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# TABLE OF CONTENTS

# SPIS TREŚCI

# TRANSFORMATION OF EMPLOYMENT STRUCTURES IN POLAND – SERVITIZATION OF ECONOMY

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A b s t r a c t

Transformation of the Polish economy and the related process of reallocation of labour resources have been progressing since the beginning of the 1990s, but their growth is insufficient. The current level of development of the service sector does not constitute an adequate alternative to diminishing employment in the so-called declining heavy industries, which were dominant in the Polish economy for many years. Given that a more dynamic growth in the services sector can contribute to the labour market balancing alleviating the unemployment problem, not only by the absorption of people laid off from the restructuring industrial enterprises but also by providing new jobs for young people, it is necessary to increase consistently the share of modern section services in GDP and total employment.Increasing employment and created added value in modern, knowledge-based services are consistent with the direction of changes observed in the developed countries.In Poland, the employment is steadily increasing in services related to real estate and businesses, financial and insurance services, particularly in IT services. The knowledge embodied in products and technologies and highly skilled labour resources determines the innovativeness of the economy, providing a source of growth and competitiveness. Therefore, the direction and pace of these changes are important.One of the possibilities of further service sector development in Poland is the offshoring of business services. The created BPO and KPO centres allow for the absorption of high-quality labour resources, including university graduates, whose numbers are increasing from year to year. This is even more important as in the long time span the sector development and created jobs will increasingly be based on the human factor and the skills possessed by employees rather than on lower labour costs compared with other locations.

A b s t r a k t

Przesunięcia w trójsektorowej strukturze gospodarki bezpośrednio są powiązane z poziomem rozwoju danego kraju, któremu z kolei towarzyszą zmiany na rynku pracy – w jednych sektorach miejsca zatrudnienia znikają, a powstają w innych. Wzrostowi zatrudnienia w sektorze usługowym towarzyszy systematyczny spadek liczby pracujących w przemyśle oraz w rolnictwie, co jest określane jako proces serwicyzacji gospodarki. Kierunek oraz dynamika zachodzących zmian wskazują, że nie cały postęp można wyjaśnić za pomocą analizy sektoralnej (rolnictwo–przemysł–usługi), a coraz większe znaczenie mają zmiany zachodzące wewnątrz tych sektorów. Następują zasadnicze przesunięcia w kierunku wiedzochłonnych usług biznesowych.

## Introduction

Services play a key role in modern economies. They are the largest source of growth in jobs and the increase in the national income per capita to a large extent contribute to the growth in demand for them. In addition, the services determine smooth running of the production processes, and some of them are used to satisfy social needs of the population. Thus the increase of their share in total employment as well as in GDP reflects fundamental structural changes taking place in many countries and regions. Transformational changes in the Polish economy, especially the servitization process and transition to a know-ledge economy, are reflected in the labour market and lead to raising the questions, whether the service sector is able to absorb labour resources appearing on the labour market as a result of the loss of employment in the manufacturing and agriculture? Whether the job creation dynamics in the modern, knowledge-based services meets the needs of the modern economy? The occurring changes indicate that not all progresses can be explained by the sectoral analysis (agriculture-manufacturing-services), and the changes taking place within these sectors are becoming more and more important. From the standpoint of structural policy and the labour market it is, therefore, essential to identify the fastest growing areas of the Polish economy, characterized by high growth in employment and productivity, their convergence and possible divergence in comparison with the developed countries. Hence the aim of this article is to determine trends in the evolution of employment structures in the various sectors of the economy in Poland compared to other European Union countries, with particular emphasis on knowledge-intensive business services.

## Servitization of economy and its determinants

Servitization, also referred to as tertierization of economy, has been recognized as one of the main megatrends of the modern world. From the

macroeconomic perspective it means the growing importance of services in the economy, reflected both by the third sector participation increase and the large-scale use of services in other sectors (the first and second). Relating this concept to the servitization of industry or production is understood as convergence of products offered by manufacturing companies and the service products or enlarging the share of services in production activities. From the viewpoint of changes in the labour market the servitization is reflected in the increasing number of workers in the service sector and the tertierization of industry usually refers to the increasing participation of managers and specialists in the employment in the industry. The growing role of services in the products reflects their position in the strategies of manufacturing enterprises and the customers' role recognition as an important factor of competitiveness[1].

Combining the progressive servitization with the deindustrialization process, understood as a cumulative reduction of the manufacturing industry share in the national economy, which is visible if the industry share in creating added value and domestic product, exports value, capital investment and employment decreases significantly, and in relation to employment this decrease is not only relative but also absolute (Kuciński 2007). Deindustrialization does not mean the disappearance of manufacturing as a means of producing wealth, but rather its better adaptation to the changing technological and social conditions existing in the modern world.

Assuming that the servitization is an inevitable stage of economic development, which brings certain advantages, the scope and dynamics of changes taking place should be adapted to local conditions and specifics of each country. Servitization leads to changes in the structure of the economy, affects the use of resources, especially human capital, increases competitiveness and creates conditions for the knowledge economy development. Servitization does not mean benefits only, but also the risk that the service sector will not be able to fully absorb the labour resources, emerging in the labour market as a result of employment loss in the manufacturing sector, which may lead to rising unemployment and stagnation.

Among the factors that determine the development of the service sector it is worth to point at:
- internationalization of services, supported by deregulation processes,
- technological advances, particularly the use of ICT,
- demographic factors,

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[1] Convergence of both sectors is also done through the industrialization of services, which means that in service activities modern technologies are increasingly used, particularly IT, and the specific processes occurring in the services sector are subject to the same organization and based on the same principles as those in the manufacturing sector. Although many features still differentiate the two sectors, but their number is definitely smaller than it has been thought for many years.

– interactions, dependencies and the convergence process of service and manufacturing sector.

One of the vital determinants of the services development is an increase of competitiveness on the international level associated with the ongoing globalization process, whose effects, among the others, are: rise in the flow of goods, services, individuals, payments and information transmitted between organizations or countries. The changes in laws and regulations on the transport, communication, financial market, or more broadly – business services, combined with abolishing barriers to international trade and investment in the service sector, with the simultaneous growth of competitiveness and scale of international trade in this field contributed to the opening of services markets, which were previously protected from competition[2].

The requisite facilitating the flow in the international field, and thereby contributing to the growth in demand for certain services, is technological progress. A growing number of collected, stored and distributed information requires framing into the specialized institutional service forms. On the other hand, the ongoing process of specialization, the growth of state intervention and regulation causes that entrepreneurs increasingly use the specialized services of financial and legal advice. The intensification of specialization and competition in the services sector is important for another reason, it fosters growth and market launch of new companies demonstrating an innovative and effective approach to individualized consumer demand for services.

Changes within the service sector allow for increasing labour productivity in this sector and the quality of services as well as are contributing to the emergence of new types of services. In these change processes an important role is played by innovation and new technologies, especially information and communication technologies revolutionizing the means of production and delivery of traditional services as well as offering the ability to create entirely new services, not existing yet. More often, the services are delivered to customers in a package with a specific commodity, such as banking, insurance, etc. The creation of new types of services, their transformation into commodities (processes of commoditisation of services), as well as "industrialization" processes and the reorganization taking place in this sector on a global scale indicate that they constitute the essence of structural changes in modern economies.

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[2] The process of European integration plays a vital role here. The accession to the European Union, amongst others, is associated the adoption of the principle of free movement of services, so the liberalization of financial services, the harmonization of inspection of banks and insurance, as well as opening transport and telecommunication services markets.

## Theoretical explanation of the service sector development

The overlap of various factors of an endo- and exogenous character affected the evolution of several basic hypotheses regarding the development of the service sector. Given that the size and pace of the service sector expansion can be measured by, among others: the share of services in the general level of employment, the following hypothesis were subject to research on the structural shift in employment:

– changes in the structure of demand, resulting from an increase in consumers' income and differences in income elasticity in demand for services and products. The Clark-Fisher hypothesis verification, based on the model built in 1990's, was undertaken by APPELBAUM and SCHETTKAT (1999) and ECHEVARRIA (1997). The empirical validity of the approach presented, among others, was argued by Curtis and Murthy, and Summers (CURTIS, MURTHY 1998). Bearing in mind that this hypothesis is increasingly being challenged both on theoretical and empirical grounds, and the traditional division into three sectors becomes outdated, one can not refer to the theory of transformation of economic structure in the three-sector system as a universal economic law,

– an increase in productivity, which in the service sector is called: stagnant, is relatively slower than in the processing sector, as it is pointed in their publications, among others, by BAUMOL (1967). This theory is based on the assumption that the economy consists of two different, in terms of the level and pace of development, sectors. The manufacturing sector, in contrast to the service, is growing rapidly thanks to technological progress, capital accumulation, and economies of scale, which is the result of: standardization, specialization and formalization[3]. The uneven development of manufacturing and service sectors causes reallocation of resources towards the "stagnant" sector, ultimately slowing down the aggregate productivity growth,

– relatively rapid growth in demand for services as intermediate goods used in the manufacturing sector, which is emphasized in the publications of, among others: FRANCOIS (1990), KLODT (2000), FIXLER and SIEGEL (1999). The growing share of modern knowledge-intensive services has a beneficial effect on productivity changes and the development of the whole economy,; changes in the intersectoral work division – globalization and technological revolution, the progressive restructuring of industrial enterprises; focusing on the core business, which shows their competitive advantage associated with the development process of outsourcing and offshoring services.

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[3] This assumption, however, is denied by the heterogeneity of services. In addition to "stagnant" services the increasing number of services such as telecommunications have similar and sometimes higher than that productivity growth in the observed industrial sector.

Particular approaches and hypotheses, along with their revisions, are still an important research area, in particular, as so far there has been no approximation of individual views leading to the development of a coherent theory on the development of the service sector.

## Transformation of the employment structure in the services sector in Poland in the years 1992–2010

In the economies of developed countries services play a key role and are the largest source of growth in jobs, and their increasing share in the created GDP confirms major structural changes in many countries. In the EU, services account for more than 70% of GDP, at a similar level of employment. In Belgium, Denmark, France, Luxembourg the figure exceeds 76%, and in the Netherlands and the UK is over 80% – see Figure 1. Since 2000, nearly 20 million jobs have been created the service sector, with a simultaneous loss of employment in agriculture (3.8 million). In the EU countries, the percentage of the employed in agriculture is less than 4%, and in most countries of the "old 15" oscillates at around 2–3%, with the added value produced at a similar level (1.8% in 2008).

The sectoral employment structure in Poland compared to other EU countries, and especially the EU-15 is unfavourable, although the direction of change is similar. Poland has a very high share of employment in agriculture (13% in 2009) and the pace of change is too slow. Although the percentage of
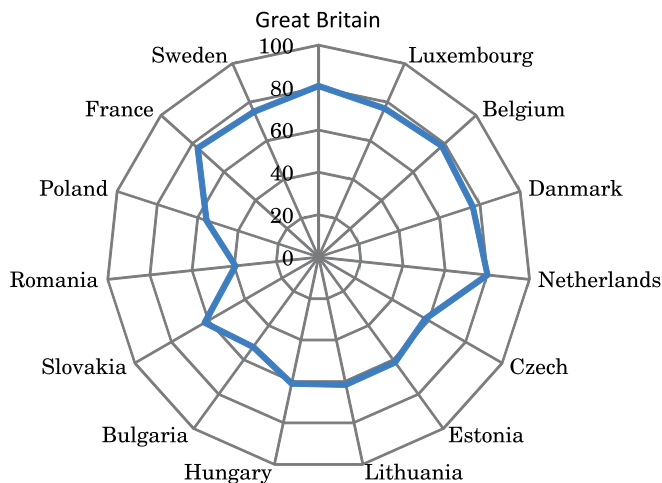


Fig. 1. Share of employment in the services sector in Poland and other EU countries in 2008
Source: http://eurostat.ec.europa.eu/ (12.08.2011)

working in this sector, which was nearly sixfold higher than in the EU-15 in 1992, in the year 2009 was outpacing the EU average only fourfold, but the gap between Poland and the individual member countries remains a significant e.g. in relation to the UK or Luxembourg (nearly 13 percentage points).
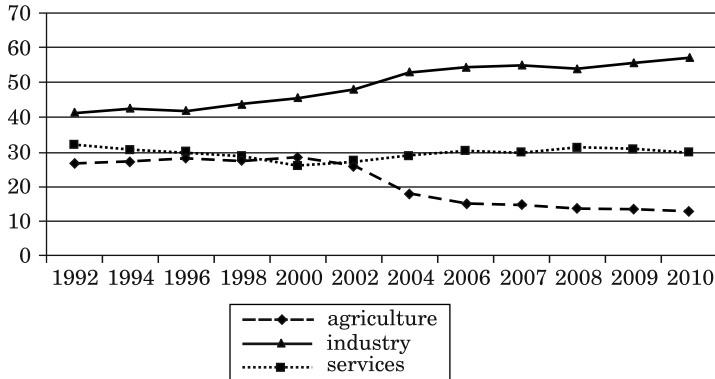


Fig. 2. Structure of employment by the sectors of economy in Poland in 1992–2010
Source: Latour Force Survey 2002–2010, GUS, Warsaw 2002–2010, s. 34, 80.

The employment growth in the third sector is due to the progressive tertierization of Polish economy, although the proportion of employed in the service sector remains one of the lowest in the EU. In 2002, the borderline of 50% share of services in employment was exceeded in Poland, which is conventionally taken as a criterion for assigning to the countries with the service economy. In 2010, this share was just over 57% and lower rates were found only in Bulgaria and Romania. However, in comparison with 1992, the share of employment in this sector increased by over 36%, which meant increasing the number of employees by more than 2.3 million people. One of the factors affecting the development of service sector in Poland is the inflow of foreign direct investment (FDI), which share in financial intermediation only and real estate and business services exceeded 40% of the total FDI in 2006-2007, and 56% in 2008 (*Ewolucja sektora usług...* 2010).

The growing importance of services sector and its differentiation across particular countries is evident not only in relation to the level of employment, but also the added value produced by the sector. In 2008, in the EU-27 the share of services in the structure of added value amounted to more than 71% and in comparison to Poland was more than 7 percentage points higher, while this proportion ranged from 55% in Romania, and 75% in Belgium, Greece, France or Great Britain , to 84% in Luxembourg – see Figure 3.

In comparison to 1992, the decreasing importance of the first and second sector in the structure of added value was observed in all EU countries,

opposing the growth of third sector involvement, especially business and financial services. The relatively high rate of changes dynamics occurring in Poland indicates that the distance in relation to the developed countries is reduced, but even in comparison with some "new" member states (Latvia, Estonia, Hungary), the share of services in the added value is lower in Poland.
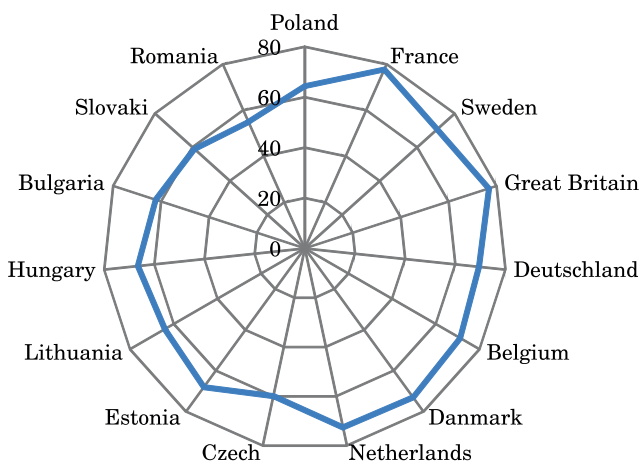


Fig. 3. The share of services in the added value structure in Poland and other EU countries in 2008 (in %)
Source: http://eurostat.ec.europa.eu/ (12.08.2011).

When analyzing and assessing the development level of the service sector particular attention should be paid to the changes within the sector. The development level of an economy is not determined by the bare share of employment or the added value produced by the entire services sector, but in certain types of services. In Poland, like in other EU countries, the market services dominate (69% in 2008), wherein an unfavourable phenomenon is the excessive share of hollow services, which neither enhance the competitive position of the country, nor do they increase its intellectual potential, and they lead to obtaining profits only (KARPIŃSKI 2010, p. 92–94). According to A. Karpinski's estimates the share of employment in the hollow services, i.e. advertising, public relations, security services and *non-banks* financial inter-mediation is 2.5% of total employment in Poland, while in the EU only 1.3% (KARPIŃSKI, PARADYSZ 2010, pp. 23, 41, 64). Although the starting point for the development of these services was much lower in Poland than in the EU-15, but after several years of transition, their excessive share in the services cannot be explained by mere filling the development gap in relation to more developed countries.The growing importance of services sector in the Polish economy should be evaluated positively, as it provides the evidence that the

structure of the Polish economy is getting closer to the developed countries, although the development gap in this field is still quite significant. Assuming the current pace of change and the convergence thesis, namely the changes direction complementarity in the structure of employment, it should be considered as the most likely that the third sector participation will be in the range of 70–78% in Poland in 2025, compared to 73% in the EU-15 in 2008 (KARPIŃSKI 2006). It should be noted that the depletion of the formula of the economy division into three sectors contributed to the attempt of separating and supporting the development of modern sectors, which determine the competitiveness of modern economies.

## INTRASECTORAL CHANGES – development of knowledge--intensive business services (KIBS)

Distinguishing the sector of knowledge-intensive business services (KIBS) is associated with their three characteristics: knowledge-intensity, which singles them out from other services, and is a form of advice addressing clients; problems and creating services in close interaction with the customer (customer orientated).

Initially, this group of services was described as "advanced corporate services" and then "professional business services". The concept of KIBS has also been associated with research and development services or information technologies. In the early 1990s characterizing KIBS this concept was applied to consulting firms and sometimes also to the whole business services sector, without exposing the importance of knowledge in this kind of services.

The advancement in research on knowledge intensive business services in highly developed countries falls on the second half of the 1990's. The intense interest in KIBS is often combined with the growing role of innovation in modern economies, especially through the perception of KIBS from the angle of initiating and stimulating innovative operations. Continuous development of knowledge in the learning process lays foundations for KIBS activities, which in accordance with the concept of transition to a knowledge economy, is of fundamental importance for innovative operations. These services provide valuable guidance and insight into their customers' business processes and knowledge delivered by them is vital for the active development of products, processes, and technology.Being aware of the diversity of approaches and ways of defining KIBS, it is assumed that these are companies that specialize in professional customer problem solving, providing knowledge-intensive products (knowledge-based services), which are produced in close interaction with the client / service user. KIBS are a subcategory of business services, whose

customers are businesses, both private and public, and are based on the professionalism involved in their labour provision, which with a slight simplification can be referred to their level of education.

## Knowledge-intensive business services in Poland
## – actual state and structure

The development of KIBS is determined by several factors of various nature. Globalization, increased competition, shorter implementation cycle of innovative solutions and primarily the development of new technologies, including IT contributed to the growing demand for external sources of expertise, delivered within KIBS. Not without significance are also issues of cost reduction, which add to outsourcing and offshoring of knowledge-intensive services.

The development of KIBS is reflected in the growing share of this sector in the economy in relation to employment or added value and high productivity but the KIBS quantitative volume was not, especially in the 1990's, dominant in the service sector. The share of KIBS in services employment in the EU-15 in 1996 did not exceed 7%, and the produced added value 398bn euro, although a considerable diversification in this respect was visible inside the Community[4]. Countries with higher development levels (e.g. the Netherlands, the United Kingdom) showed a 10-15% share of KIBS, while in Poland the figure was 3.6%. In 2008 more than 16.8 million people were employed in more than 3.5 million enterprises, in KIBS across the EU, representing 11.7 percent of the total services and nearly 21%, if not accounting for public administration, while the sector generated added value amounted to 842bn euro[5]. Despite the dynamic KIBS development the distance between Poland and the highly developed countries is not diminishing. Although the recorded employment growth in the period 1996–2008 (nearly 300 thousand people) and in the added value (by over 300%), the share of employment in KIBS in Poland remains one of the lowest in the EU – in 2007 was only 6.2%, while in Luxembourg exceeded 23%, 21% in the Netherlands.

The analysis of knowledge-intensive services requires paying attention to their heterogeneity resulting, among others, from the diversity of the markets in which they operate, the average size of enterprises, tradition or work methods. Legal, accounting and management services (74.1) and in the field of

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[4] According to the PKD 2004 classification the KIBS sector includes the following sections and groups of Section K: 72. Computer and Related Services (excluding 72.5), 73 Research and development, and 74, other business activities (74.1, 74.2, 74.3, 74.4, 74.5).

[5] Data taken from the website http://eurostat.ec.europa.eu/

architecture, engineering and technical studies (74.2–3) show a similar economic profile characterized by a higher share in the total number of enterprises than the number of employed. These two subcategories constitute more than 60% of all enterprises belonging to the KIBS in Poland, with employment of no more than 55% of working across the sector – Figure 4. These proportions indicate a dominance of small firms employing a relatively small number of people.
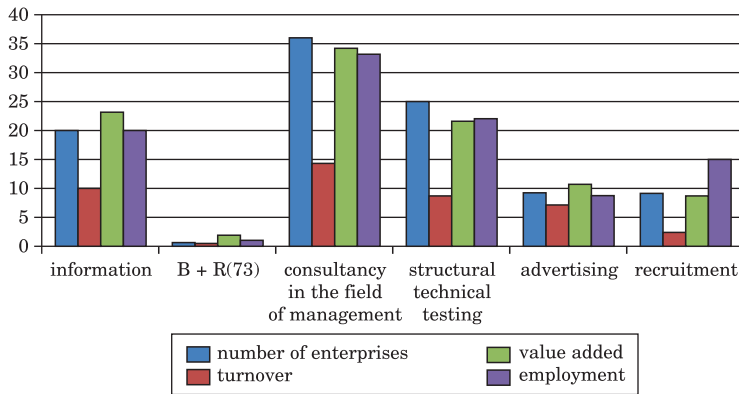


Fig. 4. The share of each subcategory of services in KIBS: in relation to the number of enterprises, turnover, added value, employed in Poland in 2008 – in%

A clear division between the countries of "old" 15 and new EU members is shown in relation to architectural and engineering services and technical studies. Their share in employment fluctuates around 25-28% among the new member states (Poland – 22%), while in Luxembourg amounts to 4.3% and 9.2% in the Netherlands.

The technological and information revolution and the transition to a knowledge economy are reflected, among others, in the dynamic development of computer services. The use of IT tools and of advisory services in the field of software and hardware, data processing, and management of websites, is a requirement of the modern world. In Poland, both the dynamics of changes in employment (an increase of over 250% between 1996–2008) and the added value (an increase of almost 700%) and the share of computer services in KIBS are relatively high; in 2008 it was almost 20% – Figure 4. This is, among others, the result of foreign direct investment (FDI) inflow and associated with it the increase in the number of investment projects in the field of offshoring services. At the same time a higher share of added value compared to the employed in computer services as well as in research and development, advertising and management services reflects a higher average labour produc-

tivity, which is related to the employment of highly qualified, specialist staff providing consulting services in this field.

In the developed countries, among others, due to the long tradition of using employment agencies and human resources consulting, there were a high number of jobs in this subcategory. It was respectively: in Luxembourg – 34.1%, the Netherlands – 45.2% and Belgium – 34.5% and in this sense we can speak about the specialization of these countries in the provision of recruitment services[6]. The domestic enterprises much less often use the services of employment agencies. The proportion of the number of recruitment services providers (74.5) in KIBS is a little over 9% in Poland, with a parallel 15% share of employment – Figure 4.

The development of knowledge-intensive services in Poland should be considered as a positive direction of change but their growth remains insufficient. The gap separating Poland from highly developed countries adversely translates into a competitive position and innovativeness of Polish economy in this respect.

## Prospects of services sector development in Poland

Taking the thesis of convergence, i.e. the directions of change complementarity in employment structure, it should be assumed that aspiring to the reduction of the development gap occurring between Poland and the developed countries, the service sector will continue to develop. It is predicted that changes within the service sector will continue to advance along with the pace of change, especially they will grow steadily in less developed countries. In these countries, just as today in highly developed countries, an increasingly bigger share and importance will fall on business activities based on knowledge-oriented services. This reflects the growing demand of individual and business customers for certain services, outsourcing and offshoring of service activities from manufacturing companies and the leading role of the IT sector.

The process of moving modern services beyond boundaries of a country where a company is located takes two basic forms:
– Business Process Offshoring (BPO),
– Knowledge Process Offshoring (KPO).

The Business Process Offshoring sector includes, among others, service centres handling accounting or human resource management and call centres. The Knowledge Process Offshoring focuses on key operations for the company, having strategic importance in the long time span, such as research and

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[6] Data taken from the website http://eurostat.ec.europa.eu/.

development, designing information systems or creating analyses and forecasts.

From the point of high-quality human capital absorption a vital role is played by a form of dynamically growing business process offshoring, which is Knowledge Process Offshoring (KPO). It includes services which in order to be provided require specialistic, expert knowledge, together with: financial services, accounting, research and development, analysis and market research, legal advice, design services, engineering. Companies dealing in KPO conduct scientific research on business operations, investment, databases, and intellectual property. The development of this type of operations in Poland is clear evidence of the growing international attractiveness of our country. Companies prefer opening research centres in the field of information technology, telecommunications, and electronics, which allow them to reduce costs, save time, and consequently give them the opportunity to gain an advantage in the market by creating high added value. Still, the figures are far below the absorption capacity of highly skilled labour resources, including the growing population of university graduates.

The value of modern business services market reached $ 2.5 billion in Poland in 2010 and to a large extend is the result of operations development of companies that have already been operating in Poland. The dynamic development of BPO and KPO is reflected, among others, in an increasing number of entities and people employed in them. The decision about the location of service centres in Poland is primarily undertaken companies from the EU countries (including France, Germany, Great Britain, Italy, the Netherlands) as well as the United States, and India. In 2010 132 international BPO service centres conducted their operations in Poland, employing nearly 40 thousand people. It should be noted that compared to 2008, employment grew by over 36%, and in line with expectations the growth is forecast to exceed 45% at the end of 2011 (*Sektor SSC/BPO w Polsce* 2010, p. 15).

In the BPO and KPO services centres the employment is found by, among others: specialists in human resource management, supply management, accountants, lawyers, analysts, financiers, market research, investment, insurance, specialists etc. Thus, a high share of employment in finance and accounting (almost 50%), customer service and financial services (*Sektor SSC/BPO w Polsce* 2010, p. 22). An increasing share has also created the so-called Centres of Business Excellence, which set standards and create best practices for the services they render.The main centres of business services offshoring are, apart from Warsaw (28 centres), Kraków (24 centres), Wrocław (13 centres), Łódź (11 centres) and Poznań (10 centres). A total of 14 centres operate in the Silesian agglomeration, of which 9 are located in Katowice. An example of a consulting company in the region of Katowice is Capgemini,

which is a leader in providing integrated advisory and IT services, and outsourcing. In turn, Rockwell Automation, also located in Katowice, is a global provider of industrial automation, process control and information technology, supporting businesses throughout the world.Analyzing the impact of offshoring services on the labour market it is also necessary to draw attention to the fact that apart from jobs directly created in this field, they are also created in the company's environment, both for people with lower qualifications (security services, cleaning, catering) and people with higher education (e.g. training, information technology, medical services)[7].

The attractiveness of Poland as an offshoring services location has been confirmed by the rankings conducted by various companies and institutions. On the 30 countries list developed by specialists from Gartner, representing the most attractive locations for offshoring services, among European countries, Poland found itself next to Bulgaria, the Czech Republic, Hungary, Romania and Slovakia[8].

The investment attractiveness analysis and the service location indicator, developed by A.T. Kearney, show that Poland is one of the most attractive countries in Europe in terms of services offshoring, especially that there was an upward change in the ranking of 15 positions in relation to the year 2009 there – see Table 1.

Prospects of meeting the demand for specialized knowledge-intensive services, reducing the level of structural unemployment, building local competencies and consequently long-term economic development caused that offshoring of knowledge-intensive services has become an important element of economic policies of modern economies. It should be noted that the global economic crisis may bring about significant changes in the global market, influencing the direction and extent of offshoring in both the short and long term.Polish potential remains not fully utilized in this regard. The country has an enormous potential for research and development. It consists of academic as well as research and development units, development centres and higher education institutions, leading research. Being aware of the fact that due to the

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[7] According to current estimates for 1000 jobs in the service centres were created 110 jobs in companies that support these centres, including training companies, transportation, medical services, recreation, information, and security. Additionally, 150 jobs were created in the field related to the purchasing of consumer goods and services, thanks to income earned by the service centres employees, and 5 jobs in the hotel and catering services. In total for 1000 working in BPO 265 jobs were created in their environment. See: G. Micek, J. Działek, J. Górecki, Centra usług w Krakowie i ich relacje z otoczeniem lokalnym, Wydawnictwo Uniwersytetu Jagiellońskiego, Kraków 2010.

[8] Ranking is created based on 10 evaluation criteria that determine the location of the offshoring of services, include: language, government support, access to labour resources, infrastructure, education system, cost, political and economic factors, cultural proximity, the maturity of the legal system, data and intellectual property protection, assessed on a scale from "weak" to "excellent". See. www.gartner.com/resId+ 1,491,316 (as of 15/06/2011)

Table 1

Ranking of countries with the highest investment attractiveness in the field of services

| Place | Country | The attractiveness of financial terms | Access to skilled labour | Business environment | Final result |
|---|---|---|---|---|---|
| 1 | India | 3.11 | 2.7 | 1.14 | 7.01 |
| 2 | China | 2.66 | 2.55 | 1.31 | 6.49 |
| 3 | Malaysia | 2.78 | 1.38 | 1.83 | 5.99 |
| 4 | Egypt | 3.10 | 1.36 | 1.35 | 5.81 |
| 5 | Indonesia | 3.24 | 1.53 | 1.01 | 5.78 |
| 11 | Estonia | 2.31 | 0.95 | 2.24 | 5.51 |
| 12 | Brasil | 2.02 | 2.07 | 1.38 | 5.48 |
| 13 | Latvia | 2.56 | 0.93 | 1.96 | 5.46 |
| 14 | Lithuania | 2.48 | 0.93 | 2.02 | 5.43 |
| 15 | United Arab Emirates | 2.41 | 0.94 | 2.05 | 5.41 |
| 16 | Great Britain | 0.91 | 2.26 | 2.23 | 5.41 |
| 17 | Bulgaria | 2.82 | 0.88 | 1.67 | 5.31 |
| **24** | **Poland** | **2.14** | **1.27** | **1.81** | **5.23** |
| 25 | Romania | 2.54 | 1.03 | 1.65 | 5.21 |

Source: Offshoring Opportunities Amid Economic Turbulance The A.T. Kearney Global Services Location Index, 2011, p. 2.

nature of offshoring, among factors that determine their location, apart from infrastructure, transport accessibility, investment incentives, low labour costs, etc. a crucial role is played by an access to high quality labour resources necessary to intensify efforts to convince potential investors to locate operations in the Silesian Voivodship.

Translated by ADAM WASIOŁKA

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# AGRICULTURAL TAX – CONDITION AND PROSPECTS

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K e y  w o r d s: agricultural tax; taxation of agricultural farms, revenue of commune.

## A b s t r a c t

During the recent years the issues of taxation on the family agricultural farms has been neglected frequently. Currently, with the discussions pending in Poland on the planned changes in that area, the issues of taxation imposed on agricultural farming requires a new approach.

The main aim of this paper is to analyze the actual tax burden on farms in Poland and to investigate the impact of agricultural tax on the formation of revenue of local government. However, an important is to consult opinions of the farmers about the individual tax burden farming structures as well as the entire system of taxation. It is important also to propose changes in the tax applied to the Polish agriculture. Suggested by farmers alternatives in the taxation of individual farms can be used as an attempt to adjust the tax system in our country, to the solutions applied in EU member states.

The paper presents the analysis of the taxation on family agricultural farms in Poland with particular focus on the agricultural tax. For the purpose of evaluating the actual burdens to the farms resulting from that title and the analysis of the volume of tax revenues to the budgets of selected communes in 2010, the method of secondary analysis of statistical data originating from the commune administration offices situated in the area of Mazowieckie voivodship was applied. It was analyzed the budgetary resolutions and reports on their implementation in the surveyed municipalities. The authors conducted the study using a questionnaire interview. The studies encompassing 200 family agricultural farms aimed at obtaining the opinions from farmers concerning the taxation system in Poland and possibilities of introducing changes proposed by the State.

## PODATEK ROLNY – STAN I PERSPEKTYWY

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S ł o w a  k l u c z o w e: podatek rolny, opodatkowanie gospodarstw rolniczych, dochód gminy.

## A b s t r a k t

W ostatnich latach problematyka opodatkowania indywidualnych gospodarstw rolnych była często pomijana. Obecnie, w świetle toczącej się w Polsce dyskusji nad planowanymi zmianami w tym zakresie, sprawy opodatkowania rolnictwa wymagają nowego spojrzenia.

Głównym celem pracy jest analiza faktycznych obciążeń podatkowych gospodarstw rolniczych w Polsce oraz zbadanie wpływu podatku rolnego na kształtowanie się dochodów budżetowych gmin. Nie mniej ważną intencją jest zasięgnięcie opinii rolników na temat poszczególnych konstrukcji podatkowych obciążających rolnictwo oraz całego systemu opodatkowania. Istotną kwestią jest również zaproponowanie zmian w polityce podatkowej stosowanej wobec polskiego rolnictwa. Sugerowane przez rolników alternatywy w zakresie opodatkowania gospodarstw indywidualnych mogą zostać wykorzystane jako próba dostosowania systemu podatkowego w naszym kraju do rozwiązań funkcjonujących w krajach członkowskich UE.

W pracy przedstawiono analizę systemu opodatkowania indywidualnych gospodarstw rolniczych w Polsce, ze szczególnym uwzględnieniem podatku rolnego. Do oceny faktycznych obciążeń gospodarstw z tego tytułu oraz analizy wielkości wpływów podatkowych do budżetów wybranych gmin w 2010 r. zastosowano metodę wtórnej analizy danych statystycznych pochodzących z urzędów gmin zlokalizowanych na terenie woj. mazowieckiego. Badania, którymi objęto 200 indywidualnych gospodarstw rolnych, miały na celu poznanie opinii rolników na temat systemu opodatkowania w Polsce oraz możliwości wprowadzenia zmian proponowanych przez państwo.

# Introduction

Economic transformations in Poland, initiated in 1989, introduced the foundations of market economy in our country. Free market mechanisms have become the key regulators of social and economic processes taking place in the country that up to that moment was subject to stringent control by central authorities. The financial policy was to be the main component of the economic policy. This determined the new position for it within the Polish economic system, because projected reforms did not allow direct control of prices by the state. Given the circumstances that developed the role of other than price instruments of state influence on the society and the economy, particularly that of direct and indirect taxes increased significantly (POD-STAWKA 1995, KISIEL et al. 2012). In designing the new tax system in Poland, particular attention was focused on the tax law principles and the specificity of the national economy. However, the European Union requirements concerning harmonization of taxes in the Union countries were of superior importance.

Currently, local taxes and fees, including the agricultural tax, represent one of the sources of own revenues for the fundamental units of public administration in Poland, i.e. the communes (DĘBSKA-RUP 2002). Although agriculture employs ca. 15% of the total population (for comparison, in the other European Union countries farmers represent just 4.5% of the total population), the revenues to the budgets of communes from the agricultural tax are very low. This is the consequence of the fact that the subject tax does not fulfil the fiscal function of the budget.

# Characteristics of the agricultural tax

Agricultural tax, which is one of the major charges on the owners of agricultural farms in Poland, is the subject of this paper. This is the non-refundable charge, free off additional fees and compulsory, imposed unilaterally by the State on the family agricultural farms. It is collected for the purpose of fulfilling the role of authorities represented by financing the needs of the community. The agricultural tax was introduced by the Act of 15 November 1984 on the agricultural tax and it substituted for the earlier progressive land tax. As if that moment it has been in effect in the almost unchanged form. It is levied on all the land lots (also those up to 1 ha) that are classified in the register of land and buildings as̀ land under agricultural use of lands covered with trees and bushes for agricultural use, with the exception of land taken for conducting other economic activities than agricultural activities (*Act on the agricultural tax*... 1984).

The agricultural tax in its shape designed by the Polish legislature represents a classic variation of property tax. In case of it, possession or acquisition of property rights itself is subject to taxation in this case. The farmer is required to make payments even in case he conducts no activity on the land that is part of his farm or, which is even more, when economic activity on such areas generates financial losses.

The amount of the agricultural tax in Poland is based on the financial value of the taxpayer's property. Land, which is characterised by a certain level of stability as concerns both the quantity and quality represents the basic and at the same time the only type of property on the base of which the farm assets value is computed. The usable value of the land, in turn, is expressed using coefficients designed on the base of land productivity and differential location rent. They have been included in the Act of 15 November 1984 on the agricultural tax. Using those coefficients, the conversion of physical hectares of agricultural farms into the co-called hectares for tax computation purposes is conducted (PODSTAWKA 1995).

The choice of the taxation base results in consequences to the country on both the economic level and the technical level related to the procedure as well as collection of it. While computation of the taxation base represents a relatively simple task and raises no major objections the situation looks slightly different in case of agriculture taxation. The fact of considering only one income generating component of the farm assets, i.e. the usable value of land, causes that taxation of family agricultural farms is considered representing low level of precision and violating the principle of tax justice (GRUZIEL 2008).

# Agricultural tax as the income of communes
# in Mazowieckie voivodship

From the perspective of the entities eligible to collect the agricultural tax its full amount represents own revenue of the communes. At the same time, it represents one of the most important sources for supplying the territorial government finance from taxes characterised by simplicity in design as well as strong links with the tasks of local authorities and territorial foundations of the territorial government units. For the purpose of determining the actual amount of revenues to the budgets of communes, analysis of reports from performance of the budget made available by three communes situated in Mazowieckie voivodship (Przasnysz – urban commune, Chorzele – urban-rural commune, Krzynowłoga Mała – rural commune) was conducted.

In 2010, in the commune of Przasnysz, almost 20% reduction in agricultural tax revenues was recorded caused by the official decrease in the price per 1 dt of rye that represents the base for accrual of the tax by 26% (as compared to 2009, when the revenues amounted to PLN 207,100.00 of which PLN 4,300.00 were funds from legal entities and other units that were not legal entities while PLN 202,800.00 originated from individuals that were taxpayers of the agricultural tax). The budget received the amount of PLN 160,800.00 (0.37% of total revenues during the budget year), which consisted of revenues from legal entities and other organisational units – PLN 3,500.00 and from individuals – PLN 157,300.00. The arrears amounted to PLN 5,729.42 (*Report from performance of the budget in the commune of Przasnysz... 2010–2011*).

In 2010, the planned revenue from agricultural tax in the commune of Chorzele amounted to PLN 355,606. Such a low amount considered already at the stage of planning was undoubtedly caused by numerous exemptions from the tax caused by the natural disaster that the droughts taking place during the season of 2009/2010 were considered. The actual revenues represented less than 1.5% (1.445%) of the total budget revenues amounting to PLN 384,725.76 i.e. 108.2% of the plan. The commune authorities forgave tax arrears amounting to PLN 3,224.73. In addition to the visible decrease in tax revenues, the decreasing trend could also be observed in payments of amounts due from individuals that were collected up to only 92.7% (PLN 381,840.76), while receivables from legal entities were collected 100% (PLN 2,885.00). At the end of the reporting period the arrears in payments amounted to PLN 31,851.67. Collection of those amounts was conducted on current bases – in 2010 the total of 123 collection writs were issued and passed to the Tax Office to the total amount of PLN 12,128.78 (*Report from performance of the budget in the commune of Chorzele... 2011*).

In 2010, the Council of the Commune of Krzynowłoga Mała projected the agricultural tax revenues at the level of PLN 371,600.00. The actual revenues

amounted to PLN 243,013.69 (2.362% of the total commune revenues), i.e. 65.4% of the plan. Despite the rye price increase to 37.64 PLN/dt (34.10 PLN/dt in 2009) and no decision by the Council of the Commune concerning the decrease of the maximum agricultural tax rate, only slightly more than a half of the revenues planned for 2010 from that tax was received by the budget. As it has already been mentioned, such a big decrease of revenues from that tax was caused by the disaster of poor yields in the area of almost the entire voivodship. The authorities of the commune decided to forgive tax liabilities to the amount of PLN 5,994.06. Also, 37 tax deductions for purchase of land were granted amounting to PLN 6,022.25 and 145 investment deductions to the total amount of PLN 101,568.31. As at the end of the reporting period the arrears in collection of agricultural tax liabilities amounted to PLN 57,953.96 (*Report from performance of the budget in the commune of Krzynowłoga M. ... 2011*).

## Test sample characteristics

In the study the survey questionnaires was used consisting of questions concerning, among others, the farm size, number of hectares for tax computation purposes, type of agricultural activity or the level of income generated by the farm. Next, functioning of the Polish system of charges to agricultural farms and proposals for liquidation of agricultural tax to be replaced by the income tax were subjected to evaluation by farmers. The respondents could also present proposals for changes aiming at improvement of the agriculture taxation system effectiveness.

The surveys covered 200 family agricultural farm owners from the region of Mazowsze and Podlasie (FADN), within three communes of Mazowieckie voivodship (urban, urban-rural and rural). The farms situated in that voivodship are characterised first of all by developed agricultural structure and consequently the results of the survey concerning the size of agricultural farms surveyed come as no surprise. The farms not exceeding 15 physical hectares dominated: 36 farms were up to 5 ha and 72 farms from 5 to 15 ha in area. The survey covered also 64 farmers possessing farms within the range of 16-30 ha, 12 farmers that were owners of 31–50 ha of agricultural land as well as 16 large farmers with farms exceeding 50 ha (Fig. 1).

Soil quality that translates directly into the number of hectares for tax computation purposes that represent the base for taxation of agricultural land represents an important factor influencing the amount of agricultural tax paid. In the area covered by the survey the soils represent lower quality and consequently, among 200 respondents as many as 104 declared that their property was within the range of 3–5 hectares for tax computation purposes, 48 possess farms of 6–10 hectares for tax computation purposes, 28 farmers
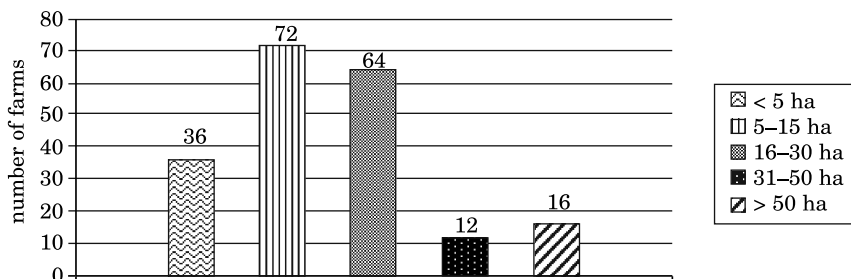
Fig. 1. Size of farms surveyed in physical ha
Source: own work based on the studies.
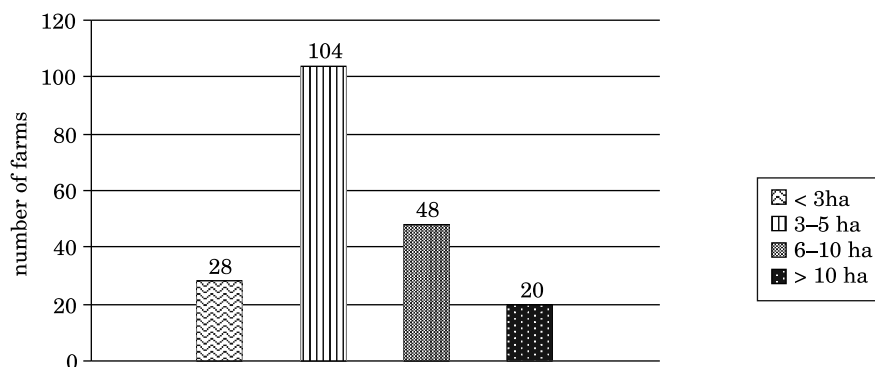


Fig. 2. Size of the farms surveyed expressed in the hectares for tax computation purposes
Source: own work based on the studies.

had less than 3 hectares for tax computation purposes, and 20 manage farms with in excess of 10 hectares for tax computation purposes (Fig. 2).

Agricultural tax levied by territorial government institutions is paid by 69.5% of the respondents. The other respondents (30.5%) indicate exemptions and forgiveness of the tax granted by authorities of the commune as the main reasons for non-performance of the tax duty. The levels of actual tax burdens in the surveyed farms are presented in figure 3.
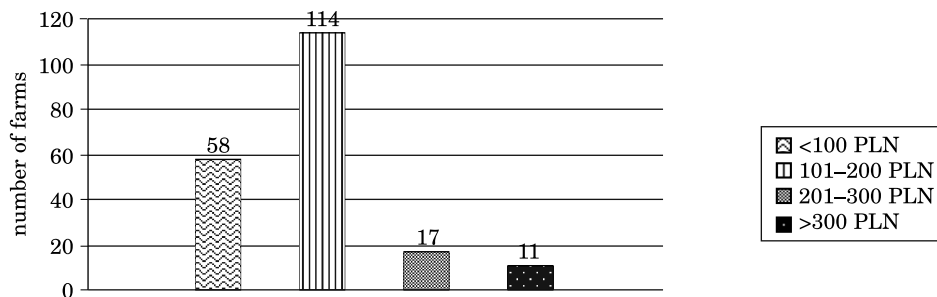


Fig. 3. Level of actual burdens of the agricultural tax
Source: own work based on the studies.

## Evaluation of the Polish system of taxation on agricultural farms

The reforms at which the State is aiming that are of major importance for further integration of Poland with the European Union may not be implemented without first obtaining the knowledge on opinions of the people to which the decision taken will apply directly. The alternatives suggested by farmers as concerns taxation of family farms may be used as indications for adjustment of the tax system in our country to the solutions in force in the Union Member States. Harmonization of the Union systems of taxation represents one of the most important goals of the further integration.

In addition to acquiring important information concerning the size structure of farms, type of production or income group, the survey also aimed at testing the attitudes of Polish farmers concerning the taxation system in force in our country. According to the 1–10 scale (where 1 meant that the system works very badly and that immediate steps should be taken to improve the situation up to 10 indicating that the system is effective and changes to it are not required), the respondents were to evaluate the legal regulations and procedures currently functioning in the sector of agriculture and its entire environment. The results are presented in figure 4.
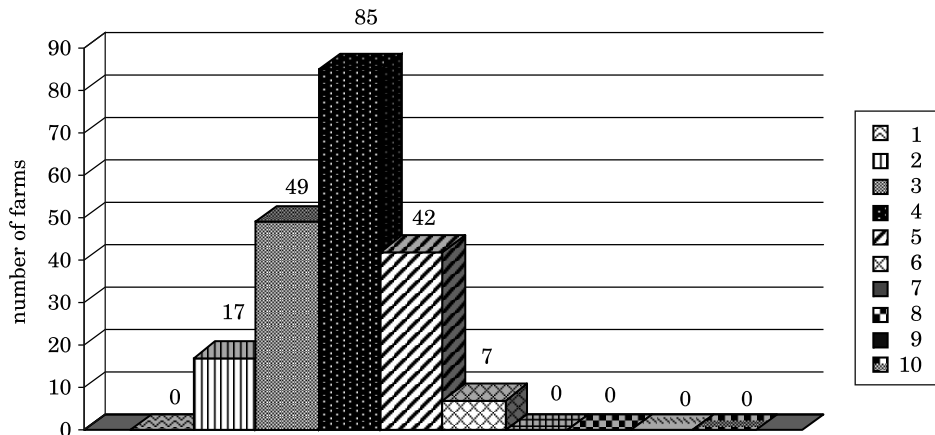


Fig. 4. Evaluation of the Polish system of taxation concerning agricultural farms
Source: own work based on the studies.

Among the responses, scores ranging from 2 to 6 dominated meaning that the farmers were quite sceptical about the system and indicated numerous defects of it. None of the respondents indicated a score higher than 6 meaning

that numerous weaknesses existed on the side of the authorities and officers responsible for the institutional environment of the taxation system. That attitude was justified, among others, by the excessively developed bureaucracy, injustice as well as excessive differences in interpretation of regulations by tax institutions at different levels. The respondents described the system as complicated while they considered the officers to be incompetent, possessing no knowledge of regulations as well as representing unfriendly attitude towards the clients.
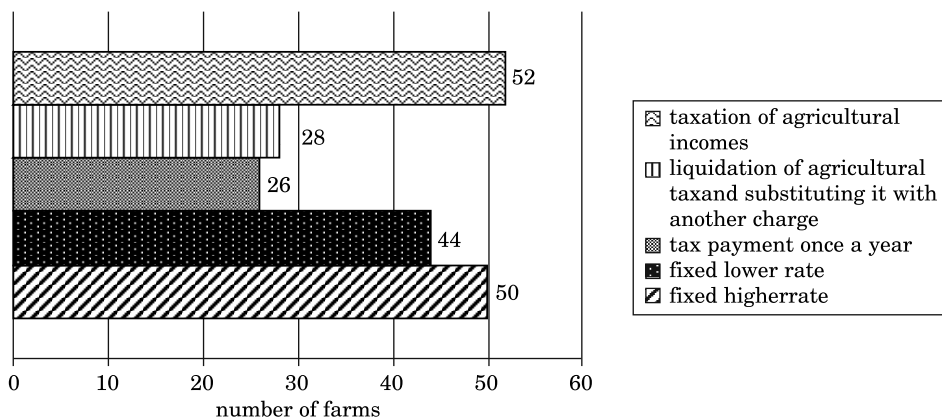


Fig. 5. Proposals of changes in the agricultural farms' taxation system
Source: own work based on the studies.

Farmers asked about their proposals that could improve functioning of the system for taxation of family agricultural farms proposed numerous solutions that could have positive impact on its effectiveness (Fig. 5). It was surprising that over 1/4 (52) respondents indicated implementation of income tax as an option that could substitute with success the fossilized structure of the agricultural tax. The other proposals included implementation of a fixed lower (44) or fixed higher (50) agricultural tax rate, liquidation of agricultural tax and substituting it with another charge (28) and the duty of making the agricultural tax payment just once a year (26).

The announced reform that is to introduce in Poland the income tax encompassing farmers represents a very important issue that may not be neglected here. That issue was also included in the survey conducted by the author. According to the respondents, the taxation base for the family agricultural farms should be based on the: revenues (8 respondents), assets (20 respondents), and incomes (52 respondents). More than a half of the respondents (120) presented negative attitudes to changes, which is confirmed by their position concerning the formulated question as they opted for the

currently effective taxation base in the form of the number of ha owned by them (Fig. 6).
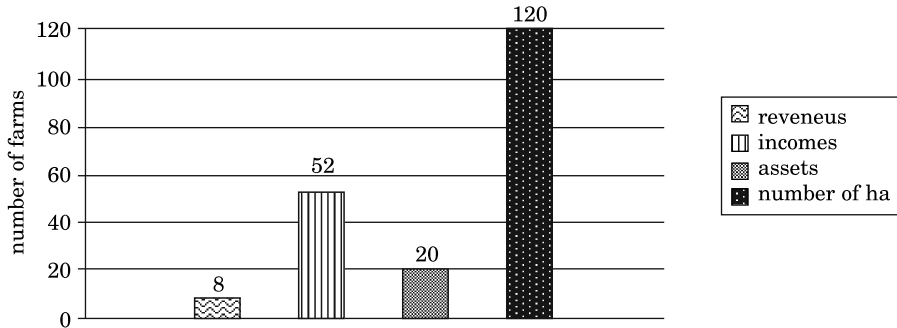


Fig. 6. Proposed taxation base
Source: own work based on the studies.
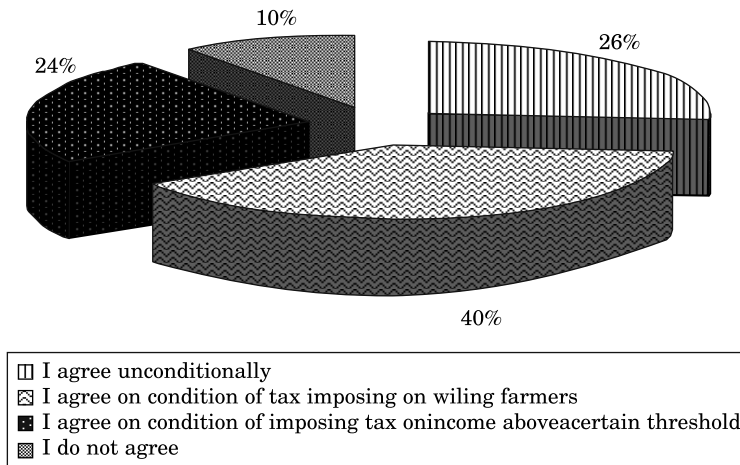


Fig. 7. Position of farmers concerning substitution of agricultural tax with income tax
Source: own work based on the studies.

Farmers also expressed their attitudes concerning the plan of agricultural income taxation announced by the government. The vast majority (74%) of the respondents expressed lack of support to that solution giving as the main reason the excessively low incomes in the sector of agriculture that could be burdened with payment of taxes. The remaining respondents (26%) supported implementation of the income tax and justified their opinion by numerous privileges offered by such a solution such as, for example, the duty of making payments only in case of generating income as well as numerous relief measures and deductions.

For the purpose of obtaining more detailed knowledge on the moods among the farmers, the respondents were also asked about their position concerning the substitution of agricultural tax with income tax (Fig. 7). That proposal was accepted unconditionally by the people that in the earlier part of the survey presented their clear position on that issue (26%) while 40% of the respondents would express consent if the tax duty was imposed on the willing farmers only and 24% in case if the taxation would apply to agricultural income only above a determined threshold.

## Conclusions

The studies conducted allowed obtaining knowledge on the realities of conducting farming activities in Poland and evaluation of the actual tax revenues to the budgets of communes as well as their shares in the total amount of revenues. Based on the analysis of the results obtained the following conclusions have been formulated:

1. Revenues to the budgets of communes located in Mazowieckie region originating from the agricultural tax are at a low level and they represent from 0.4 to 4% of the total territorial government unit revenues. The spread of results is a consequence of the type of the commune where the study was conducted. The highest share is recorded in rural and urban-rural communes while the lowest in urban communes. At the same time a decrease in revenues from agricultural tax not related to the natural conditions in the amount of own revenues of the surveyed communes that may result from increasing their financial independence by, e.g. gradual increase of the share in the income taxes that are revenues of the state budget can be observed. For that reason substitution of the agricultural tax with income tax, assuming that the excess of that burden above the current agricultural tax would remain in the communes, could lead within a longer time perspective to an increase of communes' budget revenues in Mazowieckie region.

2. The structure of the farms surveyed matches the agricultural structure of the entire country. Polish rural areas are characterised by overpopulation and agricultural scattering, which is reflected in the results of the conducted studies. The significant dispersion of farms is characteristic as farms with the area of under 15 ha of physical area dominate.

3. In Poland, the agricultural tax of property tax nature is in force the amount of which depends on the area of agricultural land and not the value of the land owned. Despite unchanged from the year of construction, still enjoys a positive reputation among taxpayers. That way of levying is contrary to the accepted principles, particularly the principle of tax justice. Farmers, however,

give positive opinions concerning it because they realise their privileged position as compared to the other taxpayers and they know that substitution the agricultural tax with the income tax is necessary. According to the respondents, the advantage of implementing that charge may be the fact that economically strong farms would generate additional surplus by paying the agricultural tax to communes as that tax is low compared to the income generated by them.

4. The Polish system of taxation of agricultural farms was considered by farmers excessively complicated and unjust. In many cases using help of advisors is necessary. The farmers objectively described themselves as one of the most privileged groups of taxpayers. Excessively rapidly changing regulations and differences in their interpretation by tax authorities of different levels represent other weaknesses of the current system. Excessively developed bureaucracy, incompetence of officers and their unfriendly attitude towards the taxpayers also had significant influence on the critical opinions expressed by the respondents.

5. The respondents expressed sceptical opinions concerning implementation of income tax in agriculture. If, however, it is introduced for the willing land owners only or above a certain threshold of revenues generated by them, they would agree to pay it. As it is known, however, public consultations on that issue will not be conducted any more as implementation of the reform has already been decided. Implementation of the postulated changes represents a long-term and complicated process and that is why that time should be used for implementing numerous information activities among farmers thanks to which they would realise the benefits that could be obtained as a consequence.

Translated by JERZY GOZDEK

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# QUALITY OF LOCATION IN REGIONS AND ECONOMIC EFFICIENCY OF PRIVATE COMPANIES IN POLAND*

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A b s t r a c t

Evaluation of the correlation between the economic efficiency level of private companies in Poland and the quality of location in the regions was the aim of the study. Based on the conducted analyses it was established that the level of sales markets absorptiveness shows the strongest correlation with the level of economic efficiency of the companies surveyed. The majority of regions characterised by absorptive sales markets also recorded good results in economic efficiency of companies located there while voivodships with low internal demand were characterised by definitely lower efficiency. Increasingly strong correlation was also recorded between the economic efficiency level of the companies surveyed and the level of knowledge in the regions. This may be the signal that currently the location factors of "soft" nature present increasing influence on the efficiency of companies and it is not impossible that their importance will continue increasing.

## JAKOŚĆ LOKALIZACJI W REGIONACH A EFEKTYWNOŚĆ EKONOMICZNA PRZEDSIĘBIORSTW PRYWATNYCH W POLSCE

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A b s t r a k t

Celem badań była ocena związku między poziomem efektywności ekonomicznej przedsiębiorstw prywatnych w Polsce a jakością lokalizacji w regionach. Na podstawie przeprowadzonych analiz stwierdzono, że najsilniejszy związek z poziomem efektywności ekonomicznej badanych przedsiębiorstw wykazuje poziom chłonności rynków zbytu. W większości regionów charakteryzujących się chłonnym rynkiem zbytu notowano również dobre wyniki w zakresie efektywności ekonomicznej zlokalizowanych tam przedsiębiorstw, z kolei województwa o niskim popycie wewnętrznym cechowała zdecydowanie niższa efektywność. Coraz silniejszy dodatni związek korelacyjny odnotowano także między poziomem efektywności ekonomicznej badanych przedsiębiorstw a poziomem wiedzy w regionach. Może to sygnalizować, że coraz większy wpływ na efektywność przedsiębiorstw wywierają współcześnie czynniki lokalizacji o charakterze "miękkim" i nie wykluczone, że ich znaczenie będzie nadal rosło.

## Introduction

Choice of location is a decision of economic nature that influences the later operational conditions, costs and overall efficiency of companies (BUDNER 2007, p. 45). The quality of location in the region has direct influence on the development of investment outlays during the project construction stage as well as later it influences the profitability of operations carried out in a given location (PLAWGO, CHILICKA 2008, pp. 68–69). Every region, offering entrepreneurs less or more favourable location conditions may encourage or discourage undertaking the activity in the given place and influence the later economic standing of entities located there (GODLEWSKA 2001, p. 14). The location quality of the given region is determined by the entire set of factors, both "hard", i.e. factors the size and structure of which at a given time is given, as well as "soft", frequently of immeasurable nature but determining the quality of living in the region. Consequently, the question emerges: *Do "hard" location factors, e.g. transport access to the region or maybe the "soft" factors such as, e.g. the level of knowledge in the region show stronger correlation with the economic efficiency level of companies nowadays?* The answer to the question formulated in that way may be the source of valuable hints for both the companies taking decisions concerning location of operations in the given region as well as the authorities of regions that are interested in creating favourable conditions for operating business activity in a given area.

Given the above, the aim of the studies undertaken was to evaluate the correlation between the economic efficiency level of private companies in Poland and the quality of location in the region.

The surveys were conducted on the complete sample of private sector companies in Poland that maintain accounting ledgers employing in excess of 9 persons. They were conducted according to the system of voivodships, i.e. NUTS II regional level. The timeframe of the studies encompassed the years 1999–2008.

## Methodological assumptions for the studies

The synthetic efficiency measure that was built on the base of two selected diagnostic variables: labour productivity indicator and gross trade profitability indicator was applied for evaluation of the regional diversification in economic efficiency of private companies in Poland. Location quality in the regions evaluation was conducted for five location factors which were considered important from the perspective of their potential influence on efficiency of companies in the given region based on the review of the subject literature (see, e.g.: STANIENDA 2006, pp. 24–29; *Atrakcyjność inwestycyjna....* 2010, pp. 15–18; GODLEWSKA-MAJKOWSKA 2011, pp. 16–19). The following were included among those factors:

1. Labour resources and costs;
2. Transport access;
3. Sales market absorptiveness;
4. Economic infrastructure;
5. Level of knowledge in the region.

The four initial factors can be classified as the traditional location factors which is understood as the specific benefit obtained by the entrepreneur from location of the business undertaking in a given location. This benefit is expressed by reduction of investment outlays and savings on costs of operational activities, which facilitates maximisation of profits and improvement of operational efficiency (BUDNER 2004, p. 57). From the perspective of measurability those factors could be icluded as "hard" location factors, i.e. easily measurable and correlated directly to the operation of companies (PLAWGO, CHILICKA 2008, pp. 68–69). The fifth factor in turn, the level of knowledge in the region is a "soft" location factor, difficult to measure and not correlated with operations of the companies directly (BUDNER 2007, p. 48). It represents a conglomerate of characteristics creating the so-called "investment climate" of the region, which, in the environment of the market economy and conditions of disappearance of differences in access to production factors is becoming increasingly important (GODLEWSKA 2001, p. 17).

For the purpose of evaluating the quality of location in the regions each of the location factors was described using the synthetic measure. The choice of diagnostic variables was made with consideration for subject-formal and statistical criteria. The final set of variables contained 44 variables. The list of variables together with the allocated nature and weight given by experts participating in the survey conducted using the Delphi method is presented in the annex.

The variables were synthesised using the methods applying no standards. The procedure for determination of the synthetic measures was preceded by

the appropriate process of transformation of the variables. Unification of the nature of the variables, i.e. stimulation of them was the first step of the transformation. It was conducted according to the following formula (KOLENDA 2006, p. 22):

$$x_{ij}^* = x_{\max j} - x_{ij} \qquad\qquad i = 1,2,..., n \quad j = 1,2,..., m$$

where:

$x_{ij}^*$ – estimated value of the diagnostic variable $j$ for the object $i$,

$x_{\max j}$ – maximum value of the diagnostic variable $j$ in the set of objects,

$x_{ij}$ – value of the diagnostic variable $j$ possessing the nature of destimulant for object $i$.

Standardisation of variables, i.e. unification of the range of their variability was the second step in the transformation. It was conducted using the zero unitisation procedure according to which the initial values of diagnostic variables possessing the character of stimulants were transformed according to the following formula (PANEK 2009, p. 39):

$$z_{ij} = \frac{x_{ij} - x_{\min j}}{x_{\max j} - x_{\min j}} \qquad\qquad i = 1,2,..., n; \quad j = 1,2,..., m$$

where:

$z_{ij}$ – value of standardised diagnostic variable $j$ for object $i$,

$x_{\min j}$   $x_{\max j}$ – minimum and maximum value of the diagnostic variable $j$ in the set of objects,

$x_{ij}$ – value of the diagnostic variable $j$ for object $i$.

As a consequence of the appropriate computations the standardised variables with values belonging to the range of [0; 1] were obtained. After standardization, the value of 1 was allocated to the voivodship with the maximum value of the variable $X$ in the set of voivodships while the value of 0 was obtained by the voivodship in which the $X$ variable assumed the minimal value. The standardised diagnostic variables were subjected to the procedure of synthetizing which according to the assumption of the method without standards was conducted according to the following formula (PANEK 2009, p. 64):

$$s_i = \frac{1}{m} \sum_{j=1}^{m} o z_{ij} \qquad\qquad i = 1,2,..., n; \quad j = 1,2,..., m$$

where:

$s_i$ – value of the synthetic variable for object $i$,

$z_{ij}$ – value of the standardised diagnostic variable $j$ for object $i$,

$m$ – number of diagnostic variables.

The synthetic variables obtained assumed the values within the range of [0, 1]. This means that the regions for which the value of the synthetic measure is close to unity are characterised by the highest level of the analysed factor. On the other hand, in the regions with the worst situation in that respect the synthetic measure assumes values close to zero. It should be pointed out that to assure the possibility of comparing the voivodships during the given year as well as between years the data on the base of which the synthetic measures were computed were treated as panel data. From the technical perspective that meant that in the formula according to which the unitisation was conducted the minimum and the maximum values of each characteristic were determined for the entire panel of data encompassing all the years and all the voivodships.

Evaluation of the correlation between the economic efficiency level of private companies in Poland and location in the region quality represented the last step of the analysis. Spearman's rank correlation coefficient was used for determination of the direction and strength of that correlation. It was applied because it serves testing correlations between two characteristics in the situation when those characteristics are of quantitative nature and the numerousness of populations is small. Additionally, it is useful in the analysis of data in the set of which the outliers exist. Such outliers could be noticed in the tested population of voivodships. The coefficient value was computed according to the formula (ZELIAŚ et al. 2002, p. 107)[1]:

$$r_z = 1 - \frac{6 \, \Sigma_{i=1}^{n} \, d_i^2}{n(n^2 - 1)}$$

where:

$d_i$ – difference of ranks for the characteristic $X$ and the characteristic $Y$ computed from the formula $d_i = x_i - y_i$,

$x_i, y_i$ – ranks for characteristics $X$ and $Y$,

$n$ – numerousness of the sample.

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[1] The following adjective scale concerning the strength of correlation between the variables was assumed:
- $|r_s| < 0.3$ – weak correlation,
- $0.3 \leq |r_s| < 0.6$ – moderate (average) correlation,
- $|r_s| \geq 0.6$ – strong correlation.

In addition to the discussed statistical methods, the method of literature analysis, sources analysis, Delphi method and induction method were also used during the studies.

## Modern location factors

The role of the individual economic activity location factors and the attitude towards them changed with the socioeconomic development. The importance of traditional location factors such as cheap labour, access to raw materials or low transport costs decreased. The "location" lost on importance because the "place" understood as a set of conditions for development not linked directly with the costs of transport and labour but rather the local quality of living, education level and efficiency of the local elites emerged (SZOŁEK 2007, p. 22). PRZYGODZKI (2009, p. 74) describes this change in the following way – the economic activity location factors evolved from the so-called "hard" (quantitative) ones towards the "soft" (qualitative) ones dependent in most cases on the human capital, social capital, quality of services, etc. The quality of location still is the foundation of competitive advantage of companies. That advantage, however, currently depends not on the availability of just the production factors but on the level of efficiency of use of the available resources as well as productivity at a higher level than that of the competitors (PORTER 1998, p. 77). Which is important, also the method of defining the resources of production factors has changed. Currently, those resources encompass (*Rozwój regionalny*.... 2009, p. 22):

– human and social capital – determined by the population age structure, size and quality of labour resources, matching the qualifications to the labour market needs, networking between regional entities, cultural traditions, standards of social behaviours and attitudes favouring collaboration;

– knowledge and innovation – including the knowledge-based economy, information society, competitiveness and innovation of companies;

– fixed and financial capital – understood as the level and structure of investment outlays, availability of the sources of financing, including direct foreign investments;

– material (physical) resources of the region – treated as the factor necessary for regional development but insufficient, including appropriate development and spatial organisation that assure transport access to the region and connections to the domestic and international transport systems.

The interesting approach to the contemporary location factors is also proposed by M.E. PORTER (2001, pp. 207, 400). According to him it is a paradox that in the era of globalisation the importance of location increases

and manifests in geographic concentration of leading organisations in the individual countries. He identifies four major characteristics referred to as the Porter's "diamond" that may favour or hinder operation of business and building by it the competitive advantage in specific locations. Those factors are the production factors, character of demand, related and supporting industries and finally the strategies of businesses, structure and competition.

Concluding, the economic system evolution is accompanied by changes in understanding and defining the location factors. New factors emerge that are hard to measure as they are of qualitative nature. Also the relative importance of those factors changes because the requirements of entrepreneurs concerning location attractiveness of a given place change.

## Analysis of correlation between the economic efficiency level of private companies in Poland and the quality of location in regions

The strength and direction of correlation between the economic efficiency level of companies surveyed and quality of location in regions were evaluated using the Spearman's rank correlation coefficient. The value of that coefficient together with evaluation of statistical significance of the tested correlation is presented in table 1.

Table 1

Correlation coefficient value between the economic efficiency of companies and the level of selected location factors during the years 1999–2008

| Economic efficiency of companies | Correlation coefficient values for individual economic activity location factors | | | | |
|---|---|---|---|---|---|
| | labour resources and costs | transport access | sales market absorptiveness | economic infrastructure | knowledge level |
| 1999 | 0.24 | 0.16 | 0.60* | 0.29 | 0.39 |
| 2000 | 0.34 | 0.23 | 0.66** | 0.30 | 0.49 |
| 2001 | 0.08 | 0.00 | 0.43 | 0.17 | 0.20 |
| 2002 | -0.11 | -0.06 | 0.51* | 0.09 | 0.15 |
| 2003 | -0.06 | -0.07 | 0.41 | 0.17 | 0.36 |
| 2004 | 0.29 | 0.46 | 0.50 | 0.38 | 0.31 |
| 2005 | 0.16 | 0.47 | 0.58* | 0.50 | 0.45 |
| 2006 | 0.28 | 0.51* | 0.66** | 0.53* | 0.51* |
| 2007 | 0.20 | 0.46 | 0.65** | 0.55* | 0.46 |
| 2008 | 0.08 | 0.32 | 0.53* | 0.43 | 0.51* |

\* statistically significant correlation (test probability $p < 0.05$)
\*\* statistically highly significant correlation (test probability $p < 0.01$)
Source: Wierzbicka (2012).

During almost the entire period surveyed we can talk about statistically significant, moderate or strong correlation of the sales market absorptiveness level and the economic efficiency level of private companies according to voivodship. This means that the positive changes that have taken place during that period as concerns the economic efficiency of companies surveyed were correlated the highest with the positive changes taking place in the regional sales markets. Higher absorptiveness of those markets, i.e. higher demand for the products offered by the enterprise allowed the companies generating higher revenues from sales and higher profits. Hence, regions characterised by absorptive sales markets also recorded good results in efficiency of companies located there while regions with low internal demand were characterised by definitely lower efficiency. This finds confirmation in the scatter figure made for 2008 and presented as figure 1.
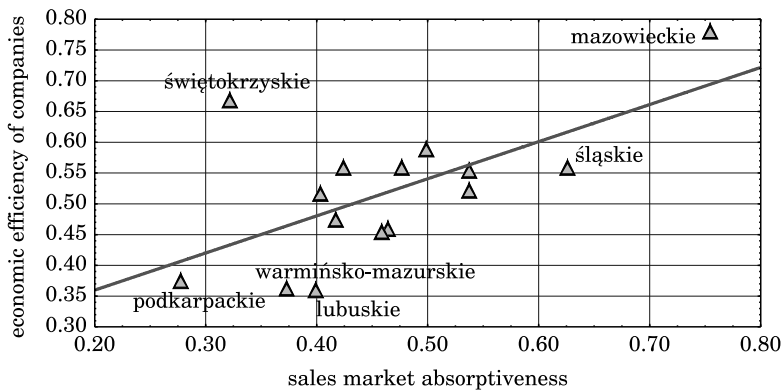


Fig. 1. Economic efficiency of private companies and the absorptiveness of the local sales markets in 2008 – the scatter figure
Source: WIERZBICKA (2012).

Analysing the presented figure, it can be concluded that the results obtained by voivodships as concerns the economic efficiency level of the companies surveyed and the absorptiveness level of their sales market were characterised by relatively strong linear correlation in 2008. The leader in market absorptiveness, Mazowieckie voivodship, was also the leader in the companies' economic efficiency level. Voivodships representing low efficiency levels, for example Podkarpackie and Warmińsko-Mazurskie, belonged in turn to the group of voivodships with low internal demand. Świętokrzyskie voivodship represented an exception as despite the relatively low absorptiveness of the local sales market, it was characterised by relatively high level of companies' economic efficiency.

Which is interesting, the private companies' economic efficiency level showed weak and also statistically insignificant correlation with the level of labour resources and costs in the region. Already during the first year covered by the analysis it could be observed that voivodships characterised by similar labour market situation recorded very clearly diversified results in economic efficiency level of private companies located within their area. This situation continued throughout the entire period covered. This can be confirmed by the scatter figure prepared for 2008 presented as figure 2. It allows noticing that there is no clear linear correlation between the level of labour resources and costs and the level of economic efficiency of companies located there. For example, Podlaskie and Mazowieckie voivodships were characterised by the identical level of labour resources and costs in 2008 while their situations concerning economic efficiency of the companies surveyed were definitely different. Mazowieckie voivodship was the leader in economic efficiency of companies surveyed while Podlaskie voivodship was characterised by medium level efficiency. The medium level of efficiency was also characteristic for private companies located in Śląskie voivodship although the level of labour resources and costs in that voivodship was more than twice higher than in Podlaskie voivodship.
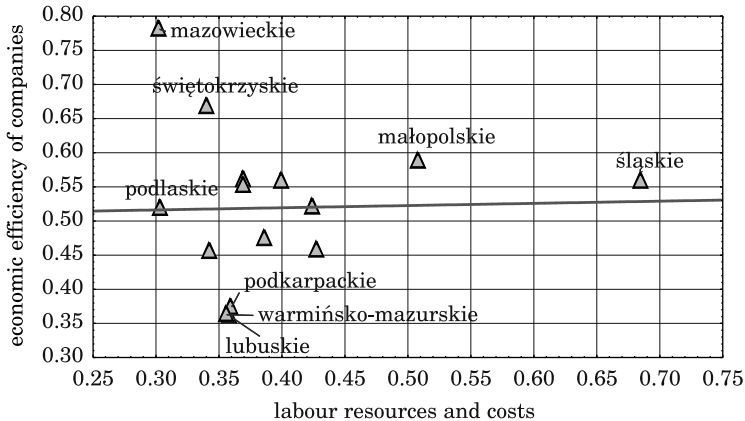


Fig. 2. Economic efficiency of private companies and the labour resources and costs in the regions 2008 – the scatter figure

Source: WIERZBICKA (2012).

The correlation observed does not mean, however, that the situation in the labour market is entirely uncorrelated with the companies' level of economic efficiency. Availability of labour resources in the region and costs of obtaining them are obviously important from the perspective of companies, although they do not determine the efficiency of their operation. It could be

said that the appropriate level of labour resources and costs in the region was the condition necessary for development of companies, but insufficient one for the current times. This probably results from the fact that the scope of labour perception as a factor of location was subject to important changes and not so much the size of labour resources available but the appropriate qualifications of that labour force is important.

The important thing is that as of 2003, the correlation of moderate and additionally increasing force has been observed between the surveyed companies; economic efficiency level and the level of knowledge in the regions, i.e. a "soft" location factor. Graphic presentation of that correlation in 2008 is presented in figure 3.
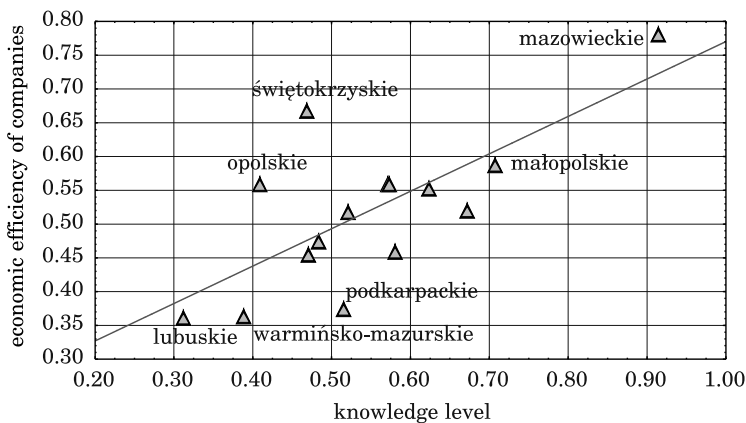


Fig. 3. Economic efficiency of private companies and the level of knowledge in the regions in 2008 – the scatter figure

Source: WIERZBICKA (2012).

In case of the majority of voivodships, a relatively strong correlation of linear character was observed concerning that factor. Voivodships character-ised by a higher level of knowledge recorded also better results in the level of economic efficiency in companies located there and the other way round. Świętokrzyskie voivodship was the exception as despite not the best situation as concerns the level of knowledge in the region it was characterised by the very high level of surveyed companies' economic efficiency. Not quite typical situations and, consequently a deviation from the linear trend outlined were also observed in Opolskie and Podkarpackie voivodships. Opolskie voivodship recorded a relatively good situation concerning the surveyed companies' economic efficiency with the relatively low level of knowledge in the region. The average knowledge level in Podkarpackie voivodship was not high enough for the private companies located within its area to achieve also the

average level of economic efficiency. Despite those unusual cases, the correlation between the level of knowledge in the region and the economic efficiency of private companies located there proves statistically significant meaning that it was not an incidental result but that it is a consequence of more general regularity in the entire population. This may indicate that the importance of the knowledge level as a "soft" location factor is increasing and that it is possible that it will continue increasing.

# Conclusion

The quality of location in the region has undoubted influence on the level of economic efficiency of companies located there. The strength of correlation between the individual location factors and the efficiency of companies may, however differ and may change over time. Some location factors may loose on importance while others may become increasingly important. The conducted studies indicate that the strongest positive correlation with the surveyed companies' economic efficiency level was presented by the sales market absorptiveness level. Hence the opportunities for private companies' economic efficiency level improvement in Poland and decreasing the regional disproportions in that respect should be seen in various types of activities aiming at stimulating the internal demand from households, companies and public institutions situated within the given region. More extensive opportunities of selling the products and services offered would allow companies generating higher revenues from sales and, consequently, will influence improvement of their economic efficiency. The important thing is that increasingly strong correlation with companies' economic efficiency is currently presented by location factors such as the economic infrastructure level and knowledge level in the region treated as "soft" location factors. Consequently, it can be expected that during the coming years the increasing level of economic efficiency of companies will be characteristic for the regions within the area of which the development level of the widely understood business environment infrastructure, level of education, innovation and information and communication technologies is high. Under those circumstances, the actions taken in the individual regions should be focused on those location aspects. Poorly developed business environment institutions' network, low level and quality of education in the region, small number of innovation projects undertaken by companies, absence of the effective network of cooperation between the science and the economy of the region, insufficient level of the network society development are just some problem areas for many voivodships limiting the potential for economic efficiency level improvement in the private companies located there.

Concluding, the stronger correlation with the economic efficiency level of private companies in Poland, show the "hard" location factors, such as: sales market absorptiveness and economic infrastructure. However, the role of "soft" location factors increases and it is possible that their importance will continue increasing.

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**Annex**

List of diagnostic variables describing the individual location factors

| Diagnostic variables | Character of variable* | Weight |
|---|---|---|
| 1 | 2 | 3 |
| 1. Labour resources and costs in the region | | |
| Number of people working in the national economy per 1 km² of the total area | S | 0.25 |
| Registered unemployment rate | S | 0.14 |
| Percentage of long-term unemployed in the total number of the registered unemployed | D | 0.16 |
| Average gross monthly wages in the national economy | D | 0.17 |
| Number of graduates from basic vocational schools per 100 km² of the total area | S | 0.04 |
| Number of graduates from general secondary schools per 100 km² of the total area | S | 0.03 |
| Number of graduates from higher schools per 100 km² of the total area | S | 0.21 |
| 2. Transport access to the region | | |
| Density of normal gauge operated railway lines in km per 100 km² of the total area | S | 0.14 |
| Density of hard surface public roads in km per 100 km² of the total area | S | 0.32 |
| Indicator of immediate refurbishment works demand | D | 0.17 |
| Share of people working in section H in the total population working in the national economy | S | 0.13 |
| Availability of airports | S | 0.06 |
| Availability of maritime ports | S | 0.05 |
| Location in relation to the western border | S | 0.13 |
| 3. Absorptiveness of the regional sales market | | |
| Population density per 1 km² of total area | S | 0.20 |
| Birth rate per 1000 residents | S | 0.14 |
| Average monthly disposable income per capita in household | S | 0.42 |
| Investment outlays of territorial government units per capita | S | 0.08 |
| Investment outlays per capita | S | 0.16 |
| 4. Economic infrastructure of the region | | |
| Density of water supply network in km per 100 km² of the total area | S | 0.14 |
| Density of sewers network in km per 100 km² of the total area | S | 0.11 |
| Population serviced by wastewater treatment plants as % of the total population | S | 0.20 |
| Entities of national economy section J and K per 10,000 residents | S | 0.25 |
| Number of special economic zones | S | 0.12 |
| Number of exhibition facilities per 10,000 entities of national economy registered with the REGON register | S | 0.18 |

| 1 | 2 | 3 |
|---|---|---|
| 5. Level of knowledge in the region | | |
| 5.1. Education | | |
| Net scholarization index of basic vocational schools' students as % of the population aged 16-17 | S | 0.16 |
| Net scholarization index of secondary general school students as % of the population aged 16-18 | S | 0.20 |
| Number of higher schools' students per 1000 residents | S | 0.30 |
| Number of postgraduate students per 1000 residents | S | 0.08 |
| People learning English as compulsory subject at schools for children, youth and post-secondary schools per 1000 residents | S | 0.11 |
| Public outlays on education as 5 of the GDP | S | 0.15 |
| 5.2. Innovation system | | |
| Number of higher schools per 100,000 residents | S | 0.11 |
| Doctoral students per 10,000 residents | S | 0.04 |
| Outlays on innovation activities in industry per capita | S | 0.14 |
| Number of units conducting R&D activities per 10,000 entities of national economy registered with the REGON register | S | 0.12 |
| Scientific research workers employed in R&D activities at the EPC per 1000 professionally active persons | S | 0.10 |
| Outlays on R&D activities per capita | S | 0.11 |
| Share of human resources for science and technology (HRST) in professionally active population | S | 0.20 |
| Percentage of external outlays on R&D provided to the higher schools | S | 0.18 |
| 5.3. Information and telecommunication technologies (ICT) | | |
| Percentage of households equipped with computers | S | 0.44 |
| Number of computers for process control and supervision in industry per 1000 companies in the industry | S | 0.35 |
| Population per 1 library | D | 0.05 |
| Television subscribers per 1000 residents | S | 0.09 |
| Telephone lines per 1000 residents | S | 0.07 |

* S – stimulant, D – destimulant

# COMPARATIVE ANALYSIS OF SELECTED ELEMENTS OF POLISH AND SPANISH ACCOUNTING SYSTEM

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A b s t r a c t

The article presents the history and premises of revolts of accounting and basic rules of double-entry bookkeeping system, which is international, so is the same both in Poland and Spain. The comparative analysis verifies, the existence of many similarities and only a few differences between Polish and Spanish annual accounts. Differences in both countries between a structure of balance sheet and income statement are of a minor character. There are different economic conditions for firms in both countries which can prepare the abbreviated format for annual accounts. The analysis of documents shows that Spanish General Accounting Plan is much more precise (359 pages) then Polish Act of Accounting (137 pages).

## ANALIZA PORÓWNAWCZA WYBRANYCH ELEMENTÓW POLSKIEGO I HISZPAŃSKIEGO SYSTEMU RACHUNKOWOŚCI

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A b s t r a k t

W artykule przedstawiono historię i rozwój rachunkowości oraz podstawowe zasady systemu podwójnego zapisu. Zasady rachunkowości są międzynarodowe, obowiazują więc te same w Polsce i w Hiszpanii. Analiza porównawcza pozwoliła zidentyfikować wiele podobieństw i jedynie kilka

różnic między polskimi i hiszpańskimi rocznymi sprawozdaniami finansowymi. Różnice w struk-turach bilansu i rachunku zysków i strat w obu krajach są nieistotne. W obu krajach istnieją różne warunki dla firm, które mogą sporządzać uproszczony format rocznych sprawozdań finansowych. Z analizy dokumentów wynika, że hiszpański General Accounting Plan jest znacznie bardziej precyzyjny (359 stron) niż polska ustawa o rachunkowości (137 stron).

## Introduction

The standards of life of Polish society is lower than the standards of life of Spanish society (Table 1). In spite of high rate of unemployment in Spain, the rest of parameters, for example: rate of inflation, minimal and average monthly wages in Spain are much better than in Poland.

Table 1

Basic information about Poland and Spain – the comparison (2$^{nd}$ of May 2012)

| Specification | Poland | Spain |
|---|---|---|
| Area | 312,000 sq. km | 504,600 sq. km |
| Population | 39,000 000 | 47,000 000 |
| Currency | 1 zloty = 100 groszy | 1 euro = 100 eurocent |
| Religion | Majority catholic | Majority catholic |
| Administrative distribution | 16 provinces 373 administrative districts | 17 autonomous communities 50 provinces |
| Accession to the European Union | 1 May 2004 | 1 January 1986 |
| Rate of unemployment | 13% | 24% |
| Rate of inflation | 4,2% | 3,5% |
| Minimal monthly wages gross | 357 euro* | 748 euro |
| Average monthly wages gross | 873 euro* | 1,899 euro |
| Political structure | Parliamentary republic President Prime Minister | Parliamentary monarchy King Prime Minister |

* 1 euro = 4.20 zloty
Source: www.stat.gov.pl/gus, www.world-adventure.net/kraj.php?krid

The largest share of the revenues of the central budget in Poland is a VAT (48%), while in Spain it is Individual Income Tax (45%). A significant part of the revenue position of the Spanish budget is a "Special Taxes and Other" (14%). The structure of the income of both countries is significantly different in the position "Corporate Income Tax" (Tab. 2).

According to the number of persons employed the structure of the firms is similar in the two compared countries.

The differences can be seen in the structure formation of companies due to the form of ownership. In Spain functions almost 24% less Individual's firms

Table 2

Structure of income taxes of public budget in Poland and in Spain

| Name of tax | Poland [%] | Spain [%] |
|---|---|---|
| Direct taxes | | |
| Individual Income Tax | 16 | 45 |
| Corporate Income Tax | 10 | 5 |
| Taxes non residents | – | 1 |
| Indirect taxes | | |
| Value Added Tax VAT | 48 | 34 |
| Duty of Excise | 23 | – |
| Special taxes and other | – | 14 |

Source: AEAT, Tax colection Monthly, www.pit.gov.pl, July 2011.

than in Poland. At the same time in Spain over 29% more Limited liability company is registered than in Poland. Much less than in Poland, Spain recorded: Private and trading partnerships and Others, for example: Cooperatives, national enterprises.

Table 3

The Firms in Poland and in Spain according to the amount of employees and kind of ownership (May 2012)

| Specification | Poland [%] | Spain [%] |
|---|---|---|
| Amount of employees: | | |
| 0–9 | 96 | 95.3 |
| 10–49 | 3 | 4 |
| 50–250 | 0.8 | 0.6 |
| Over 250 | 0.2 | 0.1 |
| Kind of ownership: | | |
| Individual's firms | 76.4 | 52.5 |
| Joint stock companies | 0.2 | 3.2 |
| Limited liability companies | 5.3 | 34.5 |
| Private and trading partnerships | 9.5 | 5.6 |
| Others: cooperatives, national enterprises | 8.6 | 4.2 |

Source: Retrato de las Pymes 2012. Ministerio de Industria, Energia y Turismo. Espana, www.stat.gov.pl/gus.

According to Polish Act of Accounting of 29th of September 2002 (art. 2, ust. 1, pkt. 2) if annual income in: individual's firms, private partnerships and social cooperatives is higher than 1 200 000 euro the firms have to start from new year double-entry bookkeeping system. If annual income in the firms is lower than 1 200 000 euro the firms can have single-entry bookkeeping system.

This single-entry system records only income and expenses. In Spain the small and medium enterprises as well as micro may use a specific Chart of Accounts (tab. 4).

Chart of Accounts of small, medium and mirco euterprises in Spain

| Baremos | PGC Small and medium | Micro companies |
|---|---|---|
| Assets | < 2,850,000 euro | < 1,000,000 euro |
| Annual sells or turnover | < 5,700,000 euro | < 2,000,000 euro |
| Employers | < 50 | < 10 |

## Research methodology

Aim of the study – a comparison of accounting systems in Poland and Spain.

The object of the research is the accounting system. The territorial scope of the research is two countries: Poland and Spain.

Research methods used in the article is the comparative method horizontal and vertical, and the method of audit the documents. The method of audit the documents is based on document analysis and secondary source documents and then draw conclusions from this analysis.

The hypothesis put into operation is as follows: Due to the membership of Polish and Spanish continental philosophy to one accounting, the differences in the accounting systems of these countries are negligible.

Sources of data include: legislation, literature and websites.

## History and premises of revolts of accounting

Accountancy is explained from records account book (accountant), and footnotes concerning activity economic, i.e. economic phenomena and owned property. Primary premise of appearance account records was necessity of helping of human memory and his relieving. This necessity increased along with development of economic life, but mainly with: (1) appearance of individual property, (2) development production and freight exchanges, (3) generalization money as basic equivalent enabling determination value commodity.

First scientific elaboration appear in XV century, discussing principle accounting, i.e.

– in 1458 year "About commerce and perfect tradesman" Benedetto Cotrugli (print 1573)

– in 1494 year "Principle arithmetic, geometry, proportion and proportionality" Luca Paccioli. This work of Luca Paccioli is considered for position about fundamental meaning for accountancy.

In polish lands in mercantile accounting XV century begin penetrating directly from Italian cities and indirectly from German cities. The most strongly mercantile accounting develop in Gdansk (the oldest business book date from first half XV century in Gdansk). From XV century date oldest maintained books as the form court inventory, that shows practice of rural accounting in greatest land properties.

The double-entry bookkeeping, we could say it is the result of single-entry annotation of commercial transactions conducted by merchants. There is no exact date the emergence of double entry but we could put ourselves in the early fourteenth century. Genoa is where the city's municipal treasurers using this method of registration. One of the precursors in the double is Luca Pacioli (1447), a Franciscan friar, mathematician, born in Tuscany, Italy. In his writings, is about three books, the Memorial (memoriale), the Diari (giomale) and Major (quaderno). After the publication of the work of Pacciolo, its successors and propelled reported accounting publications throughout Europe. At that time it appears as revolutionary invention of printing, Gutenberg 1492.While Italy is one of the origins, the Netherlands (Jehan Ympym) acquired by a development role. In the city of Girona (Catalonia-Spain) are the epitome d'Antich Rocha, as a first text on double entry in the Iberian Peninsula (1559). In the work published in February/2010, by the City Council of Girona (Catalonia), which have helped various institutions and organizations such as the Catalan Association of Comptabilitat i Directorate (ACCID) among others, has reproduced a facsimile of the book kept by the Girona Municipal file "Compendium and brief instruction Account Books, Debt and Mercaduria: very profitable for merchants and all business people. In Barcelona, Home of Claudius Bornat, 1565 "Antich Rocha highlights her role as a precursor to the release of double-entry method". He was the first to publish a translation in Spanish (RABASEDA, TARRES 2010).

The double-entry bookkeeping is still one of the main pillars of the accounts of our day and not only in Barcelona but also internationally. These days we have been able to attend some sessions taught in our university on this common technique born in the classrooms of the University of Poland. It is noted that without a prior agreement on the coordination and methodology of basic accounting issues between two universities, follow the same guidelines about the double. We would say that the double-entry bookkeeping is still a universal language that, while little has changed, evolved rapidly throughout the world, crossing borders. It is a teaching that goes through from teacher to student by word of mouth, by the social sciences university classrooms. The

double-entry bookkeeping is a well understood way to watch different fields of business. The pillars on which it stands are:

"There is no credit debit and vice versa"

"Economic Structure = Financial Structure" or "Assets = Liabilities + NP"

Bearing in mind these concepts, the user is able to star in different situations and see their implications. In the classrooms are still respecting the annotations using a minimum of two accounts, one on the debit (left) and the credit (right). With no common sense but the very fact that everything fits. The double passes to see the reasons for debit and credit in the accounts, which in summary are.

Double-entry bookkeeping system recording each transaction twice, using debits and credits, so debit and credit are the two aspects of every financial transaction. Their use and implication is the fundamental concept in the double-entry bookkeeping system, in which every debit transaction must have a corresponding credit transaction, and vice versa.

Debit "Dt" means left side of a ledger account and Credit "Ct" is the right side of a ledger account. The term "T-account" is accounting jargon for a "ledger account". We have five accounting elements: Assets, Liabilities, Equity, Income and Expenses. In table 5 is presentation increasing and decreasing attributes for the five accounting elements.

Table 5

Standard of increasing and decreasing attributes for five accounting elements

| Account type | Debit | Credit |
|---|---|---|
| Assets | + | − |
| Liabilities | − | + |
| Equity | − | + |
| Income | − | + |
| Expenses | + | − |

Sources: www.accounting.pl.en.taxes

The most important principle of accounting is: each transaction that the business makes, consists of at least one debit to one account and at least one credit to another account. For all transactions, the total debits must be equal to the total credit.

The Value of Debits = The Value of Credits

## Standards for the preparation of annual accounts in Poland and in Spain

The world's developed in an evolutionary way two different philosophies of accounting concepts:- Accounting continental type (such as Germany, France, Austria, Belgium, Spain, Italy, Switzerland, Scandinavia, Poland, the Czech Republic, Hungary, Japan)- Anglo-Saxon type of accounting (including Great Britain, United States of AP, Canada, Australia, New Zealand, and in part, the Netherlands) (TURYNA 2006).

In Poland there are following obligatory acts of accounting: The Act of Accounting from 29th of September 2004, The National Standards of Accounting and International Standards of Accounting.

In Spain is obligatory, according RD 1514/2007 and 1515/2007 from 16 of November, which approves the last Spanish General Accounting Plan SGAP "PGC plan general de Contabilidad name in Spain" It makes it obligatory for all companies regardless of their legal form, individual or corporate. In Spain, The General Accounting Plan apply to:

|  | No trades* | Traded** |
|---|---|---|
| Individual companies | SGAP or PGC | SGAP or PGC |
| Groups of companies | SGAP or PGC | International Financial Reporting Standards "NIFF normas internacionales de información financiera, name in Spain" |

\* When the company it isn't an official market (secondary market).
\*\* When the company has a official price because the stockholder can buy the share in the official market.

The annual accounts contain in both country: the balance sheet, the income statement, the statement of changes in equity, the statement of cash flows and the notes thereto.

The statement of cash flows shall not be obligatory when the balance sheet, statement of changes in equity and the notes thereto can be prepared in abbreviated format.

The annual accounts shall be prepared every twelve months, except in cases where the company has been recently incorporated, has changed its financial year end or is being dissolved.

The annual accounts shall be drawn up within three months of the balance sheet date by the owner or the directors, who shall be responsible for the veracity of the content. The annual accounts shall bear the date on which they were drawn up and shall be signed by the owner, all equity holders with unlimited liability for corporate debt, or all directors of the company.

The balance sheet, income statement, statement of changes in equity, statement of cash flows and the notes thereto shall each be clearly identified by indicating the name of the statement, the name of the reporting entity and the period to which it refers.

The annual accounts shall be expressed in zloty in Poland and in euros in Spain. Nonetheless, figures may be expressed in thousands or millions of zloty or of euros where this is advisable due to their magnitude, in which case the level of rounding in presentation should be disclosed in the annual accounts.

## Abbreviated annual accounts

The companies in Spain may use the abbreviated format for annual accounts in the following cases:

a) Abbreviated balance sheet, abbreviated statement of changes in equity and abbreviated notes thereto: companies that meet at least two of the following conditions at the balance sheet date:

– Total assets do not exceed 2,850,000 euro. Total assets shall be those disclosed in the standard format balance sheet.

– Total annual revenue does not exceed 5,700,000 euro.

– The average number of employees during the reporting period does not exceed 50.

b) Abbreviated income statement: companies that meet at least two of the following conditions at the balance sheet date:

– Total assets do not exceed 11,400,000 euro. Total assets shall be those disclosed in the standard format balance sheet.

– Total annual revenue does not exceed 22,800,000 euro.

– The average number of employees during the reporting period does not exceed 250.

The above is applicable only when at least two of the conditions are met or are no longer met by a company on two consecutive annual balance sheet dates.

Companies whose shares are admitted to trading on a regulated market of any European Union member state may not prepare abbreviated annual accounts.

The companies in Poland may use the abbreviated format for annual accounts in the following cases:

a) Abbreviated balance sheet, abbreviated income statement andd abbreviated notes thereto: companies that meet at least two of the following conditions at the balance sheet date:

– Total assets do not exceed 2,000,000 euro.

– Total annual revenue does not exceed 4,000,000 euro.

– The average number of employees during the reporting period does not exceed 50.

## Structure of Polish Act of Accounting and Spanish General Accounting Plan

The Act of Accounting consist of the following chart:

1. General rules (13 pages)
2. Bookkeeping (10 pages)
3. Inventory (2 pages)
4. Valuation of assets and liabilities and determination of the financial result (19 pages)
5. Connection of companies (4 pages)
6. The financial statements (8 pages)
7. The consolidated financial statements of the capital group ( 7 pages)
8. Research and publication of accounts (6 pages)
9. Data protection (3 pages)
10. Bookkeeping services (6 pages)
11. Criminal responsibility (2 pages)
12. Annexes (57 pages)

Total: 137 pages (The Act of Accounting from 29th of September 2004, Dz.U. 2013, poz. 330)

The Spanish General Accounting Plan consist of the following chart:

1. Introduction (20 pages)
2. Accounting framework (9 pages)
3. Recognition and measurement standards (62 pages)
4. Annual accounts (15 pages)
5. Standard annual accounts (48 pages)
6. Abreviated format for annual accounts (18 pages)
7. Chart of accounts (26 pages)
8. Devinitions and accounting entries (161)

Total: 359 pages (The Spanish General Accounting Plan. RD.1514/07, from 16th of November 2007)

The most extensive chapter in the Accounting Act is the section of attachments, and a section of the valuation of assets and liabilities. The Spanish General Accounting Plan occupies most of the chapter on definitions and accounting entries and a section on the valuation of assets and liabilities, as well as in Polish law.

## Structure of Balance Sheet in Poland and in Spain – compare

The Balance Sheet is call the Statement of Financial or the Position Financial Balance. Balance Sheet is a "photo of firm", and an "annual report". It shows how assets were financed: by borrowing money (liabilities) or by using the owner's money (owner's equity). The Balance Sheet represents a single moment in time.

Table 6

Structure of Balance Sheet in Spain

| Assets | Value | Equity and Liabilities | Value |
|---|---|---|---|
| Non-current assets | | Equity | |
| 1. Intangible assets<br>2. Property, plant and equipment<br>3. Investment property (land, building)<br>4. Non-current investment in group companies and associates<br>5. Non-current investment<br>6. Deferred tax assets | | A1. Capital and reserves without valuation adjustments<br>1. Capital (Registered capital, Uncalled capital)<br>2. Share premium<br>3. Reserves<br>4. Own shares and equity holdings<br>5. Prior periods profit and loss<br>6. Other equity holder contributions<br>7. Profit/loss for the period<br>8. Interim dividend<br>9. Other equity instruments<br>A2. Valuation adjustment<br>A3. Grants, donations and bequests received | |
| Current assets | | Liabilities | |
| 1. Non-current assets held for sale<br>2. Inventories (materials, finished goods, goods for resale)<br>3. Trade and other receivables<br>4. Current investments in group companies and associates<br>5. Current investments<br>6. Prepayments for current assets<br>7. Cash and cash equivalents | | I. Non-current liabilities<br>1. Non-current provisions<br>2. Non-current payables<br>3. Group companies and associates, non-current<br>4. Deferred tax liabilities<br>5. Non-current accruals<br>II. Current liabilities<br>1. Liabilities associated with non-current assets held for sale<br>2. Current provisions<br>3. Current payables<br>4. Group companies and associates, current<br>5. Trade and other payables<br>6. Current accruals | |
| Total value | | Total value | |

Source: Spanish General Accounting Plan.

The structure of Polish and Spanish Balance Sheet is similar. There are only a few differences about the name of the groups. For example in Spain the group of Non-current assets has one additional group inside (Investment

property – land and building). In Poland we presentation this group together with Non-current investment. In Spain we have extra group "Non-current investment in group companies and associates". In Poland we presentation this group in "Non-current receivable" and in "Non-current investment". In "Current assets" we can see three groups more in Spanish balance sheet than in polish (Non-current assets held for sale, Current investments in group companies and associates, Prepayments for current assets). The basic deferens is, that in Poland we don't presentation group "Non-current assets held for sale" in "Current assets", the other groups we add to another groups.

In "Equity" we can see a few differences, too. We have new group in Spanish Balance Sheet "Grants, donations and bequests received". In group of "Liabilities" in Polish Balance Sheet we can see two new groups "Non-current provisions" and "Non-current and current interperiodical accounts". In Spain this group is much more expand then in Poland.

Table 7

Structure of The Balance Sheet in Poland

| Assets | Value | Equity and Liabilities | Value |
|---|---|---|---|
| Non-current assets | | Equity | |
| 1. Intangible assets<br>2. Property, plant and equipment<br>3. Non-current receivable<br>4. Non-current investment (property, intangible assets, financial assets)<br>5. Non-current interperiodical accounts | | 1. Registered capital/fund<br>2. Declare payments for registered capital<br>3. Own share and equity holdings<br>4. Uncalled capital/fund<br>5. Capital/fund from estimating pricing<br>6. Other reserves capital/fund<br>7. Prior periods profit and loss<br>8. Profit/loss for the period | |
| Current assets | | Liabilities | |
| 1. Inventories (materials, finished goods, goods for resale)<br>2. Current receivables<br>3. Current investment (financial assets, bank, cash)<br>4. Current interperiodical accounts | | 1. Non-current provisions<br>2. Non-current payables<br>3. Current payables<br>4. Non-current and current interperiodical accounts | |
| Total value | | Total value | |

Source: The Act of Accounting from 29th of September 2004.

## Structure of Income Statement in Poland and in Spain – compare

The Income Statement is call The Profit and Loss Statement, The Revenue Statement, The Statement of Financial Performance, The Earnings Statement, The Operating Statement or The Statement of Operations. The Income

Statement indicates how the revenue, known as the "top line" is transformed into the net income, known as the "bottom line" or net profit. The purpose of the Income Statement is to show manager and investors whether the company made or lost money during the period being reported. The Income Statement represents a period of time.

There are (Tab. 8) presentation operating expenses by nature and by function in both countries, in Poland and in Spain.

Table 8

Operating expenses by nature and by function in Poland and in Spain

| Poland | Spain |
|---|---|
| Operating expenses by nature: | |
| 1. Raw materials and energy<br>2. Amortization<br>3. Salaries and wages<br>4. Social security and other benefits<br>5. External services<br>6. Taxes and other fees<br>7. Other operating expenses | 1. Raw materials<br>2. Amortization<br>3. Salaries and wages<br>4. Employee benefits expense<br>5. External services<br>6. Taxes<br>7. Other operating expenses |
| Operating expenses by function: | |
| 1. Direct costs<br>2. Indirect costs<br>3. Costs of administrative<br>4. Costs of purchase<br>5. Costs of sales<br>6. Interperiodical costs | –<br>–<br>–<br>–<br>–<br>– |

Source: MATUSZEWICZ, MATUSZEWICZ (2009).

In Spain, the need to put all users based on their information needs explains that financial accounting reports develop their tightly regulated by national and international standards (Code Mercanti, accounting, European Directives, IAS / IFRS of the IASB). Although financial accounting is closely related to cost accounting, certain aspects are currently analyzing only by the cost accounting, which it's is voluntary. The expenses by departments or functions, in Spain, are widely used in cost accounting.

In Poland firms can choose between recording expenses by function or by nature. Spanish firms can't choose. They must recording expenses only by nature. Cost accounting is voluntary for Spanish companies and it's in the control of management which is often used expenses classified by function, department, activities or others classifications, leaning on the cost drivers.

If firms in Poland presentation operating costs of sale by nature then The Income Statement has name The Comparison Variant, but if firms presentation cost of sale by function The Income Statement has name The Calculator Variant.

Table 9

Structure of The Income Statement in Poland

| Income/Revenue and Expenses/Costs | Value |
|---|---|
| A. Net revenues from sales | |
| 1. Net revenues from sales of finished goods | |
| 2. Changes in inventories of finished goods | |
| 3. Cost of finished goods | |
| 4. Net revenues from sales of goods for resale and materials | |
| B. Operating expenses* | |
| 1. Amortization | |
| 2. Raw materials and energy | |
| 3. External services | |
| 4. Taxes and fees | |
| 5. Salaries and wages | |
| 6. Social security and other benefits | |
| 7. Other operating expenses | |
| 8. Value of goods for resale and materials sold | |
| C. Profit/loss from sale (A-B) | |
| D. Other operating income | |
| E. Other operating expenses | |
| F. Profit/loss from operating activities (C+D-E) | |
| G. Financial income | |
| H. Financial expenses | |
| I. Profit/loss from ordinary activities (F+G-H) | |
| J. Extraodinary items | |
| K. Gross profit/loss (I+/-J) | |
| L. Income tax | |
| M. Other mandatory decrease of profit (increase in loss) | |
| N. Net profit/loss (K-L-M) | |

** Firms can choose between presentation operating costs of sale by nature (Comparison Variant) or by function (Calculator Variant)
Source: The Act of Accounting from 29th of September 2004.

In Polish The Income Statement we can see following groups: A. Revenues from sales/B. Operating expenses=C. Profit/loss from sale; D. Other operating income/E. Other operating income=F. Profit/loss from operating activities; G. Financial income/H. Financial expenses=profit/loss from ordinary activities; J. Extraordinary items (extraordinary profit/extraordinary loss) (Spanish Income Statement doesn't exist separate group with extraordinary items). Then we have K. Gross profit/loss (before income tax), and when firms pays income tax, the last position is N. Net profit/loss (after income tax).

Structure of The Income Statement in Spain

| Income/Revenue and Expenses/Costs | Value |
|---|---|
| A. Continuing operations | |
| 1. Revenue | |
| 2. Changes in inventories of finished goods and work in progress | |
| 3. Work carried out by the company for assets | |
| 4. Supplies | |
| 5. Other operating income | |
| 6. Personnel expenses | |
| 7. Other operating expenses | |
| 8. Amortization and depreciation | |
| 9. Non-financial and other capital grants | |
| 10. Provision surpluses | |
| 11. Impairment and gains/losses on disposal of fixed assets | |
| A1. Results from operating activities (1+2+3+4+5+6+7+8+9+10+11) | |
| 12. Finance income | |
| 13. Finance expenses | |
| 14. Change in fair value of financial instruments | |
| 15. Exchange gains/losses | |
| 16. Impairment and gains/losses on disposal of financial instruments | |
| A2. Net finanse income/expenses (12+13+14+15+16) | |
| A3. Profit/loss before income tax (A1+A2) | |
| 17. Income tax expense | |
| A4. Profit/loss from continuing operations (A3+17) | |
| B. Discontinued operations | |
| 18. Profit/loss from discontinued operations, net of income tax | |
| A.5 Profit/loss for the period (A4+18) | |

Source: The Spanish General Accounting Plan.

In The Spanish Income Statement we see two main groups: A. Continuing operations and B. Discontinued operations. Inside group of Continuing operations we can see following groups: A1. Results from operating activities, A2. Net finance income/expenses, A3. Profit/loss before income tax, and A4. Net profit/loss from continuing operations.

## Conclusions

1. Basic rules of accounting system in Poland and in Spain are the same, because rules of accounting are international.

2. In both countries existing differences between internal acts of accounting. In Poland the most of firms can use to prepare financial statement The Act of Accounting from 29th of September 2004. If something isn't in this Act firms have to use The National Standards of Accounting. In Poland The International Standards have to use firms, which want to be existing in international market. In Spain all firms are obligations to prepare financial statement according to Spanish General Accounting Plan with the exception of the group of companies listed on the official stock market, which should apply The International Financial Reporting Standards.

3. In Poland abbreviated annual accounts (Balance Sheet, Notes Theretoand and Income Statement) may prepare companies when at least two of the conditions are meet: total assets do not exceed 2 000 000 euro, total annual revenue does not exceed 4 000 000 euro, the average number of employees during the reporting period does not exceed 50. In Spain abbreviated annual accounts are separate conditions for: (1) (Balance Sheet, Statement of Changes in Equity and Notes Thereto) and (2) (Income Statement).

4. There are many similarities and not too much differences in both countries about structures of Balance Sheet and Income Statement. Differences are of a minor character.

The sources are so few differences between the two accounting system is membership Polish and Spanish to the European Union. The associated countries aim to harmonize regulations in the preparation of financial reporting documents as well. Methods of presentation and valuation of the assets of the company and the sources of the Balance Sheet as well as the procedure for determining net profit in the Income Statement should be comparable for EU countries.

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# FUNDAMENTAL PORTFOLIO CONSTRUCTION BASED ON SEMI-VARIANCE

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K e y  w o r d s: Markowitz model, fundamental portfolio, semi-variance, Mahalanobis distance.

A b s t r a c t

In models for creating a fundamental portfolio, based on the classical Markowitz model, the variance is usually used as a risk measure. However, equal treatment of negative and positive deviations from the expected rate of return is a slight shortcoming of variance as the risk measure. Markowitz defined semi-variance to measure the negative deviations only. However, finding the fundamental portfolio with minimum semi-variance is not possible with the existing methods.The aim of the article is to propose and verify a method which allows to find a fundamental portfolio with the minimum semi-variance. A synthetic indicator is constructed for each company, describing its economic and financial situation. The method of constructing fundamental portfolios using semi-variance as the risk measure is presented. The differences between the semi-variance fundamental portfolios and variance fundamental portfolios are analysed on example of companies listed on the Warsaw Stock Exchange.

## WYKORZYSTANIE SEMIWARIANCJI DO BUDOWY PORTFELA FUNDAMENTALNEGO

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S ł o w a  k l u c z o w e: model Markowitza, portfel fundamentalny, semiwariancja, odległość Mahalanobisa.

A b s t r a k t

W modelu budowy portfela fundamentalnego bazującym na klasycznym modelu Markowitza za miarę ryzyka najczęściej przyjmuje się wariancję. Jednak pewną wadą wariancji jako miary ryzyka jest jednakowe traktowanie dodatnich i ujemnych odchyleń względem oczekiwanej stopy zwrotu. Do mierzenia tylko odchyleń ujemnych Markowitz zdefiniował semiwariancję. Znalezienie portfela

fundamentalnego o minimalnej semiwariancji nie jest możliwe z wykorzystaniem istniejących metod. Celem artykułu jest zaproponowanie i zweryfikowanie metody pozwalającej na znalezienie portfela fundamentalnego o minimalnej semiwariancji. Dla każdego analizowanego przedsiębiorstwa wyznaczono wskaźnik syntetyczny, opisujący jego sytuację ekonomiczno-finansową. Zaproponowano metodę budowy portfela fundamentalnego o minimalnej semiwariancji. Przeanalizowano różnice między portfelami fundamentalnymi o minimalnej semiwariancji a portfelami o minimalnej wariancji na przykładzie spółek notowanych na Giełdzie Papierów Wartościowych w Warszawie.

# Introduction

Risk in development models of a fundamental portfolio is measured by rate of return variance (TARCZYŃSKI 1995, p. 99, TARCZYŃSKI 2002, p. 115), (RUTKOWSKA 2011, p. 554). One of the drawbacks of variance as a measure of risk is that negative and positive deviations from the expected rate of return are treated in the same manner. In fact, negative deviations are undesirable, while positive ones create an opportunity for a higher profit.

There has been a notion in the literature that variance can be used to measure risk when rate of return distribution is normal, or at least symmetrical, (GALAGEDERA, BROOKS 2007, p. 215–216) or investor's utility functions are square functions (ELTON, GRUBER 1998, p. 263). The square utility function has some undesirable properties, whereby it does not describe investors' behaviours correctly. First of all, it reaches the maximum value for a certain rate of return and it decreases with an increasing rate of return, which is in open contradiction to investors' preferences, who always want to have more, rather than less. In contrast to the variance the utility function for semi-variance is increasing function for all rates of return (MARKOWITZ 1991, p. 290).

Studies conducted on capital markets have shown that the rate of return distributions for some quoted companies are not normal, or even symmetrical distributions, exempli gratia power-low or log-normal (MANDELBROT 1997, ADCOCK, SHUTES 2005, p. 402–414, POST, VIET 2006, p. 824). When the semi-variance is applied, no assumption about rate of return distribution is required (HARLOW, RAO 1989). Furthermore, it can be shown that when the rate of return distribution is normal, semi-variance is a better measure of risk than variance (RUTKOWSKA-ZIARKO 2007, p. 105-116).

The theoretical objective of the article is to propose a method which allows to find a fundamental portfolio with the minimum semi-variance, which is not possible with the existing methods. In terms of application, the objective of the article is to verify the method.

## Taxonomic measure of attractiveness of investments

When the portfolio is constructed based on fundamental analysis, it is necessary to quantitatively determine the economic and financial situation of the company. To this end, financial ratios are used, calculated from the financial reports published by companies. The problem is to present the economic and financial situation of a company with just one index. To this end, a synthetic development measure may be used, based on selected financial ratios. A synthetic development measure was first used for portfolio construction by Tarczyński (TARCZYŃSKI 1995, p. 97–99). He referred to the measure as the taxonomic measure of attractiveness of investments – TMAI (TARCZYŃSKI 1995, p. 97). In fundamental portfolio construction models, companies are usually arranged according to the Euclidean distance (TARCZYŃSKI 1995, p. 97, TARCZYŃSKI 2002, p. 98, RUTKOWSKA 2011, p. 555–556). Due to a possible correlation among diagnostic variables, the Mahalanobis distance (BALICKI 2009, p. 216) is a more appropriate distance measure between companies, compared with Euclidean distance (RUTKOWSKA-ZIARKO 2013). Other synthetic measures have been used in capital market studies, such as: *generalized distance measure* (GDM) and *absolute development level ratios* (BZW) (ŁUNIEWSKA 2005 p. 469). The advantage of the GDM measure lies in that it can be used for variables measured in weaker scales (WALESIAK, DUDEK 2010, p. 186). The Mahalanobis distance has been used in this article to determine TMAI.

Four financial ratios have been taken as diagnostic variables in this paper. Three of them described the financial situation of the companies under study: current ratio (CR), return of assets ratio (ROA) and debt ratio (DR). The study also took into account the market price-earning ratio (P/E). Studies of capital markets have revealed a negative correlation between the value and future share price increases (BASU 1977, p. 663). Therefore, P/E was regarded as a destimulant and replaced with E/P:

$$E/P = \frac{1}{P/E} \tag{1}$$

CR and ROA ratios were regarded as stimulants, whereas DR – as a destimulant. DR was replaced with a corresponding stimulant (DR').

$$DR' = \frac{1}{DR} \tag{2}$$

Subsequently, a reference standard was created with which the analysed companies were compared. When Mahalanobis distances are used, it is not

necessary to standardise diagnostic variables, as is the case with Euclidean distances (BALICKI 2009, p. 216).

Let $w_{il}$ denote values of diagnostic variables, where $l = 1,..., m$ is the number of diagnostic variables considered. For each diagnostic variable, the highest observed value of ($w_{0l}$) is sought (HELLWIG 1968, p. 323–326):

$$w_{0l} = \max_i \{w_{il}\} \tag{3}$$

An abstract point $P_0(w_{0l})$ was taken as the reference standard; its coordinates assume the highest values of the diagnostic variables after transformation of variables into stimulants. The distance for each company, that is candidate for portfolio, relative to the idealised target $P_0(w_{0l})$ was calculated.

The TheMahalanobis distance could be calculated as follows (MAHALANOBIS 1936, p. 50):

$$MQ = \sqrt{(W_i - W_l) \cdot C^{-1}(W_i - W_l)^T} \tag{4}$$

where $W_i$ is a row vector, $W_i = [w_{i1},..., w_{i4}]$, $W_l$ is a row vector, representing "the ideal quoted company" $W_i = [w_{01},..., w_{04}]$, $C$ is covariance matrix for diagnostic variables.

Mahalanobis distance was used to determine the taxonomic measure of attractiveness of investments for each company (TARCZYŃSKI 2002, p. 98):

$$\text{TMAI}_i = 1 - \frac{Q_i}{\max_i \{Q_i\}} \tag{5}$$

## Fundamental portfolio and semi-variance

By combining elements of the portfolio and fundamental analysis, an additional condition can be introduced to the classic Markowitz model which ensures that the portfolio will contain only companies with good economic and financial standing. The fundamental portfolio is an efficient portfolio if, for a specific average rate of return and average TMAI, the variance calculated for it is the lowest.

The model of construction of a fundamental portfolio, which has been used in the study, is a modification of the classic Markowitz model (MARKOWITZ 1952, p. 81). A limiting condition has been introduced to the portfolio construction model, according to which the TMAI total, weighted by contribution of shares of a specific company in the portfolio, must achieve at least the level set

by the investor. The construction model of a fundamental portfolio will have the following form:

minimise the portfolio variance (RUTKOWSKA-ZIARKO 2011, p. 554):

$$S_p^2 = \sum_{i=1}^{k} \sum_{j=1}^{k} x_i x_j \, \text{cov}_{ij} \tag{6}$$

with the limitations:

$$\sum_{i=1}^{k} x_i = 1 \tag{7}$$

$$\sum_{i=1}^{k} x_i \, \bar{z}_i \geq \gamma \tag{8}$$

$$x_i \geq 0 \; i = 1,..., k \tag{9}$$

$$\text{TMAI}_p = \sum \text{TMAI}_i x_i \geq \text{TMAI}_\gamma \tag{10}$$

where: $S_p^2$ is variance of rate of return; $\text{cov}_{ij}$ is covariance between security $i$ and security $j$ $\gamma$-target rate of return, assuming that $\gamma \leq \max \bar{z}_i$; $\bar{z}_i$ – mean rate of return on security $i$; $x_i$ – contribution by value of the $i$-th share in the portfolio; $TMAI_\gamma$ – the sum of TMAI, required by the investor, weighted by the contribution of shares in the portfolio.

Considering the drawbacks of variance as a measure of risk, a monograph on the choice of a portfolio by MARKOWITZ (1959, p. 188–189) suggests semi-variance of the assumed rate of return $dS^2$ $(\gamma)$ as a measure of risk which is an alternative to variance:

$$dS^2 \, (\gamma) = \frac{\sum\limits_{t=1}^{m} d_t^2(\gamma)}{m - 1}, \, t = (1,2,..., m) \tag{11}$$

where:

$$d_t(\gamma) = \begin{cases} 0 & \text{for} & z_t \geq \gamma \\ z_t - \gamma & \text{for} & z_t < \gamma \end{cases} \tag{12}$$

When semi-variance of an investment portfolio is determined, semi-covariances of the rates of return of shares which it comprises are used:

$$dS_p^2\ (\gamma) = \sum_{i=1}^{k} \sum_{j=1}^{k} x_i x_j\ d_{ij}(\gamma) \tag{13}$$

where: $dS_p^2\ (\gamma)$ – semi-variance of the portfolio rates of return; $d_{ij}(\gamma)$ semi-covariance of the rate of return for the $i$-th and the $j$-th share.

When semi-covariance is determined, it is noted in which periods the rate of return is higher and in which it is lower than the level assumed by the investor.

$$d_{ij}\ (\gamma) = \frac{1}{m-1} \sum_{t=1}^{m} d_{ijt}\ (\gamma) \tag{14}$$

where:

$$d_{ijt}(\gamma) = \left\{ \begin{array}{ll} 0 & \text{for } z_{pt} \geq \gamma \\ (z_{it} - \gamma)(z_{jt} - \gamma) & \text{for } z_{pt} < \gamma \end{array} \right. \tag{15}$$

where:

$$z_{pt} = \sum_{i=1}^{m} x_i z_{it}, \ t = (1,2,..., m) \tag{16}$$

Determination of effective portfolios for the risk understood to denote a possibility of achieving a lower rate of return than the assumed value is reduced to minimising semivariance of the assumed rate of return at the predetermined value of $\gamma$, therefore, to solving the following optimising problem:

minimise the semi-variance of portfolio rate of return:

$$dS_p^2\ (\gamma) = \sum_{i=1}^{k} \sum_{j=1}^{k} x_i x_j\ d_{ij}(\gamma)$$

with the limitations (7–10).

When seeking an effective portfolio for the risk measured with semivariance, the sum of squares of "downward" deviations from the assumed rate of return is minimised, while there are no limitations imposed on "upward" deviations. Further in the article, the fundamental portfolio with the minimal variance will be referred to as VFP, while that with the minimum semi-variance – as SFP.

Using semi-variance to determine effective portfolios creates considerable problems because when semi-covariance of rates of return are determined

$d_{ij}(\gamma)$ one has to know in which periods the rate of return of the entire portfolio was lower than the assumed value, and this depends both on the assumed rate of return and on the portfolio composition. This makes determination of effective portfolios for semi-variance of the assumed rate of return more complicated than for variance. In order to determine the composition of Markowitz's portfolio for any $\gamma$, it is enough to know co-variance $cov_{ij}$ and mean rates of return $\bar{z}_i$, those parameters are estimated on a one-off basis and they do not depend either on the portfolio composition or on the assumed rate of return $\gamma$. On the other hand, when a portfolio with the minimum semi-variance is determined, each time the composition of the portfolio or the assumed rate of return $\gamma$ changes, semi-covariance of rates of return $d_{ij}(\gamma)$ should be re-estimated. In order to determine an effective fundamental portfolio, which minimises semi-variance of the assumed rate of return, modification of the iterative algorithm (used to build a portfolio with the minimum semi-variance) was applied (RUTKOWSKA-ZIARKO 2005, p. 72–77). Starting with the FTP portfolio, the following procedure is reiterated until self-consistency[1] of the portfolio composition has been achieved:

1. Determination of the rates of return of portfolio $z_{pt}$ within time units according to (16).

2. Determination of semi-covariances of rates of return $d_{ij}(\gamma)$ (14–15).

3. For the semi-covariance of rates of return $d_{ij}(\gamma)$ determined in point 2. – minimise the semi-variance of portfolio rate of return:

$$dS_p^2 \ (\gamma) \ = \ \sum_{i=1}^{k} \sum_{j=1}^{k} x_i x_j \ d_{ij}(\gamma)$$

with the limitations (7–10).

Further in the article, this procedure will be referred to as the MFP procedure.

It should be emphasised that determination of the composition of the VFP portfolio and the semi-variance minimising portfolio in subsequent passages through point 3 is an issue which is independent of the proposed procedure. In this study, a ready-to-use optimising package, named WinQSB, has been used. It is used as a sub-program and it could be replaced with any algorithm of non-linear programming, which would not affect the SFP procedure.

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[1] Self-consistency is understood as stabilisation of the portfolio composition at a set level of precision.

## Empirical results

The study covered 10 of the largest and most liquid companies listed on The Warsaw Stock Exchange (included in the WIG20 index), excluding financial institutions[2]. The study was based on quarterly rates of return calculated based on daily closing prices during the period from January 1, 2010 until March 22, 2011. Rates of return were computed as relative increases in prices of stocks according to the formula:

$$R_{it} = \frac{N_{i,t+s} - N_{it}}{N_{it}} \cdot 100\% \tag{17}$$

where $R_{it}$ is the rate of return on security $i$ at time $t$, $s$ is the length of the investment process expressed in days, $N_{it}$ is the listed value of security $i$ at time $t$, $N_{i,t+s}$ is the listed value of security $i$ after $s$ days of investing started at time $t$.

The share closing price on March 22, 2011, was taken as the market share price of a company. Financial ratios were calculated for each company based on annual financial reports for 2010.

For each of the analysed companies taxonomic measure of attractiveness of investments was determined. Based on time series of rates of return mean rate of return, variance and semi-variance were calculated. The profitability, risk and taxonomic measures of attractiveness of investments are presented in Table 1.

Table 1

Profitability, risk and taxonomic measures of attractiveness of investments

| Company | Mean (%) | Variance | $dS^2$ (4) | $dS^2$ (8) | $dS^2$ (12) | TMAI | Rank |
|---------|----------|----------|------------|------------|-------------|------|------|
| ACP | -2.25 | 18.25 | 56.67 | 123.65 | 222.06 | 0.5766 | 3 |
| KGH | 16.26 | 299.22 | 45.20 | 72.67 | 110.73 | 0.7195 | 1 |
| LTS | 9.22 | 137.19 | 19.70 | 45.33 | 88.46 | 0.1519 | 8 |
| LWB | 12.41 | 208.32 | 16.29 | 37.15 | 72.60 | 0.4287 | 5 |
| PBG | 0.03 | 36.78 | 45.71 | 99.02 | 180.54 | 0.6674 | 2 |
| PGE | 0.39 | 27.81 | 37.38 | 85.61 | 163.16 | 0.4526 | 4 |
| PGN | 8.37 | 53.24 | 6.62 | 21.80 | 54.07 | 0.1949 | 7 |
| PKN | 1.61 | 86.57 | 56.60 | 109.28 | 186.72 | – | 10 |
| TPS | -0.15 | 72.87 | 73.24 | 133.62 | 219.67 | 0.2819 | 6 |
| TVN | 3.11 | 132.35 | 51.15 | 101.90 | 176.96 | 0.1166 | 9 |

Source: the author's own calculation.

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[2] The three-letter abbreviations used at the Warsaw Stock Exchange are used in the paper instead of the full names of stock issuers.

During the analysed period, the highest TMAI values was calculated for the KGH company; at the same time, its risk, measured as the variance of rates of return was the highest. Considering the semi-variance for different levels of $\gamma$, risk was at a medium level as compared to the other analysed companies. The variance for the ACP company was the lowest; however, the values of semi-variance were very high.

Efficient fundamental portfolios with the minimum variance values (VFP) were built as well as fundamental portfolios with the minimum semi-variance (SFP) for selected levels of target rate of return ($\gamma = 4, 8, 12\%$) and $TMAI_\gamma = 0.5$. For all the portfolios, the limitation concerning the required level of TMAI was an active limitation. The composition of the determined portfolios (by value) and their selected characteristics are presented in Table 2, 3 and 4.

Table 2

Efficient fundamental portfolio for $\gamma = 4\%$ and $TMAI_\gamma = 0.5$

| Issuer | Starting portfolio | Portfolio composition in the $i$-th iteration | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| ACP | 0.352 | 0.428 | 0.386 | – | – | – | – | – |
| KGH | 0.122 | 0.153 | 0.159 | – | – | – | – | – |
| LTS | 0.067 | – | – | – | 0.050 | 0.059 | 0.064 | 0.064 |
| LWB | 0.169 | 0.230 | 0.284 | 0.680 | 0.718 | 0.722 | 0.722 | 0.722 |
| PGE | 0.132 | – | – | – | – | – | – | – |
| PGN | – | – | – | – | – | – | – | – |
| PKN | – | 0.102 | 0.057 | – | 0.014 | 0.008 | 0.003 | 0.003 |
| TPS | – | – | – | – | – | – | – | – |
| PBG | 0.122 | 0.087 | 0.103 | 0.140 | 0.002 | – | – | – |
| TVN | 0.036 | – | 0.011 | 0.180 | 0.216 | 0.211 | 0.211 | 0.211 |
| | starting portfolio | profitability, risk and TMAI in the $i$-th iteration | | | | | | |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Average rate of return | 4.000 | 5.216 | 5.742 | 8.987 | 10.139 | 10.229 | 10.233 | 10.233 |
| Variance | 20.362 | 31.114 | 36.458 | 85.369 | 97.513 | 97.967 | 97.770 | 97.770 |
| Semi-variance of 4% | 11.698 | 10.470 | 10.333 | 6.068 | 5.341 | 5.321 | 5.324 | 5.324 |
| $TMAI_p$ | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

Source: The author's own calculation with WinQSB.

The SFP portfolios were determined by iteration by following the SFP procedure, assuming that self-consistency of the portfolio is achieved after its composition is stabilised at the accuracy of 3 decimal digits. The fundamental portfolio with the minimum variance (VFP) was each time taken as the

starting portfolio. The final solution was achieved in the seventh iteration, because – considering the assumed accuracy – the iteration does not contain changes in the portfolio composition or the value of semi-variance at the assumed rate of return of 4%. Shares for the portfolio in each iteration were chosen from among the initial set of 10 quoted companies. The largest decrease in semi-variance took place in the first and third iteration; it was then that the largest changes concerning the companies making up the portfolio and the proportions of their contributions took place. However, no change took place in the companies in the portfolio starting from the fifth iteration; only proportions of shares changed slightly and the decrease in semi-variance was small.

Table 3

Efficient fundamental portfolio for $\gamma = 8\%$ and $\text{TMAI}_\gamma = 0.5$

| Issuer | Starting portfolio | Portfolio composition in the $i$-th iteration | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| | | 1 | 2 | 3 | 4 | 5 |
| ACP | 0.147 | – | – | – | – | – |
| KGH | 0.296 | – | 0.016 | 0.010 | 0.010 | 0.010 |
| LTS | 0.061 | – | 0.021 | 0.058 | 0.059 | 0.059 |
| LWB | 0.189 | 0.664 | 0.703 | 0.706 | 0.707 | 0.707 |
| PGE | 0.083 | – | – | – | – | – |
| PGN | – | – | – | – | – | – |
| PKN | 0.075 | – | 0.039 | – | – | – |
| TPS | – | – | – | – | – | – |
| PBG | 0.149 | 0.063 | – | – | – | – |
| TVN | – | 0.273 | 0.221 | 0.227 | 0.225 | 0.225 |
| | starting portfolio | profitability, risk and TMAI in the $i$-th iteration | | | | |
| | | 1 | 2 | 3 | 4 | 5 |
| Average rate of return | 8.000 | 9.084 | 10.193 | 10.152 | 10.168 | 10.168 |
| Variance | 56.352 | 82.746 | 97.640 | 95.190 | 95.478 | 95.478 |
| Semi-variance of 8% | 31.543 | 22.670 | 20.178 | 20.109 | 20.102 | 20.102 |
| $TMAI_p$ | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

Source: The author's own calculation with WinQSB.

In the case of $\gamma = 0.8\%$ final solution was achieved in the fifth iteration. The largest decrease in the semi-variance took place in the first iteration.

In the case of $\gamma = 12\%$ final solution was achieved in the fourth iteration. The largest decrease in the semi-variance took place in the first iteration.

SFP portfolios are safer than the initial portfolio (lower semi-variance than the assumed rate of return). It means in practice that on average, deviations below the target rate of return for SFP portfolios are smaller in comparison to their VFP counterparts. Moreover, SFP portfolios for $\gamma = 4, 8\%$ have a higher

Efficient fundamental portfolio for $\gamma = 12\%$ and $\text{TMAI}_\gamma = 0.5$

| Issuer | Starting portfolio | Portfolio composition in the $i$-th iteration | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| ACP | – | – | – | – | – |
| KGH | 0.469 | 0.129 | 0.173 | 0.174 | 0.174 |
| LTS | 0.046 | – | – | – | – |
| LWB | 0.218 | 0.700 | 0.650 | 0.649 | 0.649 |
| PGE | – | – | – | – | – |
| PGN | – | – | – | – | – |
| PKN | 0.150 | 0.130 | 0.108 | 0.108 | 0.108 |
| TPS | – | – | – | – | – |
| PBG | 0.116 | – | – | – | – |
| TVN | – | 0.041 | 0.069 | 0.069 | 0.069 |
| | starting portfolio | profitability, risk and TMAI in the $i$-th iteration | | | |
| | | 1 | 2 | 3 | 4 |
| Average rate of return | 12 | 12 | 12 | 12 | 12 |
| Variance | 115.527 | 135.824 | 130.489 | 130.394 | 130.394 |
| Semi-variance of 12% | 62.716 | 53.232 | 52.776 | 52.774 | 52.774 |
| $TMAI_p$ | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

Source: The author's own calculation with WinQSB.

average rate of return. SFP portfolios have different compositions than VFP portfolios. SFP portfolios differ from VFP portfolios in terms of the shares present in them and the proportions between their contributions. For each assumed rate of return, part of the companies present in both types of portfolios are the same.

## Conclusion

The results have shown that adopting a specific measure of risk significantly affects which achievable portfolios will be regarded as effective. The differences between effective fundamental portfolios with the minimum variance and those minimising semi-variance of the assumed rate of return are particularly distinct for low assumed rates of return. The determined SFP portfolios have lower semi-variance of the assumed rate of return than VFP portfolios, i.e. they are safer. Moreover, those are more profitable portfolios for lower assumed rates of return.

The advantage of the method is the possibility of using one of the available applications of non-linear or square programming to determine portfolios with the minimum semi-variance.

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# OPTIMAL LAND USE ANALYSIS USING LINDENMAYER GRAMMARS

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A b s t r a c t

In today's world, when it is so important to use every piece of land for a particular purpose, both economically and ecologically, identifying optimal land use is a key issue. For this reason, an analysis of the optimal land use in a section of the city of Olsztyn, using the L-system Urban Development computer program, was chosen as the aim of this paper. The program uses the theories of L-systems and the cartographic method to obtain results in the form of sequences of productions or maps. For this reason, the first chapters outline both theories, i.e. the cartographic method to identify optimal land use and Lindenmayer grammars (called L-systems). An analysis based on a fragment of the map of Olsztyn was then carried out. Two functions were selected for the analysis: agricultural and forest-industrial. The results are presented as maps and sequences in individual steps.

## ANALIZA OPTYMALNEGO UŻYTKOWANIA ZIEMI Z WYKORZYSTANIEM GRAMATYK LINDENMAYERA

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A b s t r a k t

W dzisiejszym świecie, gdy tak ważne jest wykorzystanie ziemi w sposób celowy, ekonomiczny oraz zgodny z ekologią, rozwiązanie problemu optymalnego jej użytkowania wydaje się być zagadnieniem najważniejszym. Jako cel pracy obrano analizę optymalnego użytkowania ziemi na wycinku

Olsztyna, z wykorzystaniem programu komputerowego L-system Urban Delopment. Program wykorzystuje teorię L-systemów i metodę kartograficzną, pozwala na uzyskanie wyników w postaci sekwencji produkcji lub map. W pierwszej części przybliżono obydwie teorie, tj. metodę kartograficzną służącą do znajdowania optymalnego użytkowania ziemi oraz gramatyki Lindenmayera (zwane właśnie L-systemami). Następnie przeprowadzono analizę na podstawie fragmentu mapy Olsztyna. Do analizy wybrano dwie funkcje: rolną i leśną przemysłową. Wyniki zamieszczono na mapach oraz w postaci sekwencji w poszczególnych etapach.

## Introduction

According to BAJEROWSKI'S (2003b) proposal, the state of land use may be understood as a function of the demand for the appropriate manner of using a given fragment of space. This fragment is a system which, because of its features, has one optimal state of use that "causes the highest land value from among the physically possible and legally permitted forms of use, consistent with its functional use" (BAJEROWSKI 2003b, p. 183). However, the existence of this optimal state of land use does not determine the actual manner of spatial use, which can be achieved by analysis and carrying out transforming measures. The following elements should be used to carry them out:

1. Selection of tools serving to find optimal land use.

2. Definition and examination of the parameters of the studied space which will allow transformation in the direction of optimal land use,

3. Selection of the method for estimating the profitability of undertaking the transformation (BAJEROWSKI 2003b).

Because space is represented by maps, the cartographic method seems most natural for its analysis. This method is proposed by BAJEROWSKI (1996, 2003b), who also notes that a spatial system is a dynamic system which can be analysed and forecast in the direction of optimal land use (BAJEROWSKI 2003a). However, this manner of using the cartographic method has some shortcomings, e.g. it becomes very painstaking and laborious without the use of supporting tools. For this reason, a combination of the cartographic method with Lindenmayer grammars has been proposed (ŻUKOWSKA 2008).

Lindenmayer grammars, also called L-systems or parallel rewriting systems, were originally created for description of the development of plant structures by the biologist Aristid Lindenmayer in 1968 (MARTYN 1996, PEITGEN et al. 1996, PRUSINKIEWICZ, LINDENMAYER 1996). However, the simplicity of their use and the possibility of extension with additional elements have allowed them to be used to simulate the development of not only individual elements of the plant or animal environment (PRUSINKIEWICZ 1993, PRUSINKIEWICZ et al. 1996, STREIT et al. 2005), but also landscapes and ecosystems (DEUSSEN et al. 1998). To present the results graphically, the so-called "turtle graphics", similar to the Logo language, were defined and

simulation of the structure development in two and three dimensions was undertaken (PRUSINKIEWICZ et al. 1995, PEITGEN et al. 1996). Numerous computer programs using these grammars have been developed. One of them is the Virtual Laboratory (FEDERL, PRUSINKIEWICZ 1999), which can simulate plants with realistic shapes and also build other models, including models using fractal geometry. Another program is the Lsystem Urban Development, which combines the cartographic method proposed by Bajerowski and Lindenmayer grammars (ŻUKOWSKA 2012b). This program will serve here for analysis of optimal land use based on the example of a selected fragment of the map of Olsztyn. The program was made for finding the optimum usage of a land and combines two theories: modified Bajerowski's method and Lindenmayer's grammar. In this paper we try to answer to these question: Is modified method still working for finding the optimum usage of a land? Can we reach some vital conclusions from this application? Is this method suitable for economic use?

## The application of the cartographic method for selection of the manner of optimal land use

According to SALICHCHEV (1998), cartographic research methods include, among others, mathematical modelling, which "consists in the creation of spatial mathematical models of phenomena or processes on the basis of data obtained from maps" (SALICHCHEV 1998, p. 272). For this purpose, Bajerowski uses topographic maps, land register content maps and the matrix of features inducing optimal land use. The method he proposes consists of the following stages:

1. A network of squares is superimposed on the selected map, whole or its fragment,

2. Selected features are then read from each field of the network and entered in the inventory matrix, the coordinates of matrix elements correspond to the coordinates of the corresponding field in the network,

3. The last stage is multiplication of the transposed matrix of features inducing optimal use and the inventory matrix, which gives as a result the matrix of optimal land use, which can be used for further analyses (BAJEROWSKI 1996, 2003b).

According to the first stage, a network of squares, i.e. basic fields, should be superimposed on the map. As can be read in Bartkowski, the basic evaluation field is the unit of area to which a specific geographical environment evaluation value can be assigned unambiguously (BARTKOWSKI 1974). The basic field does not have to be a square, but only this shape allows in the surface to be filled coherently and it can be easily compared with other fields. The size of the field

so selected, e.g. for objects such as a village, should be from 4 to 30 ha (SENETRA, CIEŚLAK 2004). BAJEROWSKI (2000) is also in favour of selecting a square basic field, stressing that this is a practical shape for computer processing.

Reading and entering features from the map consists in using the digits "0" – feature absent and "1" – feature present. The inventory matrix of features is ready after this stage. The features referred to here can be read from the topographic map and from the land-in-use map.

The last stage is multiplication of the appropriate matrices. This stage and further analysis use the following manners of land use, also called planning land functions (BAJEROWSKI 1996, 2003a, 2003b): Agricultural: arable land (R), grassland (Ps), meadows (Ł); forest: productive (LsP), ecological (LsE), recreational: individual recreation (Wi), group recreation (Wz), without the right to build (Wn), community (B), infrastructural – industrial (P).

The above functions and expert methods allowed to create the *matrix of features inducing optimal land use* (BAJEROWSKI 1996, 2003a, 2003b). This matrix contains 56 features which can be read from the topographic map and the land-in-use map. The whole matrix can be found in the publications cited above. We will only mention here that the values from the table with plus or minus signs should be interpreted as the force with which a given feature influences the entry of the studied land function in the basic field. The points are added up, first positive, then negative, and finally both groups together. Their sum should give zero, which results from the fact that if all features occur, their effects cancel each other because it is not possible for one field to have all land functions simultaneously (BAJEROWSKI 2003b, p. 196).

The optimal land use matrix is obtained from multiplication of the appropriate matrices at the third stage. This matrix contains negative, zero and positive values. These values are interpreted appropriately. The first group, i.e. negative and zero values, should be discarded as useless for a given land function. As for the positive points, the maximum values should be found and used in further analysis.

## Lindenmayer grammars

Lindenmayer grammars, or parallel rewriting systems, are a class of formal languages. The most basic groups of L-systems are: D0L-systems – deterministic context-free systems, IL-systems, context-sensitive systems, where I is the number of systems, stochastic systems, parametric L-systems (PRUSINKIEWICZ, LINDENMAYER 1996, PRUSINKIEWICZ et al. 1995, PRUSINKIEWICZ et al. 1996, PEITGEN et al. 1996). An important extension of L-systems is their enrichment with programming elements (PRUSINKIEWICZ et al. 1996).

The idea of L-systems consists in that we start with an axiom, which can be a single symbol or a set of symbols. Then the set of productions is reviewed in search of rules which fit a given symbol. If the rule is found, the symbol is deleted and the sequence in the rule is rewritten in its place. Sequences should be rewritten at the same time for all symbols. If the rule cannot be found for a given symbol, it is rewritten without changes. Theoretically the rewriting cycle can be continued ad infinitum. However, it is most often determined in advance how many times rewrites will be carried out. If needed, a rule can be included which will stop the whole process or which will cause only empty symbols, for which there will be no rules, to appear in the sequence and the whole process will stop (PEITGEN et al. 1996, PRUSINKIEWICZ, LINDENMAYER 1996).

The formal definition of a parametric context-free L-system will be presented below. A parametric OL-system is defined as an ordered quadruplet:

$$G = \langle V\ \Sigma,\ \omega\ P \rangle,$$

where: $V$ – is the alphabet of the system, $\Sigma$ – the set of formal parameters, $\omega \in (V \times \Re^*)^+$ is a non-empty parametric word called the axiom,

$$P \subset (V \times \Sigma^*) \times C(\Sigma) \times (V \times E(\Sigma))^*$$

is a finite set of productions.

The individual elements are understood as follows: $M^* = (V \times \Re^*)^*$ is the set of all module sequences, $M^+ = (V \times \Re^*)^+$ is the set of all non-empty module sequences, $C(\Sigma)$ is a logical expression, $E(\Sigma)$ is an arithmetic expression using parameters from the set $\Sigma$. We can use in logical and arithmetic expressions: parameters, numerical constants, arithmetic operators: $+,-,*,/$, exponentiation operator $\wedge$, relational operators: $<,<=,>,>=,=,==$, logical operators: $!,\&\&, ||$ (negation, and, or); brackets $()$ and references to mathematical functions, e.g. sine, and to pseudo-random number generators (PRUSINKIEWICZ, LINDENMAYER 1996, PRUSINKIEWICZ et al. 1996).

A production in a parametric OL-system is denoted as $a : w \to \chi$, where: $a$ – the predecessor, $w$ – the condition and $\chi$ is the successor. A given symbol is replaced with the sequence $\chi$ if: the symbol equals $a$, the number of parameters is the same and the condition $w$ is met. Moreover, we write $a \to \chi$ when the parametric word $\chi$ is successfully derived from the module $a$ as a result of rewriting (PRUSINKIEWICZ, LINDENMAYER 1996, PRUSINKIEWICZ et al. 1996).

# Compilation of the cartographic method and Lindenmayer grammars

The Lsystem Urban Development program uses the above-mentioned cartographic method. However, it was modified for the needs of the program and the use of Lindenmayer grammars. The first two stages are analogous to the above-described cartographic method. This means that a network of squares is superimposed on the prepared map. The features which can be found in the map are then written down in the inventory matrix. However, a change has taken place here compared to the described cartographic method. The features were grouped for more efficient reading, which is shown in Table 1.

This will give 8 inventory matrices, where the value "0" – that is the absence of a feature or the corresponding value from the table can appear in each matrix. The value of the dominant feature, as that most influencing the analysed basic field, is entered within a given group. This significantly shortens and simplifies the inventory of features. In the third stage, the product of the transposed matrix of features inducing optimal use and the inventory matrix is no longer conducted for the whole area but only for these fields which will be selected using the proposed Lindenmayer grammars.

The Lsystem Urban Development program stores the network of squares as a dynamic table of objects, where the object is a single basic field. This basic field contains some parameters read from the inventory matrix and parameters used for computations. Because it is impossible that the user can view the contents of the computer's memory and thus check how the computations are conducted, a sequence containing all parameter values is displayed in an alphanumeric form. The definition of the module, which is identified with the basic field, is given below: $SQ([no.x,no.y],d,f,v,w,z,s,dr,i,k,p,u)$, where individual parameters determine: $no.x$, $no.y$ – x and y coordinates of a given square, d – direction of passing to the next field, f – land (use) function, v – sum of values for a given field, w – value from the waters group, z – value from the greenery group, s – value from the land structure group, dr – value from the roads and technical infrastructure group, i – value from the other land group, k – value from the land exposure group, p – value from the slopes group, u – value from the land in use group (ŻUKOWSKA 2008, 2012a, 2012b).

The direction of passing to the next field is selected at random. It is possible in the program to switch randomization: either the direction in each basic field is randomized once and does not change in subsequent steps or the direction in each basic field is randomized at each rewrite.

Table 1

Groups of features with letter designations

| *w* – waters | | *k* – land exposure: | |
|---|---|---|---|
| Value | Feature | Value | Feature |
| 0 | none | 33 | northern |
| 1 | lake shorelines | 34 | north-eastern |
| 2 | rivers and streams | 35 | eastern |
| 3 | canals and ditches | 36 | south-eastern |
| 4 | swamps and marshes | 37 | Southern |
| 5 | small standing waters | 38 | south-western |
| 6 | springs | 39 | western |
| 13 | wetlands | 40 | north-western |
| *z* – greenery | | *p* – slopes | |
| 0 | none | 41 | 0–3% |
| 7 | forest boundaries | 42 | 3–6% |
| 8 | rows of trees | 43 | 6–10% |
| 9 | groups of trees, groves | 44 | 10–15% |
| 10 | single trees | 45 | 15–25% |
| 11 | bush belts, hedges | 46 | 25–35% |
| 12 | brushwood, bush clumps | 47 | Over 35% |
| *s* – land structure | | *u* – land in use | |
| 0 | none | 48 | Meadows I-III |
| 14 | gorges, ravines | 49 | Meadows IV-V |
| 15 | scarps, embankments, excavations | 50 | Meadows VI |
| 16 | sands, boulder deposit areas | 51 | Grassland I-III |
| 17 | rocks, boulders | 52 | Grassland IV-V |
| | | 53 | Grassland VI-VIz |
| | | 54 | arable land I-IIIb |
| | | 55 | arable land IVa-V |
| | | 56 | arable land VI-Viz |
| *i* – other land | | *dr* – roads and technical infrastructure | |
| 0 | none | 0 | none |
| 18 | devastated areas | 22 | power lines |
| 19 | industrial land in use | 23 | railway lines |
| 20 | buildings | 24 | hard-surfaced roads |
| 21 | ruins | 25 | improved roads |
| 29 | cemeteries and burial grounds | 26 | dirt roads |
| 30 | protected areas | 27 | Paths |
| 31 | natural monuments | 28 | Enclosures |
| 32 | historical monuments | | |

Source: ŻUKOWSKA (2008, 2012a, 2012b).

Selected rules used in the program are given below:
Example rule for direction selection:
SQ([no.x,no.y], d, f, v,w, z, s, dr, i, k, p, u) :
    d = 0 → SQ([no.x -1,no.y], d, f, v,w, z, s, dr, i, k, p, u),
Example rule defining field usefulness:
SQ([no.x,no.y], d, f, v,w, z, s, dr, i, k, p, u) :
    V > 0 ∧ calc = 1 → mark as useful for f,
Example rule defining the value for the agricultural function:
SQ([no.x,no.y], d, f, v,w, z, s, dr, i, k, R, u) :
    f = 1 ∧ w = 1 ∧ calc = 0 → SQ([no.x,no.y], d, f, v-5,w, z, s, dr, i, k, p, u)

## Optimal land use analysis using the Lsystem Urban Development program

To carry out an optimal land use analysis using the Lsystem Urban Development program, the user must inventory the features and enter them in inventory matrices in the program. The user must then select the land use function and select the coordinates of the initial basic field, or the axiom. The next step is to perform the rewriting. The results will be given as a table and the created sequence of productions. Additionally, if the user has a map, it is possible to present the results on the map, after prior specification of the map scale. Let us take a fragment of the map of Olsztyn as an example. An agricultural function – arable land is selected for the first analysis. The first axiom is a field with coordinates 2,2, the randomization direction will be selected in each rewrite:
Axiom: SQ([2,2],0,1,0,2,7,14,26,20,37,42,0);
First rewrite: SQ([2,2],6,1,14,2,7,14,26,20,37,42,0)
SQ([1,2],0,1,0,0,7,0,23,0,35,0,0);
Second rewrite: SQ([2,2],2,1,14,2,7,14,26,20,37,42,0)
SQ([1,2],5,1,-2,0,7,0,23,0,35,0,0) SQ([3,3],1,1,0,2,7,15,24,20,34,42,0);
Third rewrite: SQ([2,2],1,1,14,2,7,14,26,20,37,42,0)
SQ([1,2],2,1,-2,0,7,0,23,0,35,0,0) SQ([3,3],0,1,-3,2,7,15,24,20,34,42,0)
SQ([2,1],2,1,0,5,7,0,23,20,34,45,0) SQ([4,3],2,1,0,5,7,15,26,20,40,45,0).

The first axiom is a field with coordinates 2,2, the passing direction will be randomized only at field creation:
Axiom: SQ([2,2],6,1,0,2,7,14,26,20,37,42,0);
First rewrite: SQ([2,2],6,1,14,2,7,14,26,20,37,42,0)
SQ([3,3],0,1,0,2,7,15,24,20,34,42,0);
Second rewrite: SQ([2,2],6,1,14,2,7,14,26,20,37,42,0)
SQ([3,3],0,1,-3,2,7,15,24,20,34,42,0) SQ([2,3],2,1,0,2,7,14,26,0,40,42,0);
Third rewrite: SQ([2,2],6,1,14,2,7,14,26,20,37,42,0)
SQ([3,3],0,1,-3,2,7,15,24,20,34,42,0) SQ([2,3],2,1,13,2,7,14,26,0,40,42,0)
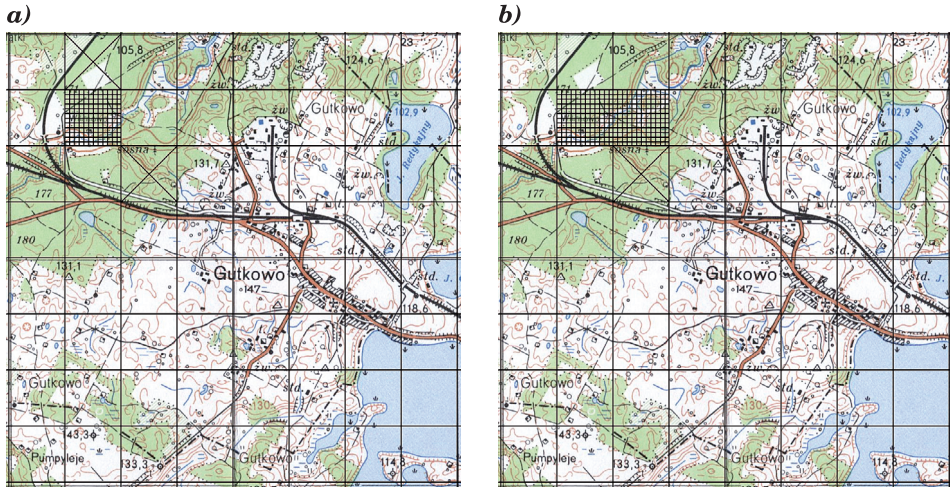
a)                                     b)



Fig. 1. Results: the squared fields denote areas suitable for the selected function, the crossed fields denote areas unsuitable for the selected function. The part (a) contains the result for the selected parameters when the direction of passing to the next square is randomized in each rewrite for each square and the part (b) the case when the direction is randomized once only at field creation
Source: Generated using the Lsystem Urban Development program.

An analysis itself of sequences created in successive rewrites already shows that the selected method of direction randomization when passing to the next field causes a higher or lower number of basic fields to be selected. If randomization in each rewrite is selected, basic fields can expand at an exponential rate. If the option that direction randomization is selected only once is chosen, then it may happen that at a certain point there are no longer new fields to be selected.

In Figure 1a and 1b the squared fields denote a field which is suitable for the selected function, in our case for arable land. The crossed fields denote that the basic fields are unsuitable for the selected function. It can be observed in both figures that the crossed fields are located within forests. This seems logical because the transformation cost for such land would be too high. Apart from legal aspects associated with changes in the local spatial management plan, aspects associated with land adaptation as well as ecological aspects, e.g. the effect of cutting down trees on the neighbouring areas and ecosystem, should be taken into account. Hence these areas are unsuitable for agricultural land. As can be seen, the selected method has confirmed its usefulness.

The fields with coordinates (2,2) and (2,3) were marked with a square pattern as those which are suitable for arable land. They are in a narrow, where there is a watercourse. Perhaps the value of these areas after transformation into arable land will exceed the transformation cost. However, it is

interesting what happens when the same coordinates are selected, but a totally different land function (the forest productive function) is selected:

Forest industrial function, randomization of the direction of passing to new fields in each rewrite:

Axiom: SQ([2,2],1,4,0,2,7,14,26,20,37,42,0);

First rewrite: SQ([2,2],3,4,21,2,7,14,26,20,37,42,0)
SQ([3,2],6,4,0,0,7,15,24,20,33,0,0);

Second rewrite: SQ([2,2],6,4,21,2,7,14,26,20,37,42,0)
SQ([3,2],0,4,21,0,7,15,24,20,33,0,0) SQ([2,3],1,4,0,2,7,14,26,0,40,42,0)
SQ([4,3],4,4,0,5,7,15,26,20,40,45,0);

Third rewrite: SQ([2,2],7,4,21,2,7,14,26,20,37,42,0)
SQ([3,2],4,4,21,0,7,15,24,20,33,0,0) SQ([2,3],2,4,33,2,7,14,26,0,40,42,0)
SQ([4,3],1,4,22,5,7,15,26,20,40,45,0) SQ([3,3],4,4,0,2,7,15,24,20,34,42,0)
SQ([3,4],3,4,0,2,7,0,28,20,35,42,0)

Forest industrial function, direction randomization only once at field creation:

Axiom: SQ([2,2],1,4,0,2,7,14,26,20,37,42,0);

First rewrite: SQ([2,2],1,4,21,2,7,14,26,20,37,42,0)
SQ([3,2],4,4,0,0,7,15,24,20,33,0,0);

Second rewrite: SQ([2,2],1,4,21,2,7,14,26,20,37,42,0)
SQ([3,2],4,4,21,0,7,15,24,20,33,0,0) SQ([2,3],6,4,0,2,7,14,26,0,40,42,0);

Third rewrite: SQ([2,2],1,4,21,2,7,14,26,20,37,42,0)
SQ([3,2],4,4,21,0,7,15,24,20,33,0,0) SQ([2,3],6,4,33,2,7,14,26,0,40,42,0)
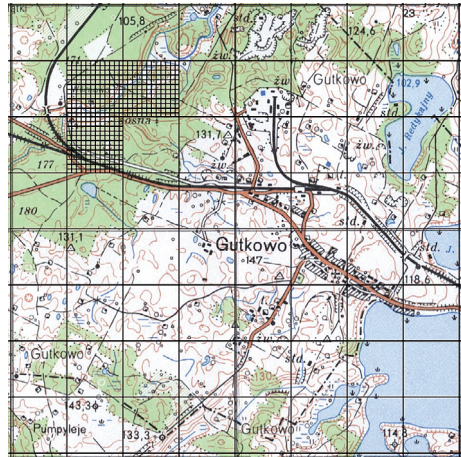SQ([3,4],4,4,0,2,7,0,28,20,35,42,0)
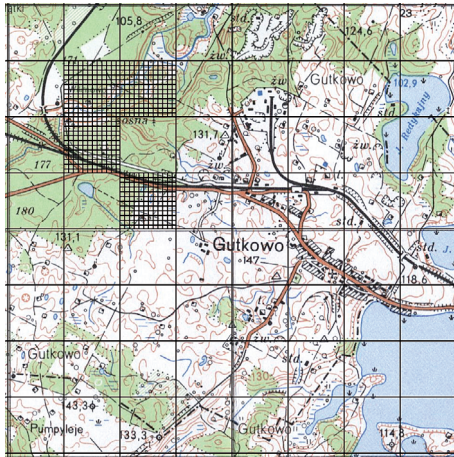


Fig. 2. Results for the forest industrial function. The squared fields are areas useful for the selected function. There are two cases: a) when the passing direction is randomized at each rewrite; b) when the passing direction is randomized at field creation

Analysing only the figures 2a and 2b themselves, it can be observed that the areas which were marked as favourable for the forest industrial function are fields dominated by forests. However, it would be worth checking the value v, which is the total value for individual fields and indicates the force with which a given function will be able to exist in a given field. For the agricultural function, it is 1 for the field with coordinates (2,2) and also 1 for the field with coordinates (2,3) and for the forest industrial function it is 4 for the fields (2,2) and (2,3). These two fields were not selected by chance – they were marked as favourable in both analyses. In the other cases, when a field is marked in one analysis as useless for a function, but is useful for another, the conclusion as to which function is more advantageous is obvious – the function is selected for which the field was marked as favourable. It would be different if fields were selected as favourable for both functions. The total value of the field, denoted as v, must be compared here and the one with the higher value selected. In the presented analysis, the forest productive function obtains the higher value for the fields (2,2) and (2,3), thus this function will bring more benefits for the considered transformation.

## Recapitulation

The method presented in this study, a compilation of the cartographic method and Lindenmayer grammars, allows an optimal land use analysis to be easily performed. The results of this analysis can be used in spatial planning, in land value determination as well as in land transformation value determination. The presented example of an analysis demonstrates how this can be carried out and how the results can be interpreted. Because of the size of the paper, although it is not a full analysis, it nonetheless shows the capabilities of the discussed method. A full analysis would include comparison of all land use functions, and more rewrites could be conducted than only 3. Finally, in a full analysis, rewrites could be performed until all fields are filled. All of this depends on the needs of the conducted study.

As we described above the method is working for finding the optimum usage of a land and is working quickly and efficiently. The conclusions from analysis are simple and can be confirmed by pure analysis of map's fragment. Proposed method is also suitable for economic use especially for optimizing land use. Therefore this method is recommended for not only for people who works with urban or rural environment but also for economists, who are interested in finding optimum usage of a land. The specified analysis can be used for planning, changing purpose of a land and moreover for estimation of a land value in further analysis. It can be also a base for calculating rent for a land.

The selection of optimal land use is only one of the many applications of L-systems. The adopted solution is fast and simple, which is an unquestionable advantage in today's world. Further development of the method could involve inclusion of other basic field selection methods, perhaps using genetic algorithms and proposed program can be part of GIS.

Translated by JOANNA JENSEN

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# EVALUATION OF THE INFLUENCE OF A CHOSEN ELEMENT OF INSURANCE COMPANIES' EMPLOYEES BEHAVIOUR OF ON SPECIFIC ASPECTS OF CUSTOMER RELATIONS MANAGEMENT

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### A b s t r a c t

Evaluation of the influence of a selected component of the insurance companies' employees' behaviour on the specific aspects of customer relations management was the objective of the paper. In the paper the hypothesis was assumed that appropriate development of customer relations depends to a large extent on the behaviours of employees defined mainly in the company management strategy in which strictly defined procedures in that area are indicated and appropriate technical, information, IT and organisation and management means are assured.

The evaluation was made based on own surveys in which the questionnaire method was used. The mail or Internet questionnaire was the research tool. The questionnaires were distributed to 63 insurance companies possessing their registered offices in Poland during the years 2009–2011. In total, 57 completely and correctly completed questionnaires were returned.

## OCENA WPŁYWU WYBRANEGO ELEMENTU ZACHOWANIA PRACOWNIKÓW ZAKŁADÓW UBEZPIECZEŃ NA OKREŚLONE ASPEKTY ZARZĄDZANIA RELACJAMI Z KLIENTAMI

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### A b s t r a k t

Celem artykułu jest ocena wpływu wybranego elementu zachowania pracowników zakładów ubezpieczeń na określone aspekty zarządzania relacjami z klientami. W opracowaniu przyjęto następującą hipotezę – właściwe kształtowanie relacji z klientami w dużym stopniu zależy od

zachowań pracowników określonych głównie w strategii zarządzania firmą, w której wskazano ściśle zdefiniowane procedury postępowania w tym zakresie oraz zapewniono odpowiednie środki techniczne, informacyjne, informatyczne i organizacyjno-zarządcze.

Oceny dokonano na podstawie wyników badań własnych, w których wykorzystano metodę kwestionariusza, narzędziem badawczym była ankieta pocztowa lub internetowa. Ankiety zostały wysłane do 63 zakładów ubezpieczeń mających siedzibę w Polsce w latach 2009-2011. Zwrócono w pełni i prawidłowo wypełnionych 57 ankiet.

## Introduction

Every insurance company must now match the values of its offer to the market that is its current and potential customer' needs and expectations. Hence, the known formula of focus on the enterprise perspective (the so-called 4P) must be substituted by a new concept based on the customer perspective (the so-called 4C), which according to the author of that concept, R. Lauternborn, not only changes the enterprise perspective into customer focus but also causes that successful enterprises in the market satisfy the needs of their customers cheaply and comfortably applying effective communication methods (LAUTERNBORN 1990, p. 26). The largest transformations among all the traditional marketing mix composition areas can be observed within the promotional measures, i.e. communicational measures according to the 4C concept. Today we should talk about the complex process of communication between the company and its customers as only well-chosen contents of messages may reflect the best the correlations between the given brand and their internal, required set of expected characteristics and values in the minds of current and potential customers (SKOWRON 2012, p. 144). Among those expected characteristics there are also behaviours of employees of insurance companies concerning performance of the customer integration process that involves, among others, building mutual trust expressed in contacts, exchange of information, participation in common events, assistance in difficult situations, and so on.

## Customer service system

The customer service system is the base for creating and managing customer relations. The company that wants to compete efficiently in the market and be successful must create the added value not only for the customers and investors but also for the employees (OBŁÓJ 2002, pp. 57–66). The employees collaborating with the customers directly have the largest influence on appropriate development of those relations. Efficiency and effectiveness of their activities is based not only on building lasting and partnership

relations with customers but also on the management developed company management strategy in which the employees get full support of the management – formal, technical, organisational and management – in appropriate development of customer relations.

Customer relations management is the way of conducting business where the customer, his expectations and needs are the focus of interest of the entire company (ZACHARA 2001, p. 15). The IT application covering the methods, software and use of the Internet potential assuring organised development of specific customer relations is one of the tools of that management. The IT support of customer relations management encompasses factors such as acquisition and continuous updating of the knowledge on customer needs, their motivations and behaviours, integration of marketing activities, sales and services for achievement of the common goals, measuring the costs of marketing and sales of services as well as profits generated on the individual customers (GWIAZDA 2002, p. 47). Internet use for customer relations management was named e-CRM. Its specific characteristic is that information on the customers is collected based on their behaviours as a result of processing the information from the statistic of visits, collected data and defined analysis algorithms (LIPIŃSKA 2003, pp. 44–46).

An important role in building innovative organisational culture focused on partnership relation with the customer is played by the leadership role of the management. Managers formulate not only the mission and vision of the company but also the standards of employee behaviours that together build the system of company values. That fact itself does not assure all the conditions necessary for systematic search for changes focused on the customer yet, nevertheless, it offers the base for development of such innovative culture. If, however, the management involves itself personally in direct contacts with customers or organisation partners, this means understanding the needs and expectations of customers, combining current efficiency with long-term outcomes in building contacts with customers as well as involving chosen customers in joint development projects focused on quality improvement in searching for the methods of building such durable relations with customers and increasing their loyalty. Moreover, support of the management to client-focused orientation and activity of employees is supportive to identification of employee problems related to customer service, which offers the base for honest evaluation of the activities of employees targeted at customers, communication of potential problems that occurred in the customer service area, appropriate focusing of motivation of the employees on taking the effort increasing customer satisfaction, development of attitudes of involvement in the customer situation and standing, intuitive understanding of customer expectations related to the offered products and the service environment in the

company premises (SKOWRON 2012, p. 142). It is believed that for the manager the employee must be no less important than the customer and hence the manager should, as a reliable person, stimulate positive attitudes towards the customer and his problems, induce employees to build relations with customers and make organisational improvements in customer service area, compensate for "being available" to the customer and involvement to the benefit of the customer. As the results of some studies show, strong dependence exists between the employee and the customer satisfaction level (HILL, ALEKSANDER 2004, p. 16). Hence it can be concluded that motivated and satisfied employee means satisfied customer. The company employee is the one that initiates and maintains the process of satisfaction and hence the loyalty of customer, which translates directly into the company results. We can then talk not only about the customer potential but also the employee potential as the ability to take active part in the process of customer relations development in "his/her" company.

## Results of own surveys

Table 1 presents the results of the responses to the statement concerning the own employee's initiative in the area of changes in the way of performance of the job for the purpose of improving customer relations. As many as 65% of the respondents declared that frequently or vary frequently they take such initiative, however, the other 35% percent of the respondents do it just sometimes on never or almost never. Further in the analysis those results will be the baseline for searching for the dependence whether such attitude of employees influences specific aspects of customer relations management.

Table 2 presents the results of responses to the statement that the current contact between employees of different company departments improves the quality of the customer relations developed. More than a half of the respondents (exactly 56.2%) declared that they agreed or agreed fully with that statement, however, as many as 43.8% of the respondents presented opposite opinions. This means that in some insurance companies either problems in communication between employees of different departments existed or such contacts have no influence on development of customer relations.

For the purpose of determining the dependence between the frequency of undertaking own initiative by employees in improving customer relations and the level of agreement with the statement that current contacts between employees of different company departments improve quality of customer relations development the Chi-square test was applied. That test showed at the significance level $p < 0.01$ (Table 3), that the more frequently the employees

manifest their own initiative in improving customer relations the more it is believed that the current contacts between employees of different company departments improve quality of customer relations development.

Table 1

Results of responses to the statement: On my own initiative I am changing something in the way of performance of my job to facilitate relations with customers

| Item | Number of responses | Percent of responses |
|------|---------------------|----------------------|
| Never or almost never | 2 | 3.4 |
| Sometimes | 18 | 31.6 |
| Frequently | 23 | 40.4 |
| Very frequently | 14 | 24.6 |
| Total | 57 | 100.0 |

Source: own work based on the results of own surveys.

Table 2

Results of responses to the statement: Current contact between employees of different company departments increases the quality of development of relations with company customers

| Item | Number of responses | Percent of responses |
|------|---------------------|----------------------|
| I do not agree entirely | 4 | 6.9 |
| I do not agree | 9 | 15.8 |
| Hard to say | 12 | 21.1 |
| I agree | 16 | 28.1 |
| I fully agree | 16 | 28.1 |
| Total | 57 | 100.0 |

Source: own work based on the results of own surveys.

Table 3

Results of the Chi-square test for the dependence between the choice of a specific part of own initiative for changing something in the way of performing own job for the purpose of facilitating relations with customers and the degree of agreement with the statement that the current contact between employees of different company departments increases the quality of development of relations with company customers

| Item | Value | $p$ |
|------|-------|-----|
| Chi-square | 26.99 | < 0.01 |

Source: own work based on the results of own surveys.

The next aspects of customer relations management studied concerned the issue of whether investments in the field of the necessity of developing appropriate customer relations are profitable to the company. The responses are presented in table 4.

Results of responses to the statement: Investing in the employees in the area of the necessity of developing appropriate relations with customers is profitable to the company

| Item | Number of responses | Percent of responses |
|---|---|---|
| I do not agree entirely | 0 | 0.0 |
| I do not agree | 12 | 21.1 |
| Hard to say | 11 | 19.3 |
| I agree | 19 | 33.3 |
| I fully agree | 15 | 26.3 |
| Total | 57 | 100.0 |

Source: own work based on the results of own surveys.

In line with the Chi-square test results presented in table 5, the more frequently the employees change something in the way of performance of their job for the purpose of improving customer relations the more profitable investing in employees in the field of the necessity of developing appropriate customer relations is for the company. Obviously, the opposite thesis, i.e. that the more investing in employees in the area of the necessity of developing appropriate customer relations is profitable to the company the more frequently the employees manifest their own initiative to change something in the way of performing their job to improve customer relations may also be formulated based on that test. This is caused mainly by the additional bonuses disbursed to employees, most probably for – as already mentioned – being available to the customer and involvement to the benefit of the customer.

Table 5

Results of the Chi-square test for the dependence between the choice of a specific part of own initiative for changing something in the way of performing own job for the purpose of facilitating relations with customers and the degree of agreement with the statement that investing in the employees in the area of the necessity of developing appropriate relations with customers is profitable to the company

| Item | Value | $p$ |
|---|---|---|
| Chi-square | 25.76 | < 0.01 |

Source: own work based on the results of own surveys.

Table 6 presents the results of the responses to the statement that I show to the superior the areas of relations with customers not seen by him/her that may create added value for those relations. More than 60% of the respondents do it frequently or very frequently, which also means that the contact with the superior is rather of partnership type and easy and not forced and difficult. This may also indicate formalisation of the duties of employees in that area,

which is considered the postulated solution at insurance companies because it creates the possibility of more efficient and effective development of customer relations required because of the continually increasing competition in the insurance market.

Results of responses to the statement: I show to the superior the areas of relations with customers not seen by him/her that may create added value for those relations

| Item | Number of responses | Percent of responses |
|---|---|---|
| Never or almost never | 9 | 15.8 |
| Sometimes | 13 | 22.8 |
| Frequently | 25 | 43.9 |
| Very frequently | 10 | 17.5 |
| Total | 57 | 100.0 |

Source: own work based on the results of own surveys.

The Chi-square test showed (Tab. 7), that the more frequently the employees make changes to the way of performance of their job to improve customer relations the more frequently they show to their superiors the areas of customer relations not noticed by them that could create added value for those relations. This means trust of employees in the operational management staff of insurance companies and appropriate relations along the employee-manager line. This also creates better opportunities for joint customer creation by the managers and employees, i.e. positioning the customer interest in the system of values defined and developed together by the management and employees of the insurance company (STACHOWICZ-STANUCH 2007, pp. 35–52).

Results of the Chi-square test for the dependence between the choice of a specific part of own initiative for changing something in the way of performing own job for the purpose of facilitating relations with customers and the degree of agreement with the statement that I show to the superior the areas of relations with customers not seen by him/her that may create added value for those relations

| Item | Value | $p$ |
|---|---|---|
| Chi-square | 28.94 | < 0.01 |

Source: own work based on the results of own surveys.

Good relations of employees with the superiors (company management) may also be indicated indirectly by the fact that in case of the statement that the majority of data concerning customer relations obtained from outside the

company go to the company management only (the results of responses are presented in table 8), the Chi-square test (tab. 9) showed that at the significance level $p<0.18$ it is impossible to establish the existence of dependence between that fact and the choice of the specific frequency of taking own initiative in changing something in the way of performing own job for the purpose of improving customer relations.

Table 8

Results of responses to the statement: The majority of data concerning customer relations obtained from outside the company go to the company management only

| Item | Number of responses | Percent of responses |
|------|---------------------|----------------------|
| I do not agree entirely | 23 | 40.4 |
| I do not agree | 8 | 14.0 |
| Hard to say | 20 | 35.1 |
| I agree | 4 | 7.0 |
| I fully agree | 2 | 3.5 |
| Total | 57 | 100.0 |

Source: own work based on the results of own surveys.

Table 9

Results of the Chi-square test for the dependence between the choice of a specific part of own initiative for changing something in the way of performing own job for the purpose of facilitating relations with customers and the degree of agreement with the statement that the majority of data concerning customer relations obtained from outside the company go to the company management only

| Item | Value | $p$ |
|------|-------|-----|
| Chi-square | 16.27 | < 0.18 |

Source: own work based on the results of own surveys.

The influence of IT means of support that are available to the insurance company on the behaviour of employees in the area of customer relations development was another studied aspect of customer relations management. Table 10 presents the results of responses to the statement concerning the role of computer equipment of the company in obtaining complete evaluation and analysis of relations with company customers. More than 61% of the respondents stated that the role is large (I agree or I fully agree), however as many as 14% of the respondents had no opinion concerning that issue (hard to say). The Chi-square test showed at the significance level $p<0.001$ (Tab. 11), that the more frequently the employees on their own initiative change something in the way of performance of their job in the area of improving customer relations the more difficult it would be for them to imagine obtaining complete evaluation and analysis of relations with company customers without computers.

Results of responses to the statement: It is hard to imagine a modern company without using computers for obtaining the full evaluation and analysis of relations with company customers

| Item | Number of responses | Percent of responses |
|---|---|---|
| I do not agree entirely | 5 | 8.7 |
| I do not agree | 9 | 15.8 |
| Hard to say | 8 | 14.0 |
| I agree | 12 | 21.1 |
| I fully agree | 23 | 40.4 |
| Total | 57 | 100.0 |

Source: own work based on the results of own surveys.

Results of the Chi-square test for the dependence between the choice of a specific part of own initiative for changing something in the way of performing own job for the purpose of facilitating relations with customers and the degree of agreement with the statement that it is hard to imagine a modern company without using computers for obtaining the full evaluation and analysis of relations with company customers

| Item | Value | $p$ |
|---|---|---|
| Chi-square | 38.82 | < 0.01 |

Source: own work based on the results of own surveys.

Table 12 presents the results of responses to the statement that in the company regular use is made of the internal Internet (so-called Intranet), which allows better evaluation of the development of relations with customers in the entire company and in the individual departments. Only slightly over 50% of the respondents agreed with that statement, which would mean that the respondents notice the need for making extensive changes in that area.

Results of responses to the statement: In the company regular use is made of the internal Internet (so-called Intranet), which allows better evaluation of the development of relations with customers in the entire company and in the individual departments

| Item | Number of responses | Percent of responses |
|---|---|---|
| I do not agree entirely | 3 | 5.3 |
| I do not agree | 11 | 19.3 |
| Hard to say | 13 | 22.8 |
| I agree | 17 | 29.8 |
| I fully agree | 13 | 22.8 |
| Total | 57 | 100.0 |

Source: own work based on the results of own surveys.

The Chi-square test showed at the significance level $p<0.001$ (Tab. 13), that the more frequently the employees change something in the way of performance of their job for the purpose of improving customer relations the more regularly they use for that purpose the internal Internet (the so-called Intranet).

Table 13

Results of the Chi-square test for the dependence between the choice of a specific part of own initiative for changing something in the way of performing own job for the purpose of facilitating relations with customers and the degree of agreement with the statement that in the company regular use is made of the internal Internet (so-called Intranet), which allows better evaluation of the development of relations with customers in the entire company and in the individual departments

| Item | Value | $p$ |
|------|-------|-----|
| Chi-square | 30.28 | < 0.01 |

Source: own work based on the results of own surveys.

## Conclusion

Appropriate management of all the processes leading to obtaining the value for the client that results in his loyalty concerns both coordination of processes within the same insurance company and collaboration of the company with the customers within the framework of created and operates customer relation systems. An important role in those processes is played by the insurance company employees that together with the customers of the company create the integrated model of mutual relations development. Building that model has its beginning in the insurance company strategic policy open to development of communication technology and respecting the economic calculus. The employee supplies benefits to the customer directly (by servicing the customer and communicating with him) as well as indirectly as a consequence of the efficient performance of tasks for the insurance company that should create its employees conditions for customer focused activities and behaviours.

In the presented results of surveys the author searched for the dependence (correlation) between the selected behaviour of the employees in the area of customer relations development and the specific aspects of the insurance company management. The most important conclusions from the conducted surveys can be presented in the following way – the more frequently the employee shows his/her own initiative in improving customer relations:

– the more the current contacts between employees of different company departments improve the quality of customer relations development,

– the more it is profitable to the insurance company,

– the more frequently the employees show their superiors the areas of

customer relations not noticed by them that could create added value for those relations,

– the more difficult it would be for them to imagine obtaining complete evaluation and analysis of relations with company customers without computers,

– the more regularly they use for the purpose the internal Internet (Intranet).

The results of studies showed that it is impossible to determine existence of dependence between employees showing their own initiative in improving customer relations and the level of agreement with the statement that the majority of data concerning customer relations obtained from outside the company go to the company management only. This means that even if such a situation occurs sometimes it is of no importance for the behaviour of insurance companies' employees. The more so that as the results of the survey showed (Tab. 8), the majority of the respondents did not agree with that opinion concerning actions by the managements of companies.

The results obtained confirm the European model for employee satisfaction surveying in the part in which it relates to the correlation between employee satisfaction and motivation and the enterprise results, the share of the employee factor in providing value to the customer, the role of direct superiors, availability of resources necessary for performance of daily duties in appropriate development of customer relations (Agencja Badawcza 2012). Systematic application of that model allows the management, among others, diagnosing the sources of increase in revenues thanks to the better customer service and hence the increase of customer satisfaction. Concluding on the results of the studies it can be stated that the hypothesis assumed in the paper was verified positively.

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## GUIDELINES FOR TEXT PREPARATION FOR THE "OLSZTYN ECONOMIC JOURNAL"

The "Olsztyn Economic Journal" (ISSN 1897–2721) is a scientific magazine published in English at the Faculty of Economic Sciences of the University of Warmia and Mazury in Olsztyn. During the years 2007–2012 the magazine was published semi-annually and as of 2013 it was transformed into a quarterly. It publishes scientific papers of methodical, review and empirical nature in economic sciences. The Olsztyn Economic Journal is published by the University of Warmia and Mazury in Olsztyn Publishing House. The printed format is the primary form of the magazine. Additionally, all numbers of the magazine are available also in the electronic format on the website: http://www.uwm.edu.pl/wne/olsztyn_economic_journal.html.

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Karpacki M., Sawicki H. 1980. *Ekonomika i organizacja gospodarstw wiejskich*. PWN, Warszawa.

Kos C. 1997. *Marketing produktów żywnościowych*. PWRiL, Warszawa.

**Collective papers:** Dbajmy o właściwe suszarnictwo ziarna. Red. K. Lewin 1982. T. 1. PWN, Warszawa.

When use is made of a particular **part or chapter only**:Lenartowicz M. 1963. Opis bibliograficzny. W: Metodyka bibliograficzna. SBP, Warszawa, s. 6–16.

### Periodicals:

In the bibliography the following information should be given in sequence: surname of the author and initial, year of publication, paper title and next the official abbreviation of the periodical, volume, number (in brackets) and pages on which the paper is published, e.g.: Czaja J., Żak M. 1993. *Systemy przetwarzania danych przy szacowaniu nieruchomości metodami rynkowymi*. Acta Acad. Agricult. Tech. Olst., 451, Geod. Ruris Regulat., 24: 7–19.

Tomczyk Z. 1996. *Wynalazczość i racjonalizacja źródłem postępu technicznego*. Gosp. Narod., 6: 21–25.

**Unpublished papers:** Malicki K. 1990. *Ubój świń. Instytut Żywienia Zwierząt ART*, Olsztyn (typewritten text). Kowalski H. 1992. *Wychów cieląt. Katedra Hodowli Bydła ART*, Olsztyn (doctoral dissertation).

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