perspectives for further research.** The analysis of innovation activity as a comprehensive characteristic of industrial enterprises of the EU and Ukraine showed that Ukraine lags behind in this process.

The mining sector that takes a significant position in the structure of Ukrainian industries (36%) is especially appropriate for the diffusion of innovations.

A specific feature of Ukrainian mining industry in comparison with EU countries is its complex mining and geological conditions. The expert evaluation of these conditions should influence the decisions of economic expediency of innovations diffusion.

The suggested method of assessing the degree of factors' impact on the production process allowed giving quantitative estimates of the complexity of mining and geological conditions. The estimates could be used in analyzing the perspectives of attracting innovations.

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## ОСНОВНІ ЕКОЛОГІЧНІ ЧИННИКИ ТА СТРАТЕГІЧНИЙ ВИБІР ПІДПРИЄМСТВ У ПОЛЬЩІ

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**В умовах ринкової економіки через навколишнє середовище польські компанії обмежують своє функціонування. Умови, що швидко змінюються, та ринки, що розвиваються, змушують компанії вживати різноманітних заходів з метою виживання, щоб впоратися з конкуренцією та скористатися можливостями для розвитку.**

**Ключові слова:** маркетинг, середовище, стратегічний вибір, умови.

## KEY ENVIRONMENTAL FACTORS AND STRATEGIC CHOICES OF ENTERPRISES IN POLAND

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**In a market economy conditions resulting from the environment of Polish companies provide the framework and limits of their functioning. The rapidly evolving conditions, and evolving markets cause that companies undertake various adaptation measures in order to survive, cope with competition, to take the opportunities for development.**

**Key words:** marketing, environment, strategic choices, conditions.

**Problem formulation.** Polish companies operate in an environment influencing the image of modern markets and effects, such as, among others progressive internationalization of economic activity (including the integration of national economies under the expanding common economic area of the