ECONOMIC SCIENCE FOR RURAL DEVELOPMENT

1. Production and Cooperation in Agriculture

2. Bioeconomy

3. Finance and Taxes

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Time schedule of the conference

Preparation of the proceedings and organization: October 2014 – April 2015
Conference: 23-24 April 2015

Researchers from the following higher education institutions, research institutions, and professional organizations presented their scientific papers at the conference:

Mendel University in Brno	Czech Republic
Silesian University in Opava	Czech Republic
Estonian University of Life Sciences	Estonia
Natural Resources Institute	Finland
Fulda University of Applied Sciences	Germany
Latvian State Institute of Agrarian Economics	Latvia
University of Latvia	Latvia
Latvia University of Agriculture	Latvia
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Rezekne Higher Education Institution	Latvia
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Baltic Psychology and Management University College	Latvia
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Editorial Board

Foreword

The international scientific conference "Economic Science for Rural Development" is organized annually by the Faculty of Economics and Social Development of Latvia University of Agriculture. The proceedings of the conference are published since 2000.

The scientific papers presented in the conference held on 23-24 April 2015 are published in 4 thematic volumes:

No 37 Production and Cooperation in Agriculture
    Bioeconomy
    Finance and Taxes

No 38 Integrated and Sustainable Regional Development

No 39 Rural Development and Entrepreneurship

No 40 Marketing and Sustainable Consumption
    New Dimensions in the Development of Society

The proceedings contain scientific papers representing not only the science of economics in the diversity of its sub-branches, but also other social sciences (sociology, political science), thus confirming inter-disciplinary development of the contemporary social science.

This year for the first time the conference includes the section on a new emerging kind of economy - bioeconomy. The aim of bioeconomy is to use renewable biological resources in a more sustainable manner. Bioeconomy can also sustain a wide range of public goods, including biodiversity. It can increase competitiveness, enhance Europe's self-reliance and provide jobs and business opportunities.

The Conference Committee and Editorial Board are open to comments and recommendations concerning the preparation of future conference proceedings and organisation of the conference.

Acknowledgements

We would like to thank all the authors, reviewers, members of the Conference Committee and the Editorial Board as well as supporting staff for their contribution organising the conference and preparing the proceedings. In particular we wish to thank associate professor Signe Dobelniece, assistant professor Zenija Kruzmetra, lecturer Lana Janmere, lecturer Baiba Miltovica, and assistant professor Juris Vuguls.

On behalf of the Editorial Board
Gunars Brazma
Associate professor of Faculty of Economics and Social Development
Latvia University of Agriculture

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CROP YIELD INSURANCE – NEGOTIATING BETWEEN GOVERNMENT, FARMERS AND INSURANCE COMPANIES

Kęstutis Peleckis[1], prof.; **Valentina Peleckienė[2*],** associated prof.; **Kęstutis Peleckis[3],** PhD student. [1,2,3,]Vilnius Gediminas Technical University, Lithuania

Abstract. The purpose of this paper is to analyse the experience of crop yield insurance in Lithuanian agricultural sector against unfavourable climatic factors causing the losses of crop harvest and their impacts on the insurance premiums and the indemnity for damage. The huge problem of Lithuanian crop insurance system is the low rate of farmer's participation and problems arising in defining insurance premiums. However, there are noticeable substantial climate changes during the last 20 years, and agricultural sector in future will be more affected by unfavourable climatic conditions and such natural disasters require the Government to provide assistance to farmers. The amount of insurance premiums for crop insurance are relatively high, because a single Insurance Company does not accumulated sufficient statistics, so farmers rarely use its services: now there are insured only 7% of insurable crop areas in Lithuania. Consequently, negotiating takes place between farmers, Insurance Company and Government concerning compensation for crop yield losses. The aim of paper is to analyze the advanced experience of other countries, to evaluate principles of crop insurance in order to give proposals for all negotiating parties. Methods of the investigation are comparative analysis of the problem, descriptive approach, synthesis, modeling. The results and conclusions of the paper suggest to modify the principles of crop insurance driving to „low-premium", „wide coverage" system, to increase the transparency of damage evaluation and payment of insurance claims and to be more focused on trends of climate change in future.

Key words: Crop insurance, loss indemnity, insurance premium, yield, weather-related disasters.

JEL code: G18, G22, Q18, Q54.

Introduction

Lithuanian agriculture employs about 5% of all persons employed. The production of agricultural sector accounts approximately 8% of GDP of Lithuania. Agriculture is a strategic sector of the economy of Lithuania due to its ties to elements essential to the quality of life of a country's population: food supplies and the environment. Crops were grown by 159 600 farms in 2013. Widespread crops in Lithuania are winter cereals and spring cereals. The winter

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cereals harvest has increased by 12.0% (169 thousand t) and harvest of spring cereals – 4.7% (59 thousand t) in Lithuania throughout 2000 – 2010 year period (Balezentis, 2011). However, it is also one of the activities with the highest risk exposure, mostly because it is carried out in a natural environment. It can also be argued that the degree of uncertainty in agriculture will be even more marked in the future due to the tendency of significant changes in weather conditions (climate change and environmental risks) and the increased international trade and free market conditions.

As for a long time insurers lacked competence in assessing the impact on plant violations to the final harvest, the ability and willingness competently and understandably to explain for farmers damages assessment methods. Hence, the negotiations between insurers and the farmers concerning crop insurance ended to conflicts typically and moved to the courts, what increased the unpopularity of the crop insurance service even more and formed negative attitude of the farmers to the insurers.

In this context, agricultural risk management has been the focus of both recent and current reforms in many countries belonging to the Organisation for Economic Cooperation and Development (OECD). Agricultural insurance is probably one of the most efficient and best known tools for managing the risks associated with agriculture. The trust of farmer in the policy of insurance is the clearest indicator of the insurance policy efficiency. It's validity becomes clear when an assessment is made on the extent of damages suffered by the insured product, since this is the time when the policy either meets or fails to meet the holder's expectations. For this reason, damage assessment is of crucial importance as it can guarantee insured farmers a satisfactory return on their work.

The objective is to carry out an investigation of crop insurance in Lithuania in order to define and offer proposals which can help solving problems arising in negotiations between farmers, Insurance Company and Government. Could the coverage level of crop insurance be capable to offer adequate compensation for yield loss from natural disasters or encourage farmers to purchase crop insurance? With the help of statistical data ratio analysis, this paper is to give recommendations for improving crop insurance system of Lithuania.

1. The overview of world agricultural insurance systems as a risk management tool

Crop insurance is an important tool to alleviate natural disaster risks. There are three types of crop insurance in the world: 1) cost insurance, 2) yield insurance and 3) revenue insurance (Ruihua *et al*., 2010).

The yield insurance is widely used in about 40 countries. Lithuania is using Government - subsidized crop insurance system from 2008, according to which the coverage level is defined on the yield cost incurred during crop production. Under the current policy of principles of crop insurance system the insurance system aims to stabilize the life of farmers in cases where natural disasters occur.

Three groups of countries can be distinguished in the European Union, which have different agricultural insurance systems (Bielza *et al.,* 2009). In Greece and Cyprus, crop insurance is mandatory only from hail, but farmers must be insured against other risks. Agriculture sector of another group of EU countries, which includes Spain, Portugal, Italy, France, Austria, Luxemburg, the Czech Republic, Slovakia, Latvia, Estonia and Lithuania, is cooperating with private insurance and public sectors and uses a variety of support measures. In other countries, the insurance system operates without state support, or only covers a number of possible risk factors (hail). The principal instruments used for risk sharing are disaster funds, regional cooperative programs and agricultural insurance. However, if the systemic risks covered in an agricultural insurance system are not passed on in the reinsurance market or backed by state guarantees (many farmers often suffer losses at the same time) insurance companies are obliged to create sizeable reserves of capital, the cost of which forces them to raise premiums to higher, and maybe impossible, levels for farmers. This means that agricultural insurance programs need the support of the public sector in order to provide ample cover at a price farmers can afford. Even though, governments disagree on the subject of whether or not to participate in the application of insurance models, analysis has shown that the most highly developed models are attained with government backing, within certain limits. Subsidies for insurance policies awarded by member states vary from one country to another and depend on the national policy on risk coverage, support for certain subsectors or assistance to certain types of agriculture. Some countries, have adopted this system as an essential part of agricultural policy for the stabilization of rural incomes.

At the time of the Common Agricultural Policy (CAP) when "Health Check" reform passed in November 2003, the EU rejected the implementation of a common risk management policy due to the wide range of different risks affecting European agriculture. More recently, the EU rejected and opted for conceding greater autonomy to member states to solve these problems themselves, with financial support from the EU.

Despite reservations of Commissions about the concept of an EU-wide insurance scheme or revenue insurance, there is a trend towards encouraging farmers to take responsibility for production risks. State aid guidelines provide that from 1 January 2010, compensation for losses due to adverse weather effects must be reduced by 50% if the farmer does not have insurance covering at least 50% of annual production or production-related income from the statistically most frequent climatic risks.

The new agreement on CAP reform reached in 2013 maintains two pillars, offering a more holistic and integrated approach to policy support. Specifically it introduces a new architecture of direct payments; better targeted, more equitable and greener, an enhanced safety net and strengthened rural development. As a result it is adapted to meet the challenges ahead by being more efficient and contributing to a more competitive and sustainable EU agriculture. The second pillar offers a new risk-management toolkit including insurance schemes for crops, animals and plants, as well as mutual funds and an income stabilization tool.

The agricultural sector is highly supported in the European, with various CAP instruments, reducing the level of income variability faced by farmers. However, in addition to these measures most countries have specific measures designed to help farmers manage risks, for example insurance. With regard to insurance type schemes, the level and extent of coverage and subsidization can vary widely in various countries.

2. Development of Crop insurance system in Lithuania

In 2006, the farmers of Lithuania suffered from drought: according to calculations, the losses exceeded LTL 600 million. Crop insurance has been carried out only by single insurance company "PZU Lithuania" in this period, for very high premiums, so only small part of farmers could insure their crops (they insured only 0.5% of overall size of crops), crop insurance for this company was unprofitable (during 5 years insurance company made only 1 000 insurance policies and insured approximately 10 000 ha of crops), therefore, farmers appealed to the state asking to cover losses caused by drought.

Already in 2006, assessing farmers' dissatisfaction with the insurance quality, the Ministry of Agriculture created a working group, which was instructed to prepare Lithuanian concept of crop insurance system that could meet the expectations of farmers, the state strategy, the European Union's priorities, trends and also would be attractive for Lithuania insurance companies. Members of the group undertook a detailed analysis of European, American and Asian countries experience on crop insurance, their existing legislation, the main trends and made recommendations for future model. It was found that the main components of risk management process are: the risk identification and assessment, its potential impact on the economy forecast; the creation and implementation of an action plan for risk management.

So working group in preparing the crop risk management action plan defined the main principles of crop insurance system (Radzevicius, 2007): interest and willingness; cooperation (coordinated interaction entities); interest and willingness; cooperation (coordinated interaction entities); fairness and objectivity; effectiveness; transparency; flexibility, adaptability; system stability; continuity of the system (development option).

German specialized crop insurance company Vereinigte Hagelversicherung VvaG „Branch" VH Lithuania" (Insurance Company) for carrying out crop insurance in Lithuania was selected in 2007 according to defined principles, which is cooperating successfully with Government of Lithuania and farmers up to now. However, the majority of the country's farmers are still unwilling to insure their crops: this is evidenced by statistics of the 2014 winter crop season, which began in August. Most farmers insured their crops against three risks: hail, rainfall and storms. No farmer had insured crops from drought risk. The winter crop insurance against the frost risk still gets a lot of discussions not only in Lithuania but in Europe also. Lithuania farmers complain of increased insurance premiums, although last winter did not make a lot of damage. However, the most famous European reinsurer's professionals say that farmers of Lithuania just were lucky in 2013 winter, because there was about 5 cm thicker coat of snow

cover. Only, in seaside region of Lithuania, where a snow cover was slightly lower, almost all winter crops have frozen. Consequently, Insurance Company have changed the insurance conditions for winter crops against frost risks in 2014, considering to the losses of last two years (Figure 1), when more than LTL 600 million of claims were paid due crop destruction by frost: the insurance premium for winter cereals and rape were increased from 1.8 to 2.5 times. So now the maximum premiums are for insurance of crops against destruction by frost. Yet, policyholders are repaid 20% of insurance premiums amount. In cases of a natural disaster, the Government can decide whether to provide support for this critical situation. It should cover losses not compensated by insurance. Member States in this case must inform the European Commission, that they intend to provide such support.
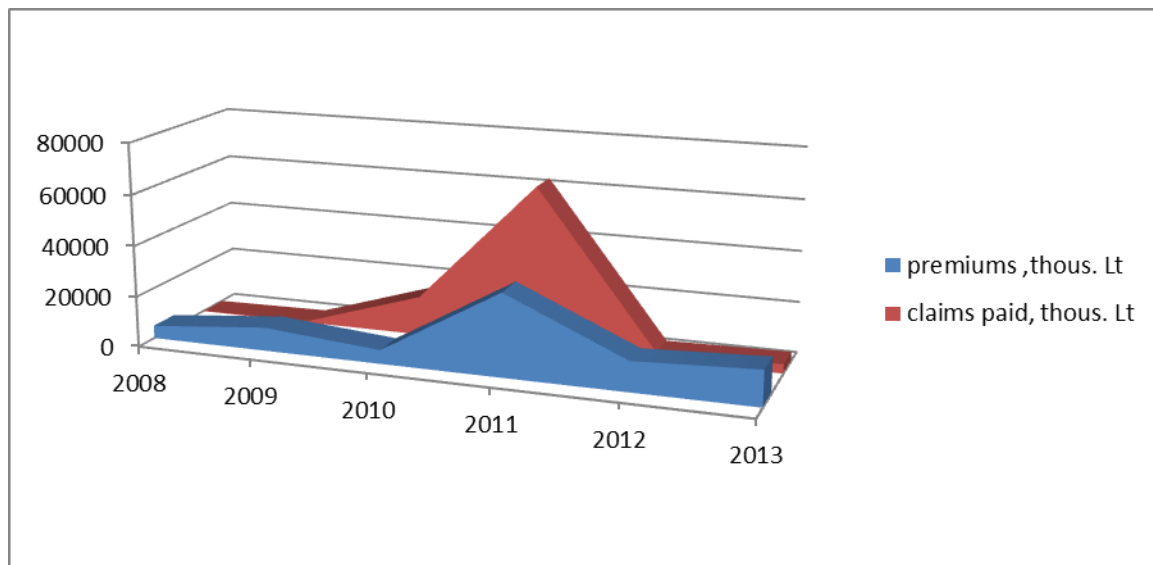
Source: author's construction based on statistics of Bank of Lithuania, Insurance supervisory authority

Fig.1. **Ratio of Insurance premiums and claims paid by Insurance Company**

The Insurance Company has opinion that crops' destruction by frost is loss insurance, rather than yield insurance because farmers can again re-sown crops, and can get a new harvest in the same year. In contrary, the hail can destroy the entire harvest. In the future farmers should focus more on crop insurance from destruction by frost or to sow less amounts of winter crops.

3. The main risk determinants and their evaluation

The most complicated issue for Insurance Company is definition of proper coverage level of the crop indemnity and determining the value of the sum insured. In 20I2 year the Ministry of Agriculture introduced restriction of 50% reimbursement of premium but no more than a certain amount of crops. This reimbursement amount is the main issue in negotiations between the Insurance Company and farmers. Defining the method of calculating reimbursement amount is essential. The decision was made to calculate it according to the income obtained from the crop production per hectare. Conditional income per hectare from growing one or

another kind of plants is calculated by statistical data - what is the average yield obtained from such unit of area and what is value of such production. After calculation the average income per hectare, the Insurance Company determines the highest amount for compensation of insurance premium: more income is higher, the insurance is more expensive, however, and the amount of compensation is higher. The Insurance Company acknowledges that now insurance premiums in Lithuania are relatively high, because the Insurance Company still does not have a so-called "history" that is, it have not accumulated enough statistical data that would allow to focus on questions: how often natural disasters touch agriculture, what areas do they cover. Insurance Company usually focuses on 30-year statistical average, while in Lithuania they work only for 7 years. Lithuania's specificity is that they have to persuade farmers to insure crops, when in other countries the insurance is much more common.

In summary can be said that there are too much constraints in trying to select feasible crop insurance scheme: lack of historical yield data, small sized farm holdings, low value crops, relatively high cost of insurance, distrust of farmers in insurance system.

4. Comparison of the harvest, areas and yields in estimation of loss indemnity costs

Winter cereals and spring cereals are the most common crops in Lithuania. Comparison of statistics on harvest, areas and yield of these two main kinds of crops in 10 counties (Alytus, Kaunas, Klaipeda, Marijampole, Panevezys, Siauliai, Taurage, Telsiai, Utena, Vilnius) has been displayed in Table 1 throughout the period of 2000-2010 on the basis of Lithuania Statistics database. Considering the results of analysis the total harvest increased about 110 thousand tons or by 4.0%. The total area of crops also grew up by 54 thousands ha or by 5.7% but the total yield of crops decrease from 2.7 to 2.6 ton per ha because of the yields drop of winter cereals from 3.1 to 2.9 ton per ha during the same period of time.

As for winter cereals, their area increased by 18.3%. More specifically, the share of winter crops compared with the whole area of Lithuania increased for counties of Marijampole, Siauliai, Telsiai, Panevezys and Taurage. On the other hand, this share decreased for counties of Kaunas, Vilnius, Utena, Alytus, and Klaipeda.

Table 1

Dynamics of crop harvest, area and yield in Lithuania under 2000 -2010 years

Cereals	Year	Harvest, t	Area, ha	Yield, t/ha
Winter cereals	2000	1410055	448934	3.1
	2010	1579274	530998	2.9
Spring cereals	2000	1247570	530693	2.3
	2010	1188492	505178	2.3
Total	2000	2657625	979627	2.7
	2010	2767766	1036176	2.6

Source: author's calculations based on Lithuania Statistics database

As for spring cereals, their area decreased by 4.8%, that is 25.5 thousand ha during 2000–2010 period. At the counties level the following shifts in crop structure were observed: in counties of Panevezys, Kaunas, Vilnius, Telsiai, Siauliai and Alytus has increased, whereas in counties of Marijampole, Taurage, Klaipeda and Utena has decreased.

Indeed, the research (Balezentis, 2011) has reported that the most efficiently operating farms were those in counties of Marijampole, Siauliai and Klaipeda. Hence, it might be concluded that farming is associated with growing of winter cereals efficiency and therefore counties of Marijampole and Siauliai were those managed to increase their share in total area of winter cereals in Lithuania (increases of 3.1% and 2.9%). Indeed, these findings can be based on commonly known advantages of winter cereals.

Considering the winter cereals, their harvest has increased by 12% (169 thousand t) in Lithuania throughout 2000–2010. The highest rates of increase were observed in counties of Telsiai, Marijampole, Taurage and Siauliai. At the other end of spectrum, counties of Vilnius, Utena, and Alytus exhibited the highest rates of decrease in harvest. The yield values have also been varying across different counties.

The alteration of the area proportions under different cereal species in certain county lead to positive effect of their mix. Hence, these changes can be considered as rational ones. Nevertheless, adverse climatic conditions lead to decrease in yields. Yield effect, hence, caused decline of 6% or 246 thousand t in total harvest. In accordance with the results obtained by Lithuanian scientists (Balezentis, 2011), the results of multiplicative index decomposition analysis (IDA) for cereal crop harvest in Lithuania during 2000–2010 year period, which are presented in Figure 2, suggest that the area effect caused increase in harvest of some 6%. Meanwhile, species mix effect led to increase in harvest of 3%, whereas structure effect – to that of 2%. The yield effect caused decrease of some 6%. The total harvest during researched period, therefore, grew by 4%.

Over time, the loss experience for an average individual producer is generally related to:

- the crop characteristics,
- the production area,

- and the weather.

  A group of producers in a particular region will generally exhibit yield risks over time in relationship to the time periods of the geographic region. This relationship is illustrated in Figure 3 that shows the evolution of regional de-trended yield risks over time and the corresponding set of producers' risk for selected years. When regional yields increase or decrease around the expected (zero percent) trend level, the producer yield distribution within the region tends to shift in the same direction. A proper yield-based insurance rating analysis would sample across each producer at various coverage levels and all years to estimate loss indemnity costs.
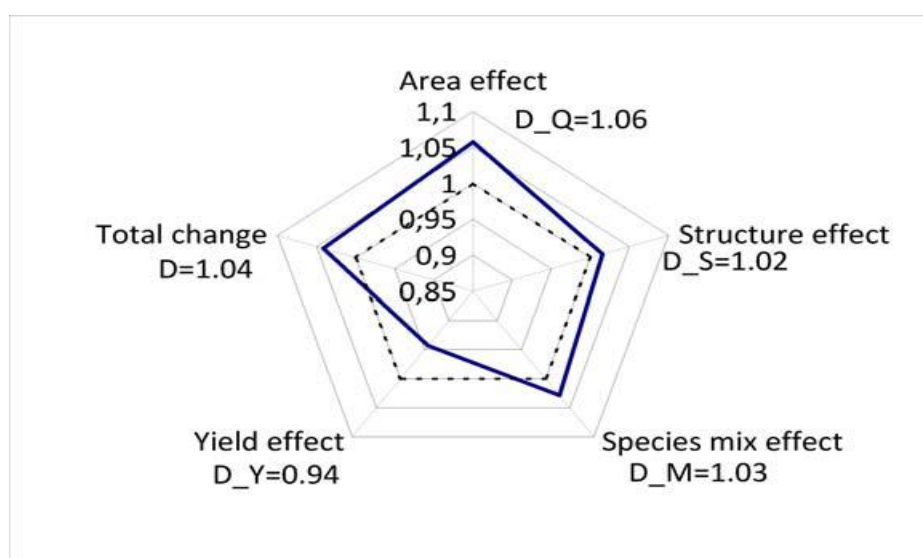
Source: author's construction based on research Balezentis, 2011

Fig.2. **The changes in crop harvest of Lithuania in 2000−2010**

  The weather is becoming an increasingly important variable in the recent period. The year 2010 can be described as specific meteorological conditions year in Lithuania: during the winter cold was of 5 degrees below, in summer - the heat was of 5 degrees higher. Agriculture particular suffers from early spring and autumn frosts, heat waves and flaw.
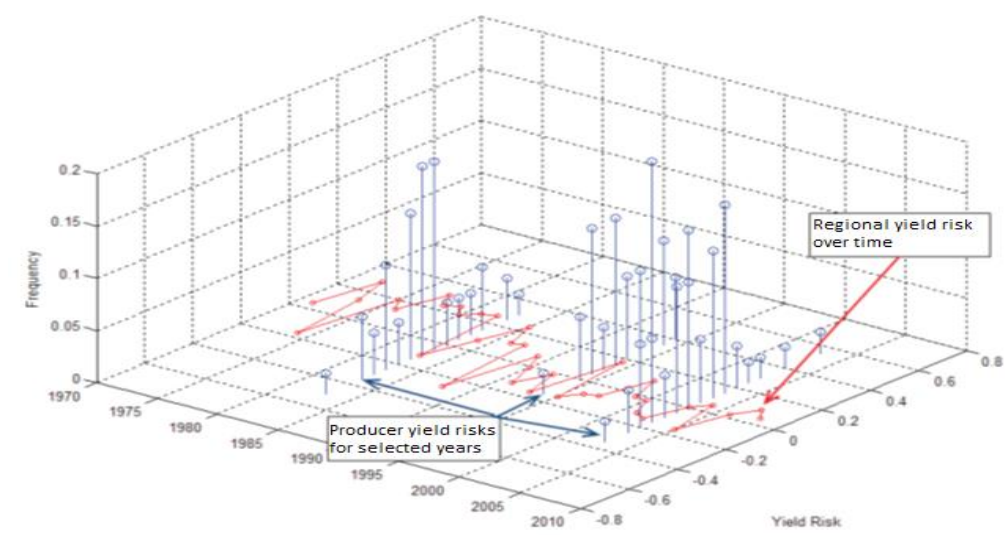
Fig. 3. **Times periods of Regional Yield and Selected Cross-sectional Producer Yield Risks**

Lithuanian climate conditions have been slowly changing over the last 20 years. While climate changes vary in different regions of Lithuania, but overall changes are observed everywhere. Research results of soil freezing depth showed that it decreased in regions (Vilnius, Utena, Varena), where history has been observed high level of soil freezing, and increased in Birzai, Kaunas, Siauliai (Stuoge *et al.,* 2012). Thus Insurance Company should be more focused on climate change trends in the future, rather than complain about the lack of statistics.

5. Negotiation strategy between Government, farmers and Insurance Company

In the crop insurance practice, it is essential to determine proper coverage level and affordable premium. However, the majority of the country's farmers are still unwilling to insure their crops. On the basis of results of the analysis, it can be concluded that crop insurance in Lithuania is ineffective, what is causing a lot of financial problems for farmers. Consequently, there are basic tasks for negotiations between Government, farmers and Insurance Company:

For Government: the government-subsidized crop insurance system is acceptable for farmers, but state budget deficit more and more restricts possibilities of subsidies payment to farmers. The Government should be interested to initiate a revision of the principles of crop insurance, which must be driven to: low-premium, wide-coverage and to plan guarantees in the state budget for cases of huge, unpredictable natural disasters.

For farmers: Farmers' crop yields are particularly dependent on the weather conditions, therefore the crop insurance has significant demand. For this purpose it is necessary and appropriate Government support. Farmers must intensify the use of crop insurance in the face of the Government and Insurance Companies' efforts to improve conditions for crop insurance.

For Insurance Company: The Insurance Company is controlling the risks by collecting insufficient amount of premiums. The biggest problem is that the Insurance Company is faced with the low rate of farmer's participation. The systematic risks in high frequency partly come from the poor agricultural infrastructure and unpredictable disasters. In future the Insurance Company must decrease insurance premiums which will help to attract more farmers, as they have a high potential: only 7% of insurable crops in Lithuania are insured now. The Insurance Company needs to increase transparency in the calculations of extent of the damage and the payments of insurance allowances, which will help to increase the confidence of the farmers for crop insurance. In addition, the Insurance Company should pay more attention to climate change trends in the future.

Conclusions

1. In Lithuania there are too much constraints in trying to select feasible crop insurance scheme: lack of historical yield data, small sized farm holdings, low value crops and the relatively high cost of insurance, farmers distrust of insurance system.

2. Insurance premiums for crop yield insurance in Lithuania are relatively high, as Lithuania's Insurance Company still does not have a so-called "history" that is, insurance premiums in Lithuania are relatively high, because the Insurance Company still does not have a so-called "history" that is, it have not accumulated enough statistical data that would allow to what will enable to evaluate all the risks and determine the correct amounts of insurance premiums. There is a high potential of crop insurance market: only 7% of insurable crops in Lithuania are insured now. If Insurance Company would like to attract a greater number of farmers it must decrease insurance premiums. The main principles of Insurance Company must be driven to: „low-premium, wide-coverage".

3. The Government must give guarantees in the state budget for cases of huge, unpredictable natural disasters if it wants to encourage the farmers to insure their crops.

4. The Insurance Company must increase transparency of process on estimation of insurance premiums and procedures of claim payments and be more focused on climate change trends in the future. This will increase the confidence of the farmers for crop insurance.

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PRODUCTION COSTS OF FINNISH DAIRY FARMS IN THE 2000S

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Abstract. The development of production costs in dairy farms in 2000—2011 was studied with a linear mixed model taking into account farm-level information (location, economic size, number of cows) and time effect. The results indicate that the unit cost increased over time and decreased as the number of cows and farm size increased and to compensate annual unit cost increase farms should be expanded with two cows every year. Small farms had higher unit cost and annual variation than medium-sized and large farms. Finnish dairy farms have developed fast and the benefits of scale may not have yet been accomplished.

Key words: dairy farm, production, cost, panel data, Finland.

JEL code: D20, Q10, Q12

Introduction

Structural change may provide benefits through economies of scale and scope, i.e. increasing farm size may reduce the production costs per unit of product as larger farms may be able, for instance, to exploit more effective technologies and use labour more effectively, or farms may increase the intensity of production through specialization (MacDonald et al., 2007; Jaforullah and Whiteman, 1999). During the period 2000—2011 the number of dairy farms has dropped by 54% (from 22913 to 10597 farms) but the number of cows only by 22% (from 364100 to 283600 cows), and when in 2000 one dairy farm had on average 15.9 cows by 2011 the average had raised to 26.9 cows (Tike, 2012). The European Union farm structure survey results from 2005, 2007 and 2010 show that the structural change has been almost similar to Finland in Sweden, the United Kingdom and Spain, and somewhat similar in Hungary, Denmark and Norway (Eurostat, 2013).

Finland is divided into seven agriculture support areas (A, B, C1, C2, C2P, C3 and C4). Support areas adapt to average growing season and the effective temperature sum (Tike, 2012; FMI, 2014). In northern Finland the growing season is shorter than in the southern Finland. Therefore agricultural support increases from South to North (from area A to C4). The majority of dairy farms (as per 2011) are located in C2 area (44% of all dairy farms) followed

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by C1 (21%), B (17%), C3 (8%), C2P (5%), A (4%) and C4 (1%) area. The farm numbers diminished quite evenly across these areas from 2000 to 2011. A larger decrease (-58%) was observed in the southernmost areas (A and B) than in the northern areas, for instance, C2 area (-48%). (Tike, 2012)

Price indices (2000–2011; OSF, 2014b) show that the prices of goods and services currently consumed in agriculture (+47%) and goods and services contributing to agricultural investments (+42%) have increased faster than the Consumer Price Index that is used to measure general inflation rate (+21%) (OSF, 2014a). Among goods and services that are targeted to animal and especially dairy production, only the price of veterinary expenses (+18%) and compound feeds for calves (+12%) have risen less than the general inflation rate. Prices for farm machinery and installations used in animal production have increased by 44% and farm buildings by 41% from 2000 to 2011. The prices for energy and lubricants (+105%) have increased substantially mainly due to crude oil prices (BP, 2013).

The production costs in Finnish dairy farms have been studied mostly based on data covering only one year. Rantala (1997) and Talpila (1999) studied the unit costs of dairy farms using the data obtained from the dairy survey farms in 1996 and 1996—1997, respectively. Talpila (1999) found that smaller farms (<15 cows) had 15% higher unit production cost than larger farms (15 or more cows) but did not observe significant differences between support areas although there was a large (smaller farms: 0.98—1.11 Finnish mark/milk kg; larger farms 0.95—1.06 FIM/kg) variation between areas in forage costs. Ovaska et. al (2004) studied the production and economy of dairy farms by using International Farm Comparison Network data from a few typical farms.

Production costs have been studied also by using different farm models (e.g. Ala-Mantila, 1998). The unit cost of milk production decreases as the farm size (number of cows) increases. Increasing farm size affects most importantly the labour cost. The share of wages of total production costs for the smallest farm model was 34% and for the largest farm model 26%. The defect of farm models is the fact that in reality the conditions on farms may be quite much different.

Ovaska and Heikkilä (2013) compared Finnish dairy farms in regards to the structural development and competitiveness to Swedish, Danish, German, Dutch and Polish dairy farms. By using International Farm Comparison farm data for years 2001–2011 they found that the unit cost of milk produced was highest on typical Finnish (24 cows) farms, USD 89/100 kg ECM (energy corrected milk) and on larger Finnish farms (70 cows) USD 78/100 kg ECM. They found that the major cost disadvantages on Finnish farms were related to machinery, labour and other miscellaneous costs. The disadvantage from labour cost decreased as farm size increased.

The goal of this study is to assess how the unit production costs of dairy farms have developed in 2000—2011 taking into account

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- farm-level information
    - geographical location,
    - economic size,
    - number of dairy cows,
- time effect by observing the same farms for several years.

This study contributes to previous knowledge by revealing changes in unit production costs over time. The following section introduces data and methods applied. Further sections represent results and conclusions.

Data and methods

The development of unit production costs of milk was studied by using the annual accounting data from dairy farms taking part in MTT profitability bookkeeping for the years 2000—2011 and specialized in dairying (code 45 defined as per European Commission regulation 1242/2008). The dataset was formed as panel allowing the possibility to effectively study change over time. During the period 2000—2011 some farms exited from and some joined in the voluntary profitability bookkeeping, and some farms exited the business. The data included 4205 observations from 633 different farms and on average 350 different farms every year in the data. The farm-level data were weighted with weight factors calculated individually for each farm taking into account the type of operations, economic size and location. Weights were calculated for each farm by stratum indicators separately for every year and calibrated taking into account the total arable land in Finland. Thus, after weighting, the used data can be used to describe the results of all Finnish dairy farms.

The unit costs were obtained by dividing the total production costs by the amount of produced milk (cent per litre) meaning the studied unit costs were not particularly targeted to milk production but also included other costs. Dairy farming is typically a combination of dairying, livestock production and forage production. In the dataset, the share of milk and milk products (SE216[*]) of total livestock and livestock products output (SE206[†]) was 91% on average. The livestock total output includes milk and animal output. When supports were included the share of milk output was on average 53% of the total output of a farm.

The farm size was described by using the number of cows and farm standard output. The number of cows is a convenient explanatory variable since it is clear and easily understandable and the explained variable (unit cost) includes the quantity of milk output as denominator. The standard output (SO) is the average monetary value of the agricultural output at farm-gate price per head of livestock. There is a regional standard output coefficient for each product. The sum of all standard outputs per unit multiplied by headcount forms the overall economic size, expressed in euro (Eurostat, 2014). The SO was classified into three classes. The smallest

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[*] Cows' milk & milk products – See definition from "Definitions of Variables used in FADN standard results" by European Commission
[†] Total output livestock & livestock products – See definition from "Definitions of Variables used in FADN standard results" by European Commission

class was selected (SO less than EUR 50000) as a basis for testing so that the medium class (SO EUR 50000—100000) and the largest class (SO more than EUR 100000) were compared to the smallest class. Since there were fewer farms in the northern area, support areas of C2P, C3 and C4 were combined and this combination (C2P—C4) was used as a basis for testing against other areas (A, B, C1 and C2). Pair-wise testing was conducted to observe significant differences between economic size classes and areas.

The linear mixed model was defined for an individual farm i as followed

$$\begin{cases} \mathbf{y}_i = \mathbf{X}_i\mathbf{a} + \mathbf{Z}_i\mathbf{b}_i + \mathbf{e}_i \\ \mathbf{b}_i \sim \mathrm{N}(\mathbf{0},\mathbf{D}) \\ \mathbf{e}_i \sim \mathrm{N}(\mathbf{0},\mathbf{R}_i) \\ b_1,...,b_n,\varepsilon_1,...,\varepsilon_n \ \ \text{independent} \end{cases} \tag{1}$$

in which y_i is i^{th} farm's $n_i \times 1$ response vector, a denotes a $p \times 1$ vector of unknown population parameters and X_i denotes a known $n_i \times p$ design matrix linking a to y_i. The b_i are distributed as N(0,D) (normal with mean 0 and covariance matrix D), independently of each other and of the e_i that is distributed as N(0,R_i). The D is a $k \times k$ and R_i is an $n_i \times n_i$ positive-definite covariance matrix. Parameters a are treated as fixed effects and b_i and e_i as random effects. In the data the n_i varied between 1 to 12.

Five fixed effects, denoted as p, (intercept a_0, time a_1, number of cows a_2, standard output class a_3, support area a_4 and weight a_5) and two random effects, denoted as k, (intercept b_0 and time b_1) were included in the model. Standard output is partially endogenous variable in the model since the number of cows influences its variation. Other explanatory variables in the model are exogenous. The *cow* variable denotes the average number of cows of a farm during the year. Intercept was included as a fixed effect since in practice all production units require a level of fixed costs independent of production levels. Variable *time* was reset by distracting value 2000 (year 2000=0, year 2001=1 etc.). Hence, variables *time* and *cow* had a similar scale.

For random effects an unstructured (UN) covariance structure that is suitable for longitudinal data was selected. Random effects were defined over the observation unit i, that is, farm register number. For residual random effects a first-order autoregressive (AR1) covariance structure was selected since it is suitable for data containing sequential observations and correlations that decline exponentially with distance (in our case time).

The UN covariance matrix for the random effects is denoted

$$\mathbf{D} = \mathrm{var}(\mathbf{b}_i) = \begin{pmatrix} \sigma^2_{b_0} & \sigma_{b_0 b_1} \\ \sigma_{b_0 b_1} & \sigma^2_{b_1} \end{pmatrix} \tag{2}$$

and has three parameters b_0 variance denoted as UN(1,1), b_0 and b_1 covariance as UN(2,1) and b_1 variance as UN(2,2). The AR1 covariance matrix for residual is denoted

$$\mathbf{R}_i = \mathrm{var}(\mathbf{e}_i) = \begin{pmatrix} \sigma^2 & \sigma^2\rho & \mathrm{L} & \sigma^2\rho^{n_i-1} \\ \sigma^2\rho & \sigma^2 & \mathrm{L} & \sigma^2\rho^{n_i-2} \\ \mathrm{M} & \mathrm{M} & \mathrm{O} & \mathrm{M} \\ \sigma^2\rho^{n_i-1} & \sigma^2\rho^{n_i-2} & \mathrm{L} & \sigma^2 \end{pmatrix} \quad (3)$$

and has two parameters variance σ^2 and correlation ρ. When N (total number of different farms) vectors are stacked, equation (1) can be represented as

$$\begin{cases} \mathbf{y} = \mathbf{Xa} + \mathbf{Zb} + \mathbf{e} \\ \mathbf{b} \sim \mathrm{N}(\mathbf{0},\mathbf{G}) \\ \mathbf{e} \sim \mathrm{N}(\mathbf{0},\mathbf{R}) \\ \mathrm{cov}[\mathbf{b},\mathbf{e}] = 0 \end{cases} \quad (4)$$

Model parameters are in the fixed effect vector a and all unknown variables in covariance matrices G and R. Matrices X and Z contain explanatory variables. Vector b contains only random effect variables. The model was solved and analyzed by using IBM SPSS 22.0 statistical software.

Results and discussion

The mean unit production cost in the dataset in 2000—2011 was 108.1 c/l (S.D. 39.1 c/l). From 2000 to 2011 this figure had reduced by 7%. Small farms (standard output < EUR 50000) had greater unit costs than medium-sized farms (EUR 50000—100000) and large farms (> EUR 100000). Unit costs in these classes have remained quite stable from 2000 to 2011. The mean unit cost of small farms was 135.5 c/l (S.D. 52.6 c/l), of medium sized farms 103.1 c/l (S.D. 28.1 c/l) and of large farms 86.1 c/l (S.D. 20.4 c/l). The annual variation of costs was larger at small farms than at medium-sized or large farms.

Descriptive statistics did not reveal clear differences in unit costs between support areas. Annual variation was large. In 2000—2011 the mean unit cost in area A was 98.5 c/l (S.D. 27.9 c/l), in area B 116.5 c/l (S.D. 47.3 c/l), in area C1 109.9 c/l (S.D. 45.9 c/l), in area C2 104.0 c/l (S.D. 32.9 c/l) and in area C2P—C4 110.4 c/l (S. D. 31.5 c/l).

During the study period the production costs and farm size had developed (increased proportionally) the same way. The rise of input prices has also been more than inflation rate. However, the shares of different types of costs have remained quite stable, apart from the share of wages that had decreased by approximately one-fourth. A previous study from the 1990s shows a similar trend (Ala-Mantila, 1998).

The estimation results of linear mixed model are presented in Table 1. The most important explanatory variables were time (1.472, p<0.001), the number of cows (-0.710, p<0.001) and standard output class. The smallest farms differ significantly (p<0.001) from other size classes so that the smallest farms have higher unit cost. Pair-wise comparison between the medium-sized and the large farms did not show significant difference. The farm location by support areas explains the unit cost only slightly so that only area B differs significantly from northern

areas (7.385, p<0.05). Pair-wise comparison shows that B area has higher unit cost than area C (B vs. C1 p=0.015, B vs. C2 p=0.002, B vs. C2P—C4 p=0.042). Areas A and B did not differ significantly from each other.

The results indicate strong year-to-year correlation in unit costs (AR1 ρ=0.493, p<0.001). Unit costs changed at different pace between farms (σ^2_{b1} p=0.021). Time effect (1.472) is more than double compared to the number of cows (-0.710). This can be interpreted so that herd size should be increased by two cows every year to compensate time effect increase of the unit cost.

Table 1

The results of linear mixed model explaining the unit cost of milk

Effect		Estimate	S.E.	Sig.	CI$_{95}$ low	CI$_{95}$ high
Intercept	a_0	135.303	3.120	<0.001	129.182	141.423
time	a_1	1.472	0.176	<0.001	1.125	1.818
cow	a_2	-0.710	0.045	<0.001	-0.797	-0.622
Standard output	a_3					
medium (EUR 50000-100000)		-20.025	1.869	<0.001	-23.689	-16.361
large (>EUR 100000)		-22.253	2.390	<0.001	-26.938	-17.567
small (EUR 0-50000)		0	0			
Support area	a_4					
A		-1.506	4.879	0.758	-11.089	8.077
B		7.385	3.623	0.042	0.268	14.503
C1		-0.921	3.195	0.773	-7.195	5.354
C2		-2.513	2.903	0.387	-8.215	3.189
C2P-C4		0	0			
weight	a_5	-0.011	0.013	0.390	-0.036	0.014
Covariance parameters						
UN (1,1)	σ^2_{b0}	342.126	57.962	<0.001	245.459	476.864
UN (2,1)	σ_{b0b1}	5.231	6.890	0.448	-8.274	18.735
UN (2,2)	σ^2_{b1}	2.774	1.205	0.021	1.184	6.499
Residual						
AR1 diagonal	σ^2	435.630	27.519	<0.001	384.898	493.048
AR1 rho	ρ	0.493	0.032	<0.001	0.428	0.554
Observations		4205				
-2 Restricted Log Likelihood		37439				
Akaike's Information Criterion (AIC)		37449				
Schwarz's Bayesian Criterion (BIC)		37481				

S.E. = standard error
Sig. = significance
CI$_{95}$ low = 95% confidence interval lower bound
CI$_{95}$ high = 95% confidence interval upper bound
UN = unstructured covariance matrix
AR1 = first-order autoregressive residual covariance matrix

Source: author's calculations.

In this study, the dataset did not allow to separate costs targeted to milk production from other costs of dairy farms. Hence, rather than the unit cost representing specifically milk production, it represents the joint production of milk and other products as it includes also costs from other activities. It may seem arbitrary, but this approach allows us to capture the

effect of farm size and 'unit' production costs as single variables. Although the data were from specialized full-time dairy farms, there were no farms producing only milk. Usually dairy farms produce also some other agricultural goods, of which beef is usually the most important product. In this data 53% of total output including support came from cows' milk and milk products on average and farms, therefore, had dairying as their main production line. Standard output was not included as a continuous explanatory variable in the model since it correlated strongly (Spearman two-tailed correlation 0.979, $p < 0.01$) with the amount of cows. Therefore, it was included as ordinal-scale explanatory variable by dividing the data into three classes. An alternative way to handle the overall farm size as an explanatory variable would have been to include the number of other resources such as arable land and the number of beef cattle as explanatory variables. Since arable land correlated strongly with the amount of cows (0.762, $p < 0.01$) it was not included into the final model. According to the results the medium sized and the large farms did not show significant difference in the unit production costs. This may be due to the fact that the farm size has grown rapidly over the past few years in Finland and the large farms are not yet operating at optimal production levels.

The estimated linear mixed model worked well. Fitted values followed well the measured values (difference on average 2.0%, minimum 0.1%, maximum 5.6%). The difference between measured and fitted values falls between the standard errors. Descriptive statistics show that unit costs have remained quite stable from 2000 to 2011. According to the model the unit cost has annually increased on average 1.472 c/l, however, the pace has varied significantly between farms. The increased number of cows and greater standard output both decrease the unit cost. Previous studies show similar results (Ala-Mantila, 1998; Riepponen, 1998, 2003; Latukka 2013, Ovaska & Heikkilä 2013). Latukka (2013) studied the costs targeted to milk production line in 2011. He found out that small farms (10 cows) had the highest unit cost (119 c/l) that decreased by increasing the number of cows. In the same study medium-sized farms (39 cows) had the unit cost of 76 c/l and large farms (141 cows) of 69 c/l. In this study significant differences between areas were not found, which is in line with results reported by Latukka (2013).

Further studies could examine the unit costs of milk production only. In explanatory models external influential factors such as input and output prices, farmland prices and different interaction effects could also be studied. Furthermore, the effect of different weighting methods should be tested. Weighting in linear mixed models is a challenge because of assumptions and because the interpretation of standard error is more complex (Bertolet, 2008). Weights were included in the model as a continuous fixed effect. The results showed that weight effect was not significant, which means that results can be generalized to the total population, the specialized Finnish dairy farms.

Conclusions

The cost per produced milk litre has remained stable in the 2000s. The smallest farms have the highest unit costs compared to medium sized and large farms. By increasing the number of cows, economies of scale can be achieved. A significant difference between medium-sized and large farms was not found, possibly due to the fact that the structural development in Finnish farms has been fast and the benefits of scale have not yet been accomplished on the largest farms. The geographical location of farm cannot be seen as important explanatory variable for the development of unit costs. The development of production costs has varied significantly between farms. To simplify further analysis, weighting can possibly be left out if dataset used is large enough and carefully classified.

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THE IMPACT OF TIME SERIES EXPANSION IN NON-PARAMETRIC ANALYSES OF EFFICIENCY EFFECTS

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Abstract. Efficiency analyses often involve panel data which enable to reveal certain longitudinal patterns. However, it is often impossible to maintain the same sample structure when expanding time series. This paper, thus, attempts to test whether there are obvious differences in the trends of efficiency across two different data sets. The research focuses on Lithuanian family farm performance. The data are taken form Farm Accountancy Data Network with different samples covering the periods of 2004-2009 and 2004-2011. The juxtaposition of two-stage efficiency analyses based on different data sets enabled to identify the impact of changes in both the structure of the sample and time series expansion upon the efficiency factors and effects. The analysis suggests that Lithuanian family farms featured generally the same patterns of efficiency during 2004-2011 if opposed to 2004-2009.

Key words: data envelopment analysis, efficiency, family farms, Lithuania.

JEL code: C14, C34, C44, D24, Q12.

Introduction

Efficiency and productivity gains are the most important factors behind a sustainable economic growth. Indeed, gains in efficiency enable to allocate the resources in a more rational way across the economy. Therefore, it is important to develop reasonable frameworks for analysis of efficiency and productivity. As regards the agricultural sector, it is due to Gorton and Davidova (2004) and Balezentis (2014b) that the frontier methods are the most widely applied ones for the efficiency analyses. Efficiency analysis requires estimation of the productive technology, which can be described in terms of the production function, distance function, cost function, or revenue function, among others. The two wide groups of the frontier methods can be delineated as regards specification of the representation of the productive technology, viz., parametric methods and non-parametric methods (Coelli et al., 2005). The parametric methods require a priori specification of the functional form of the representation, whereas the non-parametric methods do not require suchlike assumptions. These

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circumstances make the non-parametric methods quite appealing ones if opposed to the parametric ones. Yet, the non-parametric methods do not allow for analysis of efficiency effects. On the contrary, parametric methods, like Stochastic Frontier Analysis (SFA), proposed by Meeusen and van den Broeck (1977) and Aigner et al. (1977), can accommodate the efficiency effects (Kumbhakar et al., 1991; Battese, Coelli, 1995). Data Envelopment Analysis (DEA), introduced by Charnes et al. (1978) and Banker et al. (1984), does not allow for inclusion of the efficiency effects into the model. Therefore, two-stage analysis is conducted to estimate the impact of certain factors upon the DEA-based efficiency scores. Initially, such techniques as the Ordinary Least Squares and Tobit model were used for suchlike analyses. It is due to Simar and Wilson (2007) that the aforementioned setting might render misleading results due to the underlying serial correlation among the observations. Accordingly, the double bootstrap methodology has been proposed to overcome these issues. Indeed, the double bootstrap methodology can be considered as semi-parametric one, as the second stage analysis relies on the truncated regression model. Daraio and Simar (2005, 2007a, 2007b) introduced the conditional measures of efficiency. The latter framework allows for a fully non-parametric analysis of the efficiency factors. The proposed model assumes no separability among environmental variables and the shape of the underlying technology set. Fousekis et al. (2014) employed the said framework in the agricultural context. Balezentis et al. (2014) suggested a fully non-parametric framework for analysis of the efficiency effects assuming separability. In the latter case, no conditional measures are involved.

Analyses of the agricultural efficiency do often rely on the data from Farm Accountancy Data Network (FADN) or other statistical data bases. Accordingly, the data are not easily and readily available for the research. On the contrary, multiple aspects of the efficiency should be analysed by employing the same datasets in order to avoid additional sampling bias. Therefore, one often needs to check whether one data set features the same underlying trends as opposed to those associated with another data set.

The aim of the research is to propose a procedure for testing whether there are obvious differences in the trends of efficiency across two different data sets. The following tasks are set: 1) to present the preliminaries of frontier-based efficiency analysis; 2) to present the data available for analysis of Lithuanian family farm performance; 3) to analyse the impact of time series expansion on the results of efficiency analysis. This paper employs the approach proposed by Balezentis et al. (2014) to analyse the differences in efficiency effects due to expansion of the time span of the analysis. Particularly, the paper focuses on the two datasets, each covering the periods of 2004-2009 and 2004-2011. These data are taken form Farm Accountancy Data Network (Lithuanian Institute of Agrarian Economics, 2012). In addition, the results are compared with those obtained via the double bootstrap methodology.

Methodological approach

The fully non-parametric framework proposed by Balezentis et al. (2014) relies on bootstrapped DEA and non-parametric regression. The bootstrapped DEA is described by Simar and Wilson (1998) and implemented by Wilson (2008). The obtained efficiency scores are then used as dependent variables in the non-parametric regression (Racine, Li, 2004; Li, Racine, 2007) as it is implemented by Hayfield and Racine (2008). In its essence, the non-parametric regression weights the residuals at each observation with respect to its distances to other observations as defined by the kernel function when optimising the sum of squared residuals. The proposed framework uses partial regression plots to depict the relationships among the efficiency factors and efficiency scores.

As regards the double bootstrap methodology, the present research follows Algorithm #2 in Simar and Wilson (2007). The latter technique comprises the two parts. First, the bootstrap technical efficiency scores are estimated in order to approximate the true underlying technology with respect to the environmental variables. Second, the bootstrap coefficients of the truncated regression are estimated to establish the corresponding confidence intervals.

In order to maintain comparability with the previous results, the input-oriented model was employed for methodology proposed by Balezentis et al. (2014), whereas the output-oriented model was applied for the double bootstrap (Simar, Wilson, 2007).

Research results and discussion

Balezentis et al. (2014) and Balezentis (2014a) employed the FADN data set for years 2004-2009. The aforementioned dataset is a balanced panel comprising 200 observations (viz., family farms) per year. Indeed, the end of the said period coincides with economic turmoil. This paper, thus, attempts to check the consistency of the obtained results by fitting models used in the aforementioned research to the extended data set.

In order to proceed with the comparison, the additional dataset was extracted from the FADN. The new dataset covers the period of 2004-2011. Given the FADN farm sample changes year to year, the expansion of time span renders a decrease in the number of farms observed for each year to 163. The extended dataset, thus, is a balanced panel comprising 1304 observations in total. The third dataset has also been established for the same 163 farms, yet covering the initial time span.

To sum up, the following three samples were considered: 1) years 2004-2009, 200 farms; 2) years 2004-2011, 163 farms; 3) years 2004-2009, 163 farms. Samples 1 and 3 share the same time period albeit they cover different farms, hence, they can be employed to test for differences in efficiency effects due to changes in the sample structure. Samples 2 and 3 share the same sample structure yet cover different time spans, thus, they can be used to test for differences in efficiency effects arising due to temporal developments (possibly, those occurring in the whole family farming sector).

The technical efficiency was estimated by considering four inputs, namely utilised agricultural land area in hectares, labour input in annual work units, intermediate consumption in Litas, and assets in Litas, and one output, viz., total agricultural output in Litas. The monetary variables were

deflated by respective real price indices. Various explanatory variables were chosen for the analysis, yet only significant ones were finally kept in lines of the backward procedure.

Results of the non-parametric regression are presented in Figure 1. As one can note, results based on the dataset for 2004-2011 and 163 farms virtually re-iterate those obtained by considering the original data set for 2004-2009 and 200 farms (Balezentis et al., 2014). Specifically, technical efficiency appeared to increase with increasing farm size, yet a kink in the partial regression plot was observed at the (logged) value of 400 ha. The time trend showed decreases in technical efficiency during 2006 and 2009. The only evident difference between the original and extended datasets is an increase in crop farm efficiency. Anyway, livestock farming appear to be the most efficient on average. These differences might have been caused by both changes in relative performance and sample structure. Therefore, the third sample was further considered.
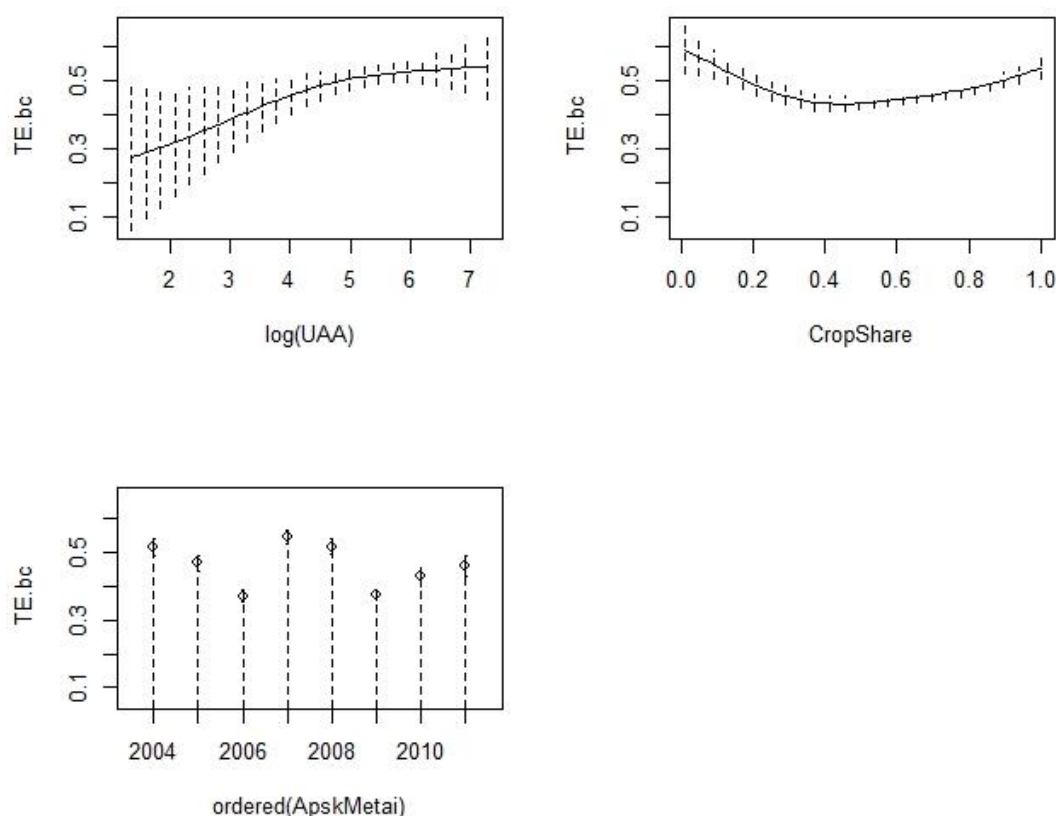
Fig. 1. **Partial regression plots (2004-2011, 163 farms, the dependent variable is Farrell input efficiency)**

The following Table 1 presents the bandwidths and p-values. Obviously, all the variables were statistically significant at 1%.

Table 1

Results of non-parametric regression analysis (2004-2011, 163 farms)

	log(*UAA*)	*CropShare*	ordered(*Year*)
Bandwidth	1.447169	0.1780017	0.04444178
P Value	<.000 ***	<.000 ***	<.000 ***

*Significance codes: *** – 0.001, ** – 0.01, and * – 0.05.*

Source: author's calculations based on Lithuanian Institute of Agrarian Economics (2012).

The double bootstrap analysis was also re-iterated with the extended data set. The resulting truncated regression's coefficients are given in Table 2. The new results can be compared against those in Balezentis (2014). Note that more variables entered the model under the backward procedure. These include time trend (*Trend*) to check if there is an underlying general trend describing the change in efficiency, utilised agricultural area (*UAA*) to account for farm size, the ratio of assets to the labour input (*Assets/AWU*) to measure the level of capital accumulation and modernisation (to a certain extent), the ratio of subsidies over the total output (*Subsidies*) to measure the impact of production subsidies on the farm performance. Note that the confidence intervals were defined for the three levels of confidence by the means of bias-corrected accelerated and percentiles methods.

Table 2

Double bootstrap estimates for determinants of the farming inefficiency (2004-2011, 163 farms)

Variables	$\hat{\hat{\beta}}$	Sig.	Confidence intervals					
			$\alpha=.1$		$\alpha=.05$		$\alpha=.01$	
BC_a **method**								
Time	0.175	***	0.114	0.240	0.103	0.256	0.082	0.280
UAA	-0.073		-0.240	0.095	-0.278	0.122	-0.331	0.177
Assets/AWU	-0.167	*	-0.361	-0.007	-0.397	0.024	-0.506	0.078
Crop	0.714	***	0.321	1.051	0.249	1.113	0.068	1.225
Subsidies	1.520	***	1.394	1.649	1.372	1.678	1.331	1.730
Percentiles method								
Time	0.175	***	0.111	0.237	0.100	0.251	0.076	0.276
UAA	-0.073		-0.242	0.094	-0.278	0.119	-0.331	0.176
Assets/AWU	-0.167		-0.347	0.006	-0.381	0.032	-0.483	0.091
Crop	0.714	***	0.339	1.066	0.274	1.134	0.086	1.236
Subsidies	1.520	***	1.392	1.646	1.370	1.676	1.322	1.721

*Significance codes: '***' - 0.01, '**' - 0.05, '*' - 0.1; the dependent variable is Farrell output efficiency*

Source: author's calculations based on Lithuanian Institute of Agrarian Economics (2012).

Results obtained for the extended data set do not contradict to those based on the original data set presented by Balezentis (2014). The only significant difference is a change in the direction of the time trend: the extended data set suggests a negative time trend. However, this can be a direct outcome of expansion of timespan. Farm size features a positive effect upon efficiency, yet the associated coefficient is no longer significant. The asset-labour ratio is also specific with the same direction of the relationship. However, it is insignificant according to the percentiles method. The remaining two variables, viz. crop share in the total output and production subsidy intensity, featured the same kind of relationships with the efficiency. These findings are also supported by results of the fully non-parametric framework (cf. Figure 1).

As it was already said, certain differences emerged between results presented by Balezentis (2014) and Balezentis et al. (2014) might be due to changes in the structure of the sample under analysis. Therefore, the new sample is reduced by considering only the period of 2004-2009 and keeping the same 163 farms in the sample. The resulting estimates of the coefficients of the non-parametric regression are depicted in Figure 2.
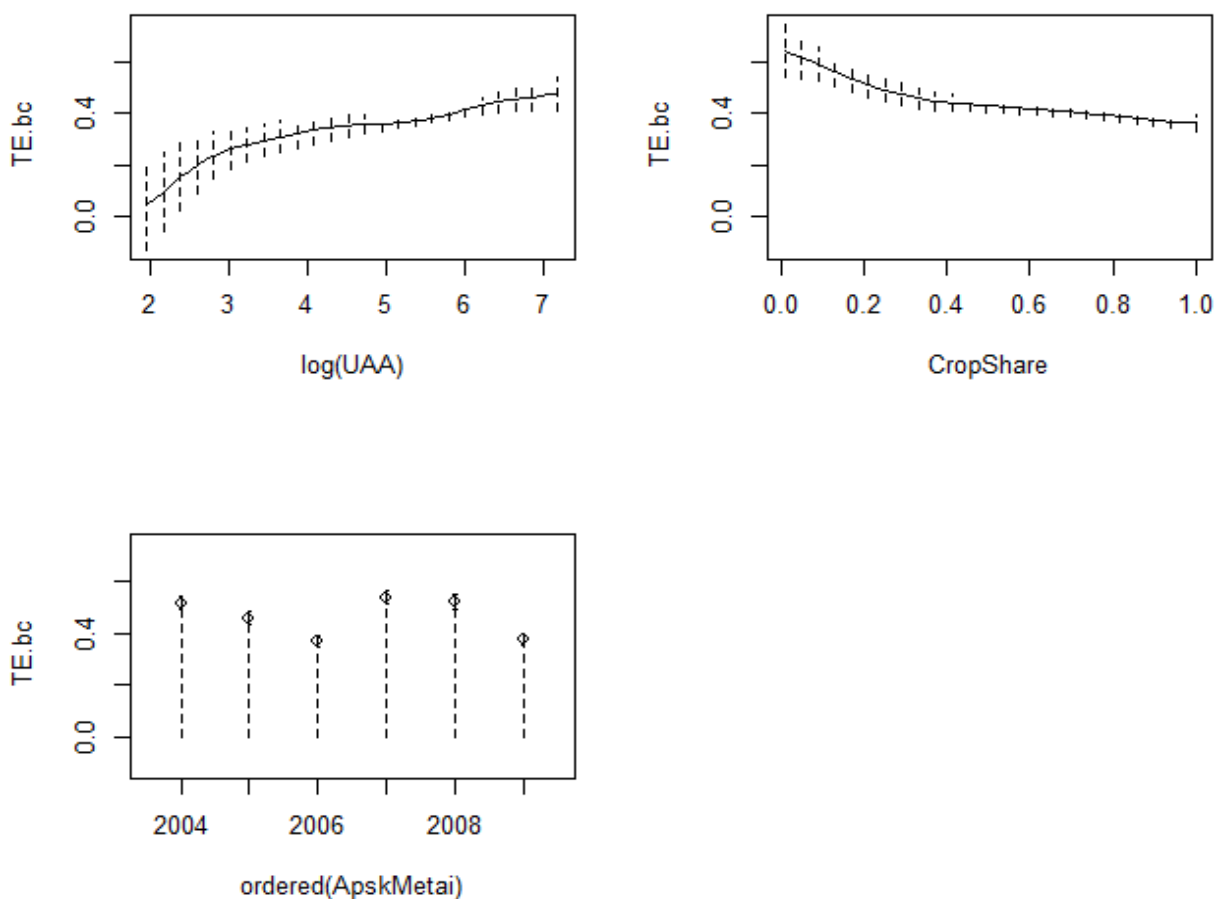
Source: author's calculations based on Lithuanian Institute of Agrarian Economics (2012).

Fig. 2. **Partial regression plots (2004-2009, 163 farms, the dependent variable is Farrell input efficiency)**

Table 3 presents the p-values associated with the regressors. Evidently, all the three variables were significant.

Table 3

Results of non-parametric regression analysis (2004-2011, 163 farms)

	log(*UAA*)	*CropShare*	ordered(*Year*)
Bandwidth	0.6636057	0.1894315	0.05482321
P Value	<.000 ***	<.000 ***	<.000 ***

*Significance codes: *** – 0.001, ** – 0.01, and * – 0.05.*

Source: author's calculations based on Lithuanian Institute of Agrarian Economics (2012).

The results of double bootstrap model for the 163 farms during 2004-2009 are presented in Table 4. If compared to results for the same period based on the larger data set for the 200 farms, it is evident that the change in the sample structure played an important role. Therefore, the impact of farm size (UAA) and assets per AWU became insignificant. Crop output's share in the total output had a negative effect upon efficiency, yet the latter factor remained insignificant at the level of significance of 10% under one of the methods for estimation of the confidence intervals (anyway, the lower bound of the confidence interval suggests that p-value might not be far from 0.1).

Table 4

Double bootstrap estimates for determinants of the farming inefficiency (2004-2009, 163 farms)

Variables	$\hat{\hat{\beta}}$	Sig.	Confidence intervals					
			$\alpha=.1$		$\alpha=.05$		$\alpha=.01$	
BC_a **method**								
Time	0.345	***	0.250	0.452	0.226	0.470	0.189	0.512
UAA	-0.020		-0.219	0.179	-0.253	0.215	-0.328	0.283
Assets/AWU	-0.135		-0.353	0.042	-0.404	0.066	-0.476	0.123
Crop	0.493		-0.026	0.871	-0.110	0.953	-0.324	1.101
Subsidies	1.347	***	1.215	1.481	1.195	1.505	1.148	1.556
Percentiles method								
Time	0.345	***	0.245	0.451	0.224	0.468	0.184	0.509
UAA	-0.020		-0.232	0.169	-0.270	0.207	-0.339	0.279
Assets/AWU	-0.135		-0.341	0.051	-0.391	0.075	-0.472	0.138
Crop	0.493	*	0.074	0.932	-0.050	0.988	-0.231	1.161
Subsidies	1.347	***	1.210	1.478	1.192	1.502	1.145	1.555

*Significance codes: '***' - 0.01, '**' - 0.05, '*' - 0.1; the dependent variable is Farrell output efficiency*

Source: author's calculations based on Lithuanian Institute of Agrarian Economics (2012).

Results based on the sample of 163 farms and the time period of 2004-2009 did indicate that the change in structure of the sample (while keeping the time period fixed) induced null effects of

farm size in terms of UAA and the ratio of assets to labour input. However, the latter variable became significant at the confidence level of 10% after time series expansion. Obviously, time series expansion resulted in decrease in the coefficient associated with the time trend, thus, implying a positive development of family farms' efficiency during 2010-2011. These results are also confirmed by a fully non-parametric framework (cf. Figures 1 and 2). Even though the farm size variable (*UAA*) remained insignificant after time series expansion, the coefficient as well as its upper confidence band decreased, thus, implying that larger farms gained more productivity if compared to smaller ones. Nevertheless, the coefficient remained insignificant at the confidence level of 10%. The negative impact of production subsidies persisted and even increased during the period of 2010-2011.

In order to obtain more precise estimates of the p-values in the fully non-parametric framework, Daraio and Simar (2014) introduced an improved bootstrapping methodology. In addition, the test proposed by Daraio et al. (2010) might be utilised to check whether the condition of separability holds for the analysed data. Finally, Badin et al. (2012) argued that the conditional framework enables to estimate "pure" and managerial efficiency.

Conclusions

1. The juxtaposition of two-stage efficiency analyses based on different data sets enabled to identify the impact of changes in both the structure of the sample and time series expansion upon the efficiency factors and effects. The analysis suggests that Lithuanian family farms featured generally the same patterns of efficiency during 2004-2011 if opposed to 2004-2009.

2. Crop farms became more efficient during 2010-2011 as opposed to 2004-2009. The carried out analysis also revealed that a part of the latter increase was due to changes in the structure of the analysed sample. Indeed, this finding is in line with the undergoing changes in Lithuanian family farms, where more and more farmers opt for crop farming. Anyway, it was livestock farms that maintained the highest efficiency.

3. The negative impact of production subsidies persisted and even increased during the period of 2010-2011. Farm size effect became insignificant in the double bootstrap setting due to changes in the sample structure, yet certain changes were observed after time series expansion.

4. For sake of comparison, the present research utilised models with exactly the same variables as it was the case with the original data set. Therefore, further analyses should attempt to apply the methodologies proposed in this paper with the extended data set in order to reveal a possible impact of inclusion of additional variables into analysis.

5. As regards the non-parametric analysis of the efficiency effects, further researches should attempt to test the condition of separability, analyse managerial efficiency in the conditional settings, and perform the improved tests of significance of the efficiency factors.

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RESOURCE USE AND PRODUCTIVITY IN AGRICULTURE ACROSS THE EUROPEAN UNION MEMBER STATES

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Abstract. This paper aims to analyse the trends in resource use across the European Union (EU) Member States. The research relies on concept of decoupling between the resource use and economic activity. Indeed, the analysis focuses on the general trends in the energy, land, and water resource as well as material consumption. The cases of decoupling across the EU Member States are presented in the paper in order to disentangle the linkages between economic activity and resource use. The research relies on the WIOD data for 1995-2009. In general, it can be concluded that energy and land were those inputs (production factors) which have been used in the most sustainable way if opposed to the remaining inputs covered in this study.

Key words: resources, decoupling, agriculture.

JEL code: Q15, Q56.

Introduction

Economic activity is mainly aimed at transforming inputs to outputs and, thus, satisfying the needs of society. Efficiency of suchlike activity can, hence, be measured by considering the ratio of output production to input use. Furthermore, the total output can be maximized by making the productive process more extensive (increase in scale) or intensive (increase in productivity). Whereas the limits for increase in the scale of production are more or less clearly defined by physical restrictions of the production system and associated production factors, the limits for increase in productivity are much vaguer. Indeed, the comparative analysis (benchmarking) can provide yardstick for possible improvements in the production systems. Therefore, it is important to develop and apply the benchmarking frameworks in order to identify the best practice and possible limits for growth.

The traditional approach is to measure the relative indicators like gross value added (GVA) per unit of labour etc. However, it is not always possible to include all sorts of costs into

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analysis as some inputs are public goods or common goods and, accordingly, require no "tangible" expenses for consumption thereof. The latter issue is especially topic for natural resources, viz. water, air etc. such inputs as land, materials etc. might also be used excessively due to market imperfections ownership rights. In addition, such undesirable outputs as carbon emission need also to be taken into account as they induce climate change along with further negative externalities. Due to the aforementioned circumstances, one needs to analyse the "physical economy", i. e. the use of resources along with economic activity. Weisz et al. (2006) analysed the trend in material consumption across the European Union Member States. Galli et al. (2012) proposed an integrated framework for analysis of the human impact. The latter framework comprises the ecological footprint, the water footprint, and the carbon footprint. The concept of eco-efficiency is further discussed by Keating et al. (2010).

At the level of the European Union, the need for analysis of resource efficiency was stressed by launching a flagship initiative "A resource-efficient Europe" (European Commission, 2011). In this vein, the associated data bases were established for international comparisons. These are, for instance, EU KLEMS (O'Mahony, Timmer, 2009) and the World Input-Output Database (WIOD) described by Timmer et al. (2012).

In a competitive environment, the productive processes are performed and influenced by multiple agents at different levels. In order to streamline the production system at sector or region, an instance of benchmarking is usually required. This is especially important in the agricultural sectors of the EU Member States which are subject to the Common Agricultural Policy.

These findings undoubtedly urge to analyse not only economic variables available by the virtue of accounting (cf. Farming Accountancy Data Network), but also physical flows of materials and input use. Indeed, the latter information is hard to measure and, due to that, only certain estimates are available. Balezentis and Hougaard (2014) performed the analysis of resource use in Lithuanian agriculture. However, in order to reveal the possible ways for improvement.

This paper aims to analyse the trends in resource use across the EU Member States. The following tasks are set: (i) to present the methodology for analysis of decoupling between the resource use and economic activity, (ii) to present the general trends in the resource use, and (iii) to analyse the cases of decoupling across the EU Member States. The research relies on the WIOD data for 1995-2009.

Methodology

The key concept for analysis of the resource use and decoupling, in particular, is resource use elasticity. It can be defined in terms of the levels of resource use and economic activity. Say r_0 and r_t are the quantities of resources used in the base and current period, respectively. Similarly,

assume e_0 and e_t denote the quantities of output, i. e. results of the economic activity in the base and current period, respectively. Thenceforth, the elasticity of resource use, ε_{re}, is defined as (Tapio, 2005):

$$\varepsilon_{re} = \frac{\Delta r / r_0}{\Delta e / e_0} = \frac{(r_t - r_0)/r_0}{(e_t - e_0)/e_0}. \tag{1}$$

However, the measure of elasticity cannot fully describe the underlying trends in resource use. This can be done by considering it alongside changes in resource use and economic activity. The four axes and the two dashed lines in Figure 1 delineate the eight types of (de)coupling.

A – weak decoupling
B – expansive coupling
C – expansive negative decoupling
D – strong negative decoupling
E – weak negative decoupling
F – recessive coupling
G – recessive decoupling
H – strong decoupling
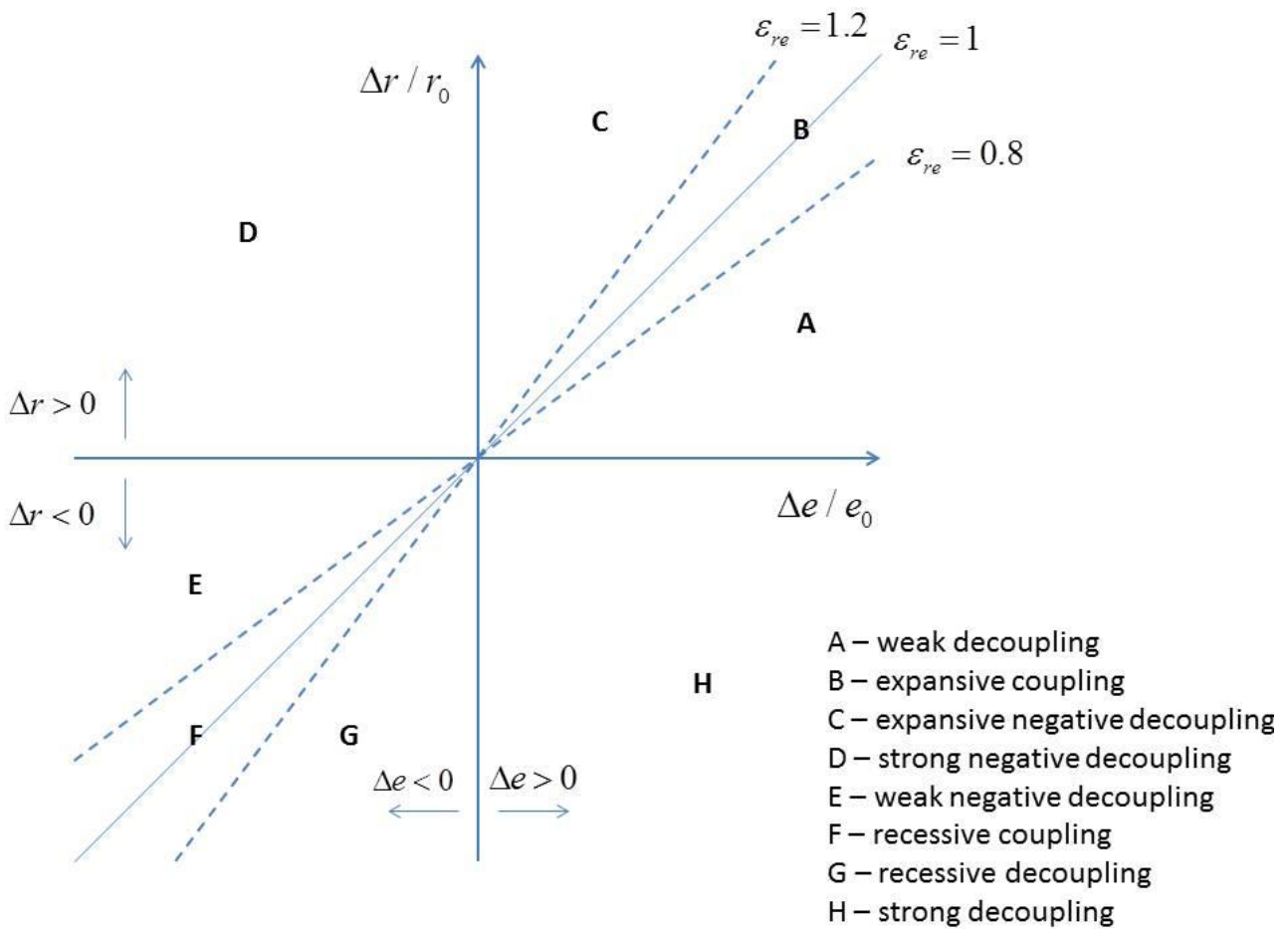
Fig. 1. **A graphical interpretation of the (de)coupling concept**

Weak decoupling can alternatively be termed relative decoupling, i. e. the rate of increase in economic activity induces is higher than that in resource use. At the other end of spectrum, strong decoupling can be termed absolute decoupling, i. e. the changes in economic activity and resource use occur towards different directions. Negative decoupling occurs whenever resource use is disproportional to changes in economic activity. Finally, expansive (resp. recessive) decoupling is related to economic growth (resp. downturn).

The research relies on the data from the WIOD (Timmer, 2012). The data cover years 1995–2009. Specifically, the research focuses on the data series for the Agriculture, Hunting, Forestry and Fishing sector (NACE 1.1 sectors A-B). In order to facilitate the international comparisons, the gross value added is deflated by respective price indices available in the WIOD (base year 1995) thus constructing the implicit quantity indices. Furthermore, purchasing power parities of 1995 based on the EU-28 Gross Domestic Product are used. Therefore, the monetary terms used in this study are expressed in purchasing power standards (PPS) of 1995, which are devoid of price and exchange rate differences, otherwise existing among the analysed states. Note that the WIOD presents material extraction rather than direct material consumption.

Results

First of all, the general trends for the agricultural gross value added (GVA) are presented to describe the relative importance of agriculture in the economic sense. The obtained results (Table 1) are based on the WIOD data base (Timmer, 2012).

Table 1

Dynamics of the agricultural value-added across the selected EU Member States, 1995-2009

Member States	The share of agricultural sector in the total GVA, per cent				Rate of growth, per cent
	1995	2009	Average	CV	
Austria	2.6	1.9	2.1	0.13	-6.7
Belgium	1.5	1.2	1.4	0.10	1.7
Bulgaria	15.7	12.5	17.5	0.23	2.8
Czech Rep.	5.0	3.2	4.2	0.15	-6.7
Germany	1.3	1.2	1.3	0.08	14.4
Denmark	3.5	3.7	3.2	0.10	29.1
Estonia	5.8	4.9	5.3	0.19	60.0
Finland	4.5	3.6	3.5	0.13	18.1
France	3.3	3.0	3.1	0.08	16.5
Hungary	8.0	9.5	7.9	0.14	66.6
Lithuania	11.0	7.4	8.6	0.22	27.1
Latvia	9.1	6.4	6.7	0.17	35.1
Netherlands	3.5	3.1	3.1	0.07	22.9
Poland	8.0	5.4	6.5	0.13	21.1
Romania	19.2	10.6	15.4	0.20	-20.7
Slovakia	5.9	6.5	5.7	0.09	102.9
Slovenia	4.4	2.7	3.6	0.19	-0.7
Sweden	3.0	2.9	2.7	0.06	33.5

Source: authors' calculations based on Timmer (2012).

These results are rather important in the sense that the general trends in GVA enable to describe the overall development of the agricultural sectors across the selected EU Member States, the corresponding decoupling types, and provide an overview on the data available in the WIOD. Table 1 presents the main results regarding GVA generated in the agricultural sector, viz., the share of the agricultural sector in the total GVA generated in an economy for 1995 and 2009, an average value, coefficient of variation (CV), and the rate of growth in the volume of the GVA in agriculture. Therefore, one can analyse the trends in both the relative importance of the agricultural sector and the absolute change in its output across the EU Member States.

In order to define the prevailing types of decoupling, the partial productivities of the resources used in the agricultural sector are analysed. Specifically, Table 2 presents the results related to energy use, whereas Table 3 deals with land, material use, and water productivity.

Table 2

Partial productivity of energy use and carbon emission, 1995-2009

Member States	Energy use productivity (million PPS / TJ)			Carbon emission productivity (million PPS / kt)		
	Average	Rate of growth	CV	Average	Rate of growth	CV
Austria	0.14	-6	0.10	3.37	15	0.10
Belgium	0.07	36	0.22	0.97	28	0.09
Bulgaria	0.36	60	0.19	6.62	-11	0.17
Czech Rep.	0.17	101	0.19	1.78	21	0.18
Germany	0.12	78	0.23	2.33	84	0.22
Denmark	0.06	34	0.09	1.29	53	0.11
Estonia	0.13	52	0.23	3.35	2	0.44
Finland	0.08	5	0.09	1.52	42	0.15
France	0.17	21	0.06	2.35	26	0.07
Hungary	0.23	141	0.35	4.71	173	0.38
Lithuania	0.26	99	0.17	6.32	104	0.21
Latvia	0.09	83	0.18	1.54	63	0.14
Netherlands	0.04	91	0.26	0.92	31	0.11
Poland	0.09	65	0.19	1.24	60	0.17
Romania	0.53	31	0.26	36.27	242	0.47
Slovakia	0.31	330	0.49	27.39	25	0.31
Slovenia	0.18	-1	0.19	3.69	17	0.06
Sweden	0.13	54	0.18	1.93	10	0.09

Source: authors' calculations based on Timmer (2012).

Energy productivity clearly depended on the geographical location of the analysed countries: the Southern countries featured higher levels of energy productivity if opposed to the Northern ones. Lithuania might be an interesting exception with rather low energy intensity. The correlation between average energy productivity and rate of growth in productivity ($R = 0.14$) indicates that the divergence in energy productivity/intensity is not likely to deepen in the analysed countries. As

regards carbon emission productivity, the pattern of country ranking remained more or less the same. However, a positive correlation coefficient between average carbon emission productivity and CV (*R* = 0.48) implied that high-productivity countries face higher variance in carbon emission productivity. Note that energy productivity decreased in Austria (-6%) and Slovenia (-1%) during the research period. Carbon emission productivity decreased in Bulgaria only.

Table 3

Partial productivity of land, water, and materials, 1995-2009

Member States	Land productivity (thousand PPS / ha)			Material use productivity (thousand PPS / t)			Water productivity (PPS / m3)		
	Average	Rate of growth	CV	Average	Rate of growth	CV	Average	Rate of growth	CV
Austria	0.54	-9	0.08	0.08	-13	0.08	0.57	-9	0.06
Belgium	1.35	5	0.05	0.07	15	0.06	0.81	-3	0.05
Bulgaria	0.84	13	0.14	0.31	-13	0.17	0.40	6	0.16
Czech Rep.	0.79	-12	0.09	0.13	-2	0.12	0.37	-17	0.13
Germany	0.79	22	0.10	0.07	20	0.10	0.38	-7	0.05
Denmark	1.10	30	0.09	0.09	35	0.08	0.34	14	0.06
Estonia	0.19	19	0.10	0.08	31	0.11	0.17	-8	0.23
Finland	0.14	7	0.08	0.07	8	0.07	0.54	0	0.08
France	0.74	17	0.05	0.11	4	0.03	0.41	-3	0.03
Hungary	0.93	79	0.25	0.15	41	0.12	0.25	49	0.14
Lithuania	0.46	50	0.13	0.12	11	0.11	0.22	-32	0.11
Latvia	0.19	8	0.14	0.03	-8	0.19	0.17	-31	0.13
Netherlands	4.27	22	0.07	0.22	-8	0.04	1.76	24	0.09
Poland	0.82	25	0.09	0.10	0	0.06	0.36	18	0.10
Romania	0.99	-15	0.10	0.23	-2	0.07	0.45	-8	0.14
Slovakia	0.86	93	0.27	0.13	44	0.20	0.43	104	0.26
Slovenia	0.66	-13	0.10	0.14	-1	0.05	0.55	-1	0.06
Sweden	0.24	30	0.12	0.07	31	0.12	0.53	23	0.17

Source: authors' calculations based on Timmer (2012).

Table 3 presents the partial productivity of land, material use, and water. Note that Romania and Bulgaria exhibited rather high land productivity levels of 0.99 and 0.84 thousand PPS/ha, respectively. This might be due to the fact that the WIOD database includes forestry GVA and productive forest area into account. It is important to take into account that the use of implicit quantity indices involved in the analysis has also altered the real output levels. The same observations can be made for material use productivity. Anyway, these countries showed negative growth rates for the aforementioned variables (save for land productivity in Bulgaria), thus, analysis of the extended time series might reveal some additional insights. The three Baltic States

performed the worst in terms of the average water use productivity. Indeed, the abundance of the latter resource there induces excessive use thereof.

Given the results presented in Table 1 and the rates of growth of resource consumption (these data are available from the corresponding author upon request), the prevailing types of (de)coupling were identified for the analysed countries. Table 4 presents the results, namely elasticities of resource use and the associated types of (de)coupling. The types of decoupling are denoted in the same manner is in Figure 1.

Table 4

Elasticities of resource use and the types of (de)coupling, 1995-2009

Member States	Energy use		Carbon emission		Land		Material consumption		Water	
	Elasticity	Type	Elasticity	Type	Elasticity	Type	Elasticity	Type	Elasticity	Type
Austria	0.0	A	2.8	G	-0.4	D	-1.1	D	-0.4	D
Belgium	-15.2	H	-12.3	H	-1.9	H	-6.9	H	2.8	C
Bulgaria	-12.8	H	5.5	C	-3.2	H	6.4	C	-0.9	H
Czech Republic	8.0	G	3.4	G	-0.8	D	0.7	E	-1.9	D
Germany	-2.5	H	-2.6	H	-0.5	H	-0.3	H	1.6	C
Denmark	-0.1	H	-0.5	H	-0.01	H/A	-0.1	H	0.4	A
Estonia	0.1	A	0.9	B	0.6	A	0.4	A	1.2	C
Finland	0.7	A	-0.9	H	0.6	A	0.5	A	1.0	B
France	-0.2	H	-0.5	H	-0.03	H/A	0.7	A	1.3	C
Hungary	-0.5	H	-0.6	H	-0.1	H	0.3	A	0.2	A
Lithuania	-1.3	H	-1.4	H	-0.6	H	0.5	A	3.2	C
Latvia	-0.7	H	-0.5	H	0.7	A	1.3	C	2.7	C
Netherlands	-1.6	H	-0.3	H	0.0	A	1.4	C	0.0	H
Poland	-1.3	H	-1.1	H	-0.2	H	1.0	B	0.1	A
Romania	1.9	G	3.7	G	0.3	E	0.9	F	0.7	E
Slovakia	-0.5	H	0.6	A	0.1	A	0.4	A	-0.005	H/A
Slovenia	-0.7	D	23.0	G	-20.7	D	-1.3	D	0.003	H/A
Sweden	-0.4	H	0.6	A	0.1	A	0.1	A	0.3	A

Source: authors' calculations based on Timmer (2012).

The results did indicate that the best situation in terms of decoupling prevailed for the energy use. Indeed, some 12 of the 18 analysed countries featured strong (absolute) decoupling (denoted as H). This implies that the economic growth did not render growth in energy use but was rather maintained along with decreasing energy use. The similar trend was observed for carbon emission. However, in this case, only 10 countries were specific with absolute decoupling. This might be due to the lack of technical innovations and sustainable energy use, which induce higher values of the carbon factor. As regards the land use, 6 countries exhibited strong decoupling (type H) and another 6 – weak (relative) decoupling (type A). Even though seven countries were specific with weak decoupling for material use, there were six cases of negative decoupling (i. e. resource use grew faster than economic activity). Finally, nine instances of negative decoupling (types C, D, and E) were observed for water use.

In general, it can be concluded that energy and land were those inputs (production factors) which have been used in the most sustainable way if opposed to the remaining inputs covered in this study. Indeed, costs associated with energy and land are those easiest to internalise through the respective factor markets, whereas such inputs as materials and water are more or less freely available upon acquisition of land.

Note that the elasticities of land use in Denmark and France along with water consumption in Slovakia and Slovenia were close to zero. Therefore, the type of decoupling is rather arbitrary for these cases.

Conclusions

1. The highest relative importance of the agricultural sector (in terms of the average share of GVA in the total GVA) was observed in Bulgaria, Romania, Lithuania, Hungary, Latvia, and Poland. The average share of the agricultural GVA exceeded 6% in these economies. Negative growth rates in the agricultural GVA were observed for Slovenia (-0.7%), Austria (-6.7%), Czech Republic (-6.7%), and Romania (-20.7%).

2. In general, it can be concluded that energy and land were those inputs (production factors) which have been used in the most sustainable way if opposed to the remaining inputs covered in this study. Indeed, costs associated with energy and land are those easiest to internalise through the respective factor markets, whereas such inputs as materials and water are more or less freely available upon acquisition of land.

3. Results for the transformation economies with a history of monetary reforms might be misleading in the sense that the estimates of real value added and, thus, elasticities of resource use might had been spuriously altered during certain periods. Therefore, further analyses should attempt to (i) use different time series, (ii) employ mathematical modelling techniques able to tackle the uncertainty.

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MODELLING THE MEAT SECTOR IN ESTONIA

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Abstract. Improving the competitiveness of Estonian agriculture is the priority objective for Estonia's agricultural policy. The livestock sector is among the most fundamental sectors of Estonian agriculture. The primary objective of this study is to model the Estonian livestock sector and to project patterns of future meat production and consumption. The model used for this purpose is multi-sectoral and comprises of econometrically estimated equations for all of the major products of the Estonian agricultural sector. The Estonian macroeconomic agricultural model is developed in order to analyse and project the medium-term developments of Estonian agricultural production and the structure of agricultural commodities. An approach based on FAPRI (FAPRI-Missouri's EU GOLD model) was used for creating the overall agricultural model which includes several modules (sub-models). Stochastic equations are estimated by two stage least squares (2SLS) and full information maximum likelihood (FIML) using data from 1993 to 2013 inclusive. Projections for the main endogenous variables are made for a seven-year period to 2020. We present and analyse the projections of production and consumption of beef, pork and poultry.

Key words: econometric modelling, simultaneous equations, livestock sector, Estonia

JEL code: C53, O13, Q18

Introduction

In 1993, approximately 13% of the labour force was employed in agriculture, forestry and fishery, producing 15.5% of Estonia's Gross Domestic Product (GDP). In 2013, only 4.3% of the workforce was employed in these areas, producing 4% of GDP (SOE, 2014). Although the relative contribution of agriculture to the economy in terms of GDP and employment is declining, there is a need for modelling tools which enable the analysis of agricultural developments allowing a well-founded basis for policy decision-making. The decline in the number of agricultural animals began during the early 1990s (Figure 1).

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Fig. 1. **Number of livestock and poultry as of 31 December (per thousands)**

Mainly due to agricultural restructuring, the number of cattle in Estonia has gradually decreased (Viira, et. al., 2009). Cattle numbers including dairy cows decreased as many small-scale producers stopped dairy farming. Certain growth of cattle occurred from 2010–2013 due to the increase in the number of beef cattle. The number of pigs decreased between 1992 and 1999. Pig numbers began to grow after 2000, mainly due to increasing demand from Eastern European markets but started to again decline from 2013 due to an import ban of live pigs from the EU. The number of poultry had been in decline until 2007. However, the poultry population has increased significantly after 2008.

After a significant decline in the production of meat, meat production is again on the rise since 2001 (Figure 2), and has amounted to 80,000 tonnes in recent years. The meat total combines beef, pork and poultry meat.

Fig. 2. **Meat production 1992–2013 (per thousand tonnes)**

The structure of meat production has changed. Production of pork and poultry meat has increased, while beef production has decreased. Meat has always had a significant place on the Estonian table. Meat consumption has been affected by changing times and traditions, i.e. changes in income and food consumption patterns. Between 1993 and 2013, meat consumption has seen a large increase (Figure 3). Consumption of meat increased from 47 kg to 65.7 kg per capita between 1993 and 2013. Therefore, in parallel to the increase in incomes, per capita consumption has increased by nearly 50%.
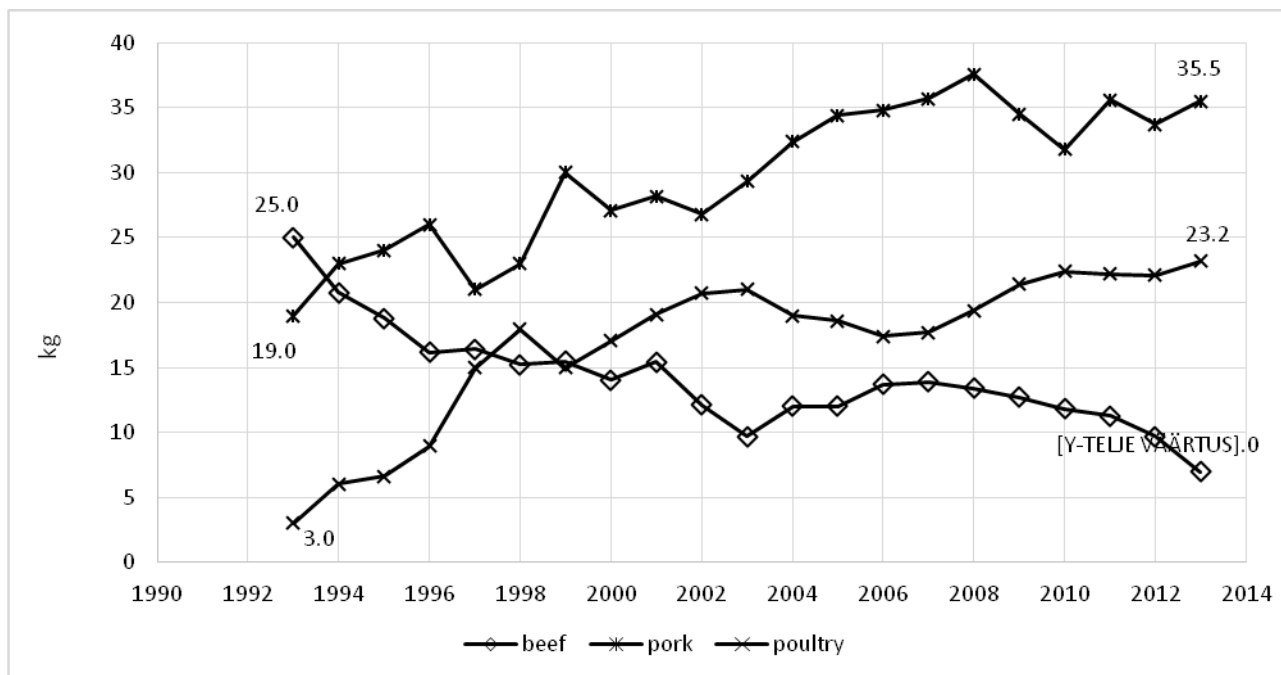
Source: authors' construction based on Statistics Estonia
Fig. 3. **Meat consumption per capita 1993-2013 (per kg)**

From 1993 to 2013, consumer preferences have also changed. Compared to 1993, the consumption of pork and poultry meat has increased, while beef consumption has decreased (follows the trends in meat production, Figure 2).

The most popular type of meat is pork. This accounts for more than 50% of all the meat consumed in Estonia. The consumption of beef decreased to 7 kg per capita in 2013 (SOE, 2014) and accounts for only 10% of meat consumed. The reduction in the consumption of beef in Estonia can be partially attributed to extensive exports of live cattle. Furthermore, the price increase is seen as having a significant negative effect on beef consumption. Poultry meat consumption, after a considerable decline between 2004 and 2006, has started to grow and has reached the maximal level – 23.2 kg per capita in 2013. Consumption of poultry meat accounts for more than 33% of total meat consumption.

This paper aims to provide an overview of modelling and projections of meat production as well as consumption per capita. The meat sub-model of the Estonian agricultural model is applied to analyse simulations in order to make projections of beef, pork and poultry production and consumption for a seven-year period until 2020. The main objective of this study is to project the most essential characteristics of the Estonian meat (livestock) sector for

the period of 2014–2020.The task of this paper is to make projections of meat production and consumption.

Stochastic equations are estimated by two stage least squares (2SLS) and full information maximum likelihood (FIML) using data from 1993 to 2013 inclusive. The Fair-Parke program is used for the estimation of meat model parameters (Fair & Parke 2003).

Research results and discussion

Materials and methods

Models in agriculture, in relation to projections of agricultural production have been used for many different purposes in decision-making. The modelling methodology employed in this paper follows the one that has been used by FAPRI (Hanrahan, 2001). The FAPRI GOLD model structure was used as a basis for the creation of the Estonian agricultural model. The specification of the model is inspired by the structure of FAPRI's Irish and UK models (Binfield, et al., 1999, 2000, 2002; Hanrahan, 2001, Moss, et. al., 2011) and the AG-MEMOD model (Donnellan, et al., 2001; Leeuwen & Tabeau, 2005; Salputra, et. al., 2011). This also facilitates the use of world and EU market projections within the Estonian model.

The FAPRI system is a dynamic, partial equilibrium, multi-commodity, global model (Hanrahan, 2001). As a partial equilibrium model, macroeconomic factors such as population, real GDP per capita, GDP deflation, GDP growth, and growth rates for the general economy, and various producer price indices are exogenous to the system.

At the Estonian University of Life Sciences we have some experience in implementing the FAPRI approach to macroeconomic modelling in agriculture (Põldaru & Roots, 2003; Põldaru, et al., 2006; Põldaru, et al., 2008). Now the integrated macroeconomic model of Estonian agriculture (milk, grain, rapeseed, meat, welfare) has been developed. The model consists of a system of equations covering the dairy, beef, sheep, pigs, poultry, grain and rapeseed sectors. There is also a block for welfare estimations. The integrated database of endogenous and exogenous variables contains data on 203 endogenous and 214 exogenous variables. Projections were made for 187 variables (equations), covering the period 2014–2020: 52 equations describing the dairy sector, 52 describing the grain sector, 24 describing rapeseed production and consumption, and 46 equations describing the meat sector. The change in economic welfare is described by 13 equations.

Figure 4 shows how the meat sector module's successive components (endogenous variables, key relationships) link with each other. The module determines a projection of production, domestic demand, stock building, producer prices, imports and exports for each of the considered commodities.

There are four livestock blocks in the meat sector's sub-model. The cattle and beef, pig and pork, and sheep meat blocks share a similar structure. The poultry block is considerably less complicated than the other livestock blocks. The key variable of supply-side in each of the livestock blocks (except poultry) is the stock of female breeding animals (cows, sows, and

ewes). The stock of female breeding animals determines the number of young animals available for fattening and/or slaughter, which in turn determines meat production. The share of sheep meat production in total meat production is insignificant (accounting for less than 1% of total meat production) and its production and consumption are not analysed in this paper.
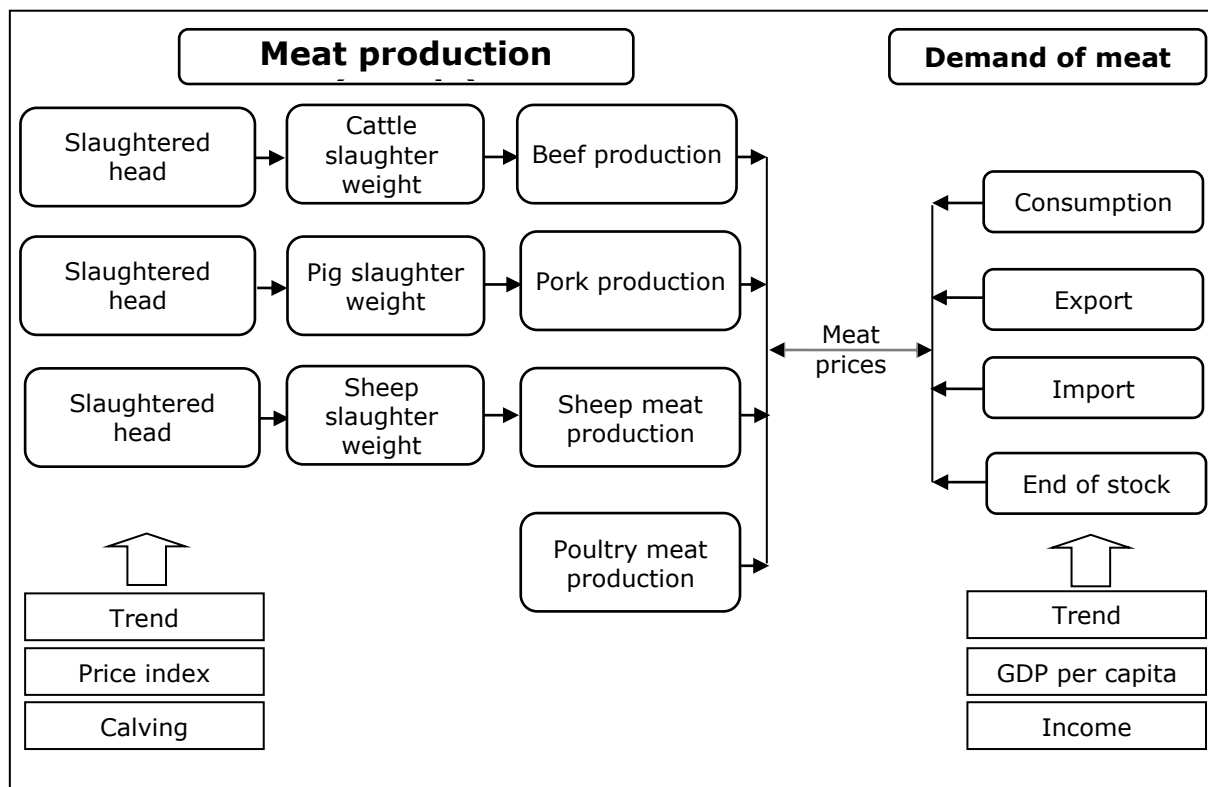
Fig. 4. **Flow diagram showing key relationships in the meat sector sub-model**

The various livestock blocks are linked primarily through their demand side specifications. Meat demand per capita is modelled as a function of real prices of meat. The beef production block is linked with the dairy block via slaughter and the calf production from the dairy herd. The grain and rape modules are linked to the livestock sub-model by means of livestock production price indices that are functions of the prices of the sub-models of grain and seed meals. Total domestic supply is equal to domestic production plus beginning stocks and imports. As the general welfare affects the consumption of meat, it is important to use the average wage and GDP per capita for modelling meat production and consumption.

The meat sector sub-model is developed in order to enable projections for meat production and consumption. This is demonstrated by means of a baseline scenario representing an estimation of a likely future development under the given conditions, the values of independent variables are at the average level of past the 3–4 years. The baseline scenario is based on the assumption that GDP per capita and the average wage will increase by 2% annually during the period of 2014–2020. The prices for different meats are modelled endogenously.

Projections for seven-year period to 2020

The baseline scenario projects a positive development for beef and poultry production and decline for pork production (Table 1). The total supply of meat (beef, pork, poultry) will increase to 82.9 thousand tonnes by 2020.

The projected values of meat supply and demand 2014−2020 (thousand tonnes)

Indicators	2014	2015	2016	2017	2018	2019	2020	Change 2020 vs 2014 %
Beef								
Production	15.6	15.2	16.2	16.8	17.5	17.9	18.7	19.6
Import	4.9	5.4	5.6	5.9	5.9	5.9	5.7	17.5
Export	9.2	8.5	9.6	10.5	11.0	11.4	11.8	27.2
Domestic use	14.5	13.7	13.0	12.4	11.8	11.1	10.6	-27.0
Pork								
Production	44.0	43.9	43.7	43.3	42.8	42.7	42.5	-3.5
Import	34.4	36.2	37.6	38.9	40.2	41.6	42.9	24.8
Export	31.3	34.3	34.6	36.7	37.2	38.5	39.2	25.1
Domestic use	47.4	46.4	46.3	46.2	46.2	46.1	46.0	-3.1
Poultry								
Production	18.9	19.1	19.6	20.1	20.6	21.1	21.7	14.3
Import	21.6	21.8	21.9	21.9	22.0	22.0	22.1	2.3
Export	10.5	10.7	11.2	11.6	11.9	12.0	11.9	12.9
Domestic use	30.2	30.1	30.2	30.4	30.5	30.6	30.7	1.5

The projected values for beef production will increase but the projected values for total beef domestic use will decrease. The supply of beef meat is projected to increase to 18.7 thousand tonnes by 2020 (19.6% growth compared to the 2014 estimate). The domestic use of beef meat will decrease 27% by 2020. In Estonia, there is a grassland resource necessary for increasing the beef cattle population but the growth is slowing down, as the subsidies and output selling prices have declined while the environmental regulations become stricter. In the projected period (2014−2020), exports will increase to 27.2% and imports to 17.5% by 2020. Export growth is mainly due to the increasing export of live animals.

The projected pork meat production will decrease by 3.5% to 42.5 thousand tonnes and domestic use will decrease 3.1% to 46.0 thousand tonnes by 2020 compared to 2014. According to projections, imports and exports continued to grow over the projection period. This implies that the processing industry will continue to import pork meat in order to prepare various products out of it.

Production of poultry meat will increase by 14.3% to 21.7 thousand tonnes and domestic use will increase by 1.5% to 30.7 thousand tonnes by 2020. At the same time, poultry's

domestic use will remain higher than production, and imports of poultry meat will exceed exports.

In the case of poultry, self-sufficiency is considerably lower than in the cases of pig meat and beef. The projections of poultry consumption and production indicate that the deficit will also remain during the period 2014–2020.

Domestic demand for meat is modelled per capita. Figure 5 shows the projections of consumption for different types of meat. Per capita beef consumption presents a downward trend while pork and poultry indicate an upward trend.
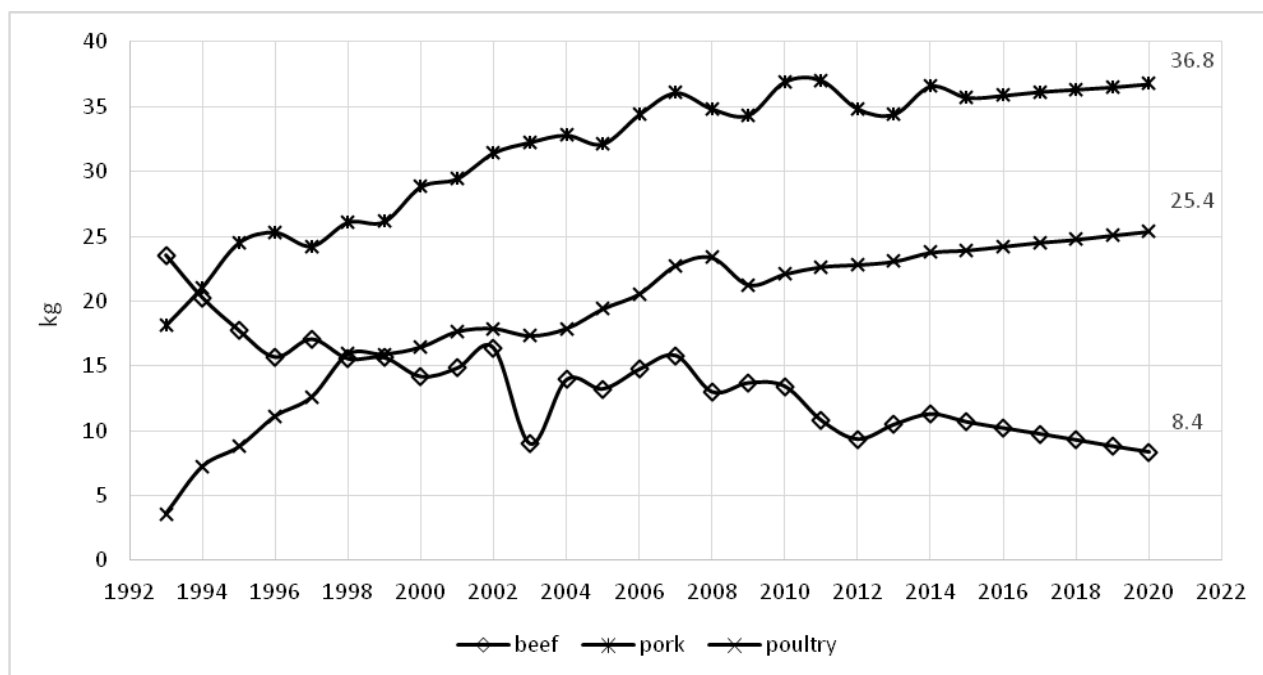
Source: authors' construction based on macroeconomic model

Fig. 5. **The projected values for meat consumption (kg per capita)**

Per capita meat consumption is specified as a function of the producer price, prices of substitutes in consumption (i.e. the prices of the other meats), average monthly wage and trend. All of the meats are assumed to be substitutes for each other in consumption. For example, the beef consumption function could be presented as follows:

$$Beef\ consumption\ per\ capita\ = f(producer\ prices\ of\ beef, pork, poultry;\ average\ wage; trend)$$

The consumption of beef will decrease and consumption of pork and poultry will increase (Figure 5). Per capita beef consumption exhibited a downward trend during the early 1990s (Figure 3). In 1993, per capita consumption of beef meat was 25 kg. The projected average annual consumption of beef is 8.4 kg per capita in 2020. Per capita beef consumption is declining as consumer attitudes and preferences have changed (increasing consumption of poultry meat), while the beef price is also higher than the prices of other meats. According to the model estimates, an increase in the beef price by EUR 0.1 per kg decreases average annual beef consumption per capita by 0.4 kg; an increase in the pork price by EUR 0.1 per kg

increases average annual per capita beef consumption by 0.3 kg; an increase in the average monthly wage by EUR 100 (from EUR 900 to EUR 1000, in 2013, the Estonian national average for the gross monthly wage was EUR 949 [SOE, 2014]) will increase average annual beef consumption by 0.47 kg.

Consumption of pork will increase to 36.8 kg per capita by 2020; this growth is mainly driven by assumed income growth (average 2% per annum) in the baseline scenario. According to the estimates of the respective equations, an increase in the pork price by EUR 0.1 per kg decreases the average pork consumption by 0.9 kg per capita per annum; an increase in the beef price by EUR 0.1 per kg increases average pork consumption by 0.05 kg per capita; an increase in the average monthly wage by EUR 100 will increase average annual pork consumption by 1.13 kg per capita.

The baseline projection indicated an increase in poultry meat consumption to 25.4 kg per capita per annum by 2020. The consumption of poultry in Estonia during recent years has been constantly growing (Figure 3). There are several reasons for the increase in the consumption of poultry meat. The main reason is the price of poultry meat, which is lower in comparison to other types of meat, and increased awareness of the characteristics of poultry meat. Production of poultry in Estonia is still modest, and the rate of self-sufficiency is projected to grow to 70% by 2020. According to the model estimates, an increase in the poultry price by EUR 0.1 per kg decreases average annual poultry meat consumption by 0.58 kg per capita. An increase in pork prices by EUR 0.1 per kg increases average annual per capita poultry meat consumption by 0.75 kg. An increase in the average monthly wage by EUR 100 will increase average annual poultry consumption by 0.96 kg per capita.

The baseline projection of the macroeconomic model of Estonian agriculture indicates an increase in the production and consumption of meat. This tendency is closely related to income growth and positive macroeconomic environment (GDP growth).

Conclusions

1. The partial equilibrium model was used as a method to evaluate the future developments of the Estonian meat sector. The livestock sub-model equations are estimated econometrically using annual data and are then solved simultaneously using 2SLS and FIML.

2. Beef meat production is projected to increase to 18.7 thousand tonnes by 2020 (19.6% growth compared to 2014). According to the projections, approximately 12 thousand tonnes of beef meat will be exported. The projected average annual consumption of beef is 8.4 kg per capita in 2020. According to the model estimates, an increase in the beef price by EUR 0.1 per kg decreases average annual beef consumption per capita by 0.4 kg.

3. Projected pig meat production indicates a decrease by 3.5% to 42.5 thousand tonnes by 2020. Consumption of pork will increase to 36.8 kg per capita by 2020. According to the estimates of the respective equations, an increase in the pork price by EUR 0.1 per kg

decreases average pork consumption by 0.9 kg per capita per annum. An increase in the average monthly wage by EUR 100 will increase the average annual pork consumption by 1.13 kg per capita.

4. The projected production of poultry meat will increase by 14.3% to 21.7 thousand tonnes. Consumption of poultry meat will increase to 25.4 kg per capita by 2020. According to the model estimates, an increase in the poultry price by EUR 0.1 per kg decreases average annual poultry meat consumption by 0.58 kg per capita and an increase in pork prices by EUR 0.1 per kg increases per capita poultry meat consumption by 0.75 kg.

5. The model estimates of meat demand indicated negative price elasticity for all considered meat types, which corresponds to expectations. According to the model estimates, meat consumption is positively related to changes in the average wage and GDP.

6. The macroeconomic model for Estonian agriculture can be used as a decision-making instrument for projection and analysis purposes.

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ECONOMIC POLICY INCENTIVES ENCOURAGING AGRICULTURAL PRODUCTION: A COMPARATIVE ANALYSIS OF LITHUANIAN RURAL DEVELOPMENT PROGRAMME FOR 2007-2013 AND 2014-2020

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Abstract. The new European Union's financial perspective for rural development policy started in 2014 bringing the need to assess the results of past policies and to design future rural development in line with new strategic objectives. While the Rural Development programme for Lithuania for 2014-2020 being still under development it is important to implement ex-ante evaluation of economic incentives being created (maintained) under these programmes in order to detect relative changes in economic policy incentives encouraging agricultural production in the future. Therefore, the aim of the paper is to define relative changes in economic policy incentives encouraging agricultural production being created by the structural support for agriculture under the Rural Development programme for Lithuania for 2014-2020. For that purpose measures aimed at support for business entities (producers) under the Rural Development programmes for 2007-2013 and 2014-2020 are compared. The results of the comparative analysis reveal that total support and its intensity is decreasing in the period 2014-2020 compared to that in the period 2007-2013. The decrease of support can induce lagging in structural changes or advancement in productivity as an option to overcome structural deficiencies.

Key words: economic incentives, rural development measures, investment support, Lithuania.

JEL code: Q18

Introduction

The new European Union's (EU) financial perspective for rural development policy started in 2014 bringing the need to assess the results of past policies and to design future rural development in line with new strategic objectives. The potential changes in support for agricultural sector could bring new incentives for changes in structure of agricultural sector, its competiveness, productivity, farm income and welfare as well as other broader benefits for whole rural and national society through economically viable, competitive, agro-environmentally friendly and sustainable agricultural sector. As the decoupling of support under the called First Pillar (direct payments) of the EU Common Agricultural Policy (CAP) is

implemented its incentives being created for agricultural production have become limited. In that context the attention shifts to the EU CAP's support for rural development (called also as the Second Pillar's and even the Third Pillar's support), its measures and their impact on agricultural production. While the Rural Development programme for Lithuania for 2014-2020 being still under development it is important to implement ex-ante evaluation of economic incentives being created (maintained) under these programmes in order to detect relative changes in economic policy incentives encouraging agricultural production in the future.

The aim of the paper is to define relative changes in economic policy incentives encouraging agricultural production being created by the structural support for agriculture under the Rural Development programme for Lithuania for 2014-2020.

In order to achieve the aim of the paper, three tasks are formulated:

- to analyse and classify measures under the Rural Development programmes for Lithuania for 2007-2013 and 2014-2020 in order to define those directly linked to productive assets, income and costs of agricultural producers;

- to make comparative analysis of intensity of support for producers (business entities) taking into account structural indicators of agricultural sector (a structural approach);

- to make comparative analysis of intensity of support for producers (business entities) taking into account indicators of economic accounts for agriculture (an economic approach);

- to draw conclusions, proposals and recommendations for further development of rural development policy with the aim to support competitiveness and sustainability of agricultural activity.

The comparative analysis is applied in order to define relative changes in economic policy incentives encouraging agricultural production being created by the structural support for agriculture under the Rural Development programme for Lithuania for 2014-2020. For that purpose there is made the analysis and comparison of packages of measures under the Rural Development programmes for Lithuania for 2007-2013 and 2014-2020. The main data sources used for the comparative analysis of packages of measures are the Rural Development Programme for Lithuania 2007-2013 (e.g. the Ministry of Agriculture of the Republic of Lithuania, 2014), Lithuania - Rural Development Programme for 2014-2020 (e.g. the Ministry of Agriculture of the Republic of Lithuania, 2014), "Lietuvos kaimo pletros 2014-2020 metu programos priemoniu pagrindines nuostatos" (Main Concepts of the Rural Development Programme's 2014-2020 Measures) – background presentation prepared by the Ministry of Agriculture of the Republic of Lithuania (e.g. the Ministry of Agriculture of the Republic of Lithuania, 2014) and the Regulation (EU) No 1305/2013 of the European Parliament and of the Council of 17 December 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD and repealing Council Regulation (EC) No 1698/2005 (e.g. European Parliament and the Council, 2013). The data on agricultural structural (on UAA)

statistics (UAA, number of holdings) for Lithuania are the data of the National Paying Agency (2014) while data on agricultural labour and economic accounts statistics for Lithuania are the data taken from Eurostat (2014).

The discussion on the impact of structural (EU CAP's Second and Third Pillars) support on agricultural sector of the world, the EU and that of Lithuania is never ending. Rural development policies as a part of common agricultural policy affect structural changes in agricultural sector to the extent it makes the effect on agricultural production incentives, output and input markets, and farm household income (e.g. OECD, 2011). The structural changes in agricultural sector will always be the result of many complex interactions among different policies and economic realities; thus, it is difficult to identify impact of specific policy measures onto structural changes in the agricultural sector. The same applies for the impact of agricultural policies on agricultural productivity and competitiveness (e.g. OECD, 2011). The relative importance and the changes in support intensity can be these measurable elements in order to identify the orientation the support policy is changing towards even if the Second and Third Pillars' support remains relatively modest compares to that of the First Pillar (e.g. Dwyer et al., 2007) and its suitability for Central and Eastern countries is under discussion itself. It is perceived that direct support being relatively important compared to farm income generated in the market (the case of Lithuania; e.g. Stonkute, 2013), it decreases the likelihood of farm households to diversify into new, non-agricultural businesses or entering the labour market, i.e. increases stagnation of the structure of rural economy (e.g. Gorton et al., 2009) decreases like hood to reform (Jensen et al., 2009). While future of the rural development is rather dependant on diversification into food and non-food production (e.g. Dammers and Keiner, 2006; Hodge, 2003), the importance of incentives being created under rural development measures (the Second and Third Pillars' support) is increasing and needs to be analysed.

Research results and discussion

The comparative analysis of changes in economic policy incentives for encouraging agricultural production during the periods of 2007-2013 and 2014-2020 in Lithuania focuses on the economic policy incentives designed, planned and implemented under the Rural Development programmes for Lithuania for the respective periods. The packages of measures included into the Rural Development programmes are analysed and compared in order to detect the main changes in intensity of economic policy incentives being created and implemented (2007-2013) or being created and planned to be implemented (2014-2020) during two periods.

The analysis starts with the analysis and definition of each measure in terms of its purpose and comparative analysis of financial importance of each type of measure in the Rural Development programmes for Lithuania for 2007-2013 and 2014-2020. The analysis of the measures and their classification is based on the identification of producer (business entity) oriented measures having direct impact on the producer's productive assets, income (or

income foregone) or costs, general services (or common benefit) for agriculture, rural development, and forestry oriented measures. The analysis and comparison of measures' packages is made eliminating certain financial engagements (measures) having no analogies in the programmes being compared. For that reason and having in mind that the Rural Development programme for 2014-2020 is not approved by the European Commission, differences in support amounts can be detected (other than official documents). The classification made takes no account of the priorities and objectives being stated in the Rural Development programmes as aims to be achieved by measures being planned, undertaken.

The analysis of support intensity changes is made taking into account structural changes in agricultural sector (a structural approach) and in economic accounts of agriculture (an economic approach) during the respective periods. The analysis is based on the comparison of average planned support intensity during periods 2007-2013 and 2014-2020 in respect to changes of structural indicators, such as utilized agricultural area (UAA), total number of holdings, and annual working units (AWU), and economic indicators, such as agricultural output, net fixed capital formation, and net value added. The data on UAA and total number of holdings are data of annual UAA declaration reports (e.g. National Paying Agency, 2014) and other data are data on agriculture from Eurostat (2014).

1. Comparison of rural development measures' packages

There are rural development measures' packages being planned under the Rural Development programmes for Lithuania for the periods 2007-2013 and 2014-2020. These measures are analyzed and classified according their purpose. The measures directly oriented and making effect on agricultural producer (agricultural business entities) productive assets, income (or income foregone) or costs are grouped into the package of support for business entities (Table 1). There are two types of support for business entities: support for investments and support in the form of compensations of additional costs and income foregone. Investments in physical assets and support for farm and business development (eligible for business development support are also non-agricultural businesses in rural areas but can be undertaken by farmers as business diversification strategy), are two measures aimed at investment support. Compensational support for business entities can be allocated under measures of quality schemes, agro-environmental – climate, organic farming, Natura 200 and Water Framework Directive payments, payments to areas facing natural or other specific constrains and as partial compensation of insurance premiums (risk management).

Measures of knowledge transfer and information actions, advisory services, support for starting-up of producer groups and organizations, co-operation and national rural network is classified as being measures of general interest for all agricultural and rural development actors. Even if advisory services and knowledge transfer measures are targeting mostly

concrete agricultural producers, their impact on the economics of business entities remains indirect. The development of basic services in rural areas and Leader are two measures oriented towards development of rural infrastructure (small, social, broadband). Support for forestry is allocated through one main measure of investments in forest area development and improvement of the viability of forest.

For the purpose of the research only support for business entities is analysed in depth while some broad analysis of other types of support is made just for the completeness and argumentation of the main research objective.

Table 1

Comparison of rural development measures in Lithuania in the periods 2007-2013 and 2014-2020

Measures/ purpose of measure	2007-2013	%	2014-2020	%
Total	*2226.6*	*100.0*	*1851.1*	*100.0*
Support for business entities	***1750.5***	***78.6***	***1404.4***	***75.9***
Investment support	*1027.5*	*46.1*	*852.1*	*46.0*
Investments in physical assets	727.9	32.7	647.3	35.0
investments in agricultural holdings	464.6	20.9	429.2	23.2
Investments in processing, marketing, and/or development of new products	148.0	6.6	111.9	6.0
investments into infrastructure	109.5	4.9	102.7	5.5
investments into non-productive assets (agri-environmental, climate objectives)	5.9	0.3	3.5	0.2
Farm and business development	299.6	13.5	204.8	11.1
start-up aid for	0.0	0.0	0.0	0.0
for young farmers	87.5	3.9	64.7	3.5
for non-agricultural activities in rural areas	0.0	0.0	34.8	1.9
for development of small farms	17.3	0.8	16.9	0.9
investments in creation and development of non-agricultural activities	194.9	8.8	44.9	2.4
annual payments or one-off payments for farmers eligible for small farmer scheme	0.0	0.0	0.0	0.0
biogas production development (from agricultural waist)	0.0	0.0	43.4	2.3
Compensation of costs (additional cost) and income foregone	*723.0*	*32.5*	*552.4*	*29.8*
Quality schemes for agricultural products, and foodstuffs	2.3	0.1	4.2	0.2
Agro-environmental-climate	170.0	7.6	55.9	3.0
Organic farming	137.6	6.2	163.9	8.9
Natura 2000 and Water Framework Directive payments	5.6	0.3	6.6	0.4
Payments to areas facing natural or other specific constraints	370.4	16.6	287.0	15.5
Risk management	37.1	1.7	34.8	1.9
financial contributions to premiums	37.1	1.7	34.8	1.9
General services, common benefits for	***38.4***	***1.7***	***58.4***	***3.2***

agricultural sector				
Knowledge transfer and information actions	24.4	1.1	23.4	1.3
Advisory services, farm management and farm relief services	6.3	0.3	4.6	0.2
Starting-up of producers groups and organizations	0.0	0.0	1.8	0.1
Co-operation	0.0	0.0	24.0	1.3
National rural network	7.7	0.3	4.6	0.3
Rural infrastructure	*201.6*	*9.1*	*190.0*	*10.3*
Basic services and village renewal in rural areas	67.2	3.0	76.2	4.1
Leader	134.4	6.0	113.8	6.1
Support for forestry	*145.5*	*6.5*	*122.4*	*6.6*
Investments in forest are development and improvement of the viability of forests	145.5	6.5	122.4	6.6
Technical support	*90.7*	*4.1*	*75.9*	*4.1*

The total support amount under the Rural Development programme for 2014-2020 is lower than that for 2007-2013 (Table 1). The total support for the period 2007-2013 was EUR 2227 million and for the period 2014-2020 is planned – EUR 1851 million or 17% lower. The structure of the allocation of support remains rather similar during these two periods, i.e. support for producers (agricultural business entities) accounted for 78.6% of all support (EUR 1750.5 million) during 2007-2013 and it will remain dominant support purpose in 2014-2020 (75.9% of total support or EUR 1404.4 million). Support for general services, common benefits for agriculture (or that with no direct link to productive assets, income or costs of the particular producers) as economic sector accounted for 1.7% of total support (EUR 38.4 million) in the period 2007-2013 and will account 3.2% of total support (or EUR 58.4 million) in the period 2014-2020. The amount of support for rural infrastructure (small, broadband, social) remain rather stable and accounts for 9.1% of total support (EUR 201.6 million) in the period 2007-2013 and 10.3% (EUR 190.0 million) in the period 2014-2020. The same importance in the Rural Development programme is put on support for forestry during two periods with marginal difference in its share (6.5% of total support in the period 2007-2013 or EUR 145.5 million and 6.6% in the period 2014-2020 or EUR 122.4 million). Even if the support for technical administration of the Rural Development programmes' implementation will be lower in the period 2014-2020 (EUR 75.9 million) than in the period

2013-2020 (EUR 90.7 million), the importance of it remains the same in both periods (4.1% of total support in periods 2007-2013 and 2014-2020).

Investment support remains dominant support in the package of support for business entities. It accounted for 58.75 of total support (EUR 1027.5 million) for business entities in the period 2007-2013 and will account for 60.7% (EUR 852.1 million) of total support in the period 2014-2020 while compensational support respectively 41.3% (EUR 723.0 million) and 39.3% (EUR 552.4 million) of total support. The importance of investments into physical assets, even if the support in EUR is lower, is higher in the period 2014-2020. The investments into physical assets accounts for 76.0% (EUR 647.3 million) of total investment support in the period of 2014-2020, while in the period 2007-2013 it accounts for 70.8% (EUR 727.9 million) of total investment support. More than a half of investments in physical assets were investments in agricultural holdings in the period 2007-2013 (EUR 464.6 million). The same is true for in the period 2014-2020 (EUR 429.2 million). Support for farm and business development accounted for 29.2% (EUR 299.6 million) in the period 2007-2013 and will reach 24.0% (EUR 204.8 million) in the period 2014-2020 of total investment support for business entities.

Payments to areas facing natural or other specific constrains remain the main compensational measure and they accounted in the period 2007-2013 and they will account in the period 2014-2020 more than a half of all compensational support (respectively 51.2% or EUR 370.4 million and 52.0% or EUR 287.0 million). Support for organic farming is becoming more important and in the period 2014-2020 it will account for 29.7% (EUR 163.9 million) of total compensational support where it accounted for 19.0% (EUR 137.6 million) in the period 2007-2013. Measures to support agro-environmental – climate objectives of the European Union agricultural policy remain of rather limited importance and their share decreases in the period 2014-2020 (10.1% or EUR 55.9 million) compared to the period 2007-2013 (23.5% or EUR 170.0 million).

Even if the total amount of support for rural development and business entities is decreasing in the period 2014-2020 compared to the period 2007-2013, the structure of the support remains rather the same preserving broadly the same policy orientation.

2.   Support intensity: a structural approach

In order to scale the changes of support for business entities in the period 2014-2020 compared to the period 2007-2013, the average planned support intensity during the respective period is compared in respect to changes of structural indicators. For that purpose, averages of total annual support for business entities, investment support and compensational support are calculated by dividing the respective amounts of support for the periods by the duration of these periods in years (7 years). The average of total annual support for business entities, investment support and compensational support in the period 2007-2013 is,

respectively, EUR 250.1 million, EUR 146.8 million, and EUR 103.3 million. In the period 2014-2020 these support measures accounted for, respectively, EUR 200.6 million, EUR 121.7 million, and EUR 78.9 million.

The average numbers of UAA, holdings and AWU were calculated finding the arithmetical average of respective numbers in the period 2007-2013 for the analysis of support in the period 2007-2013 and in the period 2012-2014 for the analysis of support in the period 2014-2020. The average area of UAA for the calculations of support intensity in the respective periods is 2693.6 thousand ha for the period 2007-2013 and 2772.9 thousand ha for the period 2014-2020. Analogically, the average number of holdings and the average number of AWU were found. The average number of holding is 171.9 thousand for the period 2007-2013 and 149.2 thousand for the period 2014-2020. The average number of AWU is 147.5 thousand for the period 2007-2013 and 145.7 thousand for the period 2014-2020.

Table 2

Average support intensity for business entities per ha of UAA

EUR/ha	2007-2013	2014-2020	2007-2013	2014-2020
Support for business entities	92.8	72.4	100.0	77.9
Investment support	54.5	43.9	100.0	80.6
Compensational support	38.3	28.5	100.0	74.2

Source: author's calculations based on agricultural structural (on UAA) statistics for Lithuania (e.g. National Paying Agency, 2014) and data generated in Table 1.

The support for business entities, investment support and compensational support per hectare of UAA in the period 2007-2013 was higher than that it is planned to be in the period 2014-2020. In the period 2007-2013 the total support for business entities amounted to 92.8 EUR/ha of UAA where in the period 2014-2020 it will be some 22.1% lower and will amount to 72.4 EUR/ha (Table 2). Relatively smaller decrease is observed in investment support (by 19.4%) than in compensational support.

Table 3

Average support intensity for business entities per holding

EUR/holding	2007-2013	2014-2020	2007-2013	2014-2020
Support for business entities	1454.7	1344.5	100.0	92.4
Investment support	853.9	815.8	100.0	95.5
Compensational support	600.8	528.9	100.0	88.0

Source: author's calculations based on agricultural structural (on number of holdings) statistics for Lithuania (e.g. National Paying Agency, 2014) and data generated in Table 1.

The average support intensity per holding, as number of holdings is decreasing, will decrease just slightly in the period 2014-2020 compared to the period 2007-2013. The average support for business entities per holding will be 1344.5 EUR/holding in the period 2014-2020 and it will account for 92.4% of the average support in the period 2007-2013

(Table 3). The average investment support per holding was 853.9 EUR/holding in the period 2007-2013 and it will be EUR 815.8 million in the period 2014-20120.

Table 4

Average support intensity for business entities per AWU

EUR/AWU	2007-2013	2014-2020	2007-2013	2014-2020
Support for business entities	1695.6	1376.7	100.0	81.2
Investment support	995.3	835.3	100.0	83.9
Compensational support	700.3	541.5	100.0	77.3

Source: author's calculations based on agricultural labour statistics for Lithuania (e.g. Eurostat, 2014) and data generated in Table 1.

As total amount of support for business entities is decreasing and the average AWU in the respective periods is rather similar, the decrease in support effects the most the decrease in support per AWU (Table 4). The average support for business entities per AWU was 1695.6 EUR/AWU in the period 2007-2013 and it will be 1376.7 EUR/AWU in the period 2014-2020 (it will account for 81.2% of the support per AWU in the period 2007-2013).

3.   Support intensity: an economic approach

For the economic importance of the changes in support for business entities being planned and foreseen in the Rural Development programmes for Lithuania, the average annual amounts of agricultural output, net fixed capital formation and net value added were divided by the average annual support amounts.

The average annual amounts of agricultural output, net fixed capital formation and net value added were calculated by finding the arithmetical average of respective numbers in the period 2007-2013 for the analysis of support in the period 2007-2013 and in the period 2012-2014 for the analysis of support in the period 2014-2020. The average agricultural output is EUR 2253.3 million for the period 2007-2013 and EUR 2635.6 million for the period 2014-2020. Analogically, the average number of net fixed capital was found being EUR 126.7 million and EUR 224.2 million holdings and the average number of net value added – EUR 601.4 million and EUR 769.2 million.

Table 5

Average support intensity for business entities in relation to agricultural output

Agricultural output per EUR 1 of support	2007-2013	2014-2020	2007-2013	2014-2020
Support for business entities	9.0	13.1	100.0	145.8
Investment support	15.4	21.7	100.0	141.0
Compensational support	21.8	33.4	100.0	153.1

Source: author's calculations based on economic accounts for agriculture for Lithuania (e.g. Eurostat, 2014) and data generated in Table 1.

The average support intensity for business entities in relation to agricultural output is lower in the period 2014-2020 compared to the period 2007-2013 (Table 5). If in the period 2007-

2013 EUR 1 of support for business entities was relative to EUR 9.0 of agricultural output, then in the period 2014-2020 EUR 1 of support will be relative already to EUR 13.1 of agricultural output. The intensity of support will decrease by 45.8% in the period 2014-2020 compared to the period 2007-2013.

<div align="right">Table 6</div>

Average support intensity for business entities in relation to net fixed capital formation

Net fixed capital formation per EUR 1 of support	2007-2013	2014-2020	2007-2013	2014-2020
Support for business entities	0.5	1.1	100.0	220.5
Investment support	0.9	1.8	100.0	213.3
Compensational support	1.2	2.8	100.0	231.6

Source: author's calculations based on economic accounts for agriculture for Lithuania (e.g. Eurostat, 2014) and data generated in Table 1.

The average support intensity for business entities in relation to net fixed capital formation will decrease in the period 2014-2020 compared to the period 2007-2013 (Table 6). The EUR 1 of support for business entities was relative to EUR 0.5 of net fixed capital in the period 2007-2013 and it will be relative to EUR 1.1 of net fixed capital in the period 2014-2020. The rather sharp decrease in the average support intensity for business entities is linked to rather sharp increase in average net fixed capital formation during the last three years (2012-2014).

<div align="right">Table 7</div>

Average support intensity for business entities in relation to net value added

Net value added per EUR 1 of support	2007-2013	2014-2020	2007-2013	2014-2020
Support for business entities	2.4	3.8	100.0	159.4
Investment support	4.1	6.3	100.0	154.2
Compensational support	5.8	9.7	100.0	167.4

Source: author's calculations based on economic accounts for agriculture for Lithuania (e.g. Eurostat, 2014) and data generated in Table 1.

The average support intensity for business entities in relation to net value added is decreasing in the period 2014-2020 compared to the period 2007-2013 (Table 7). The average net value added was EUR 2.4 per EUR 1 of support for business entities in the period 2007-2013 and it will be some EUR 3.8 for each EUR 1 of support in the period 2014-2020. The support intensity per net value added is decreasing and follows the patterns of the changes in average support intensity per agricultural output.

The average support intensity per agricultural output, net fixed capital formation and net value added is decreasing. The bigger decrease in average support intensity relative to net fixed capital formation is due to the sharp increase in fixed capital formation during the last three years as the last years of the period 2007-2013.

Conclusions, proposals, recommendations

The comparative analysis of support for business entities in the periods 2007-2013 and 2014-2020, done by comparing packages of relative measures being planned in the Rural Development programmes for Lithuania, implies generation of these conclusions:

1. The rural development policy in the period 2014-2020 remains rather similar to that being applied in the period 2007-2013 with dominant support for producers (business entities) in the form of investment support and compensational support.

2. The investment support (investments into productive assets) remains the most important support in the structure of the policy measures package, while the importance of agro-environment oriented measures (sustainability oriented measures) remains rather limited.

3. The support (in total amounts) and its intensity (relative to structural and economic indicators of agricultural sector) for business entities in the form of investments and compensational support in the period 2014-2020 are decreasing compared to the period 2007-2013.

4. The unchanging orientation of rural development policy with its decreasing intensity, could decrease economic incentives for agricultural production; however, previously high dependability on supports on products and decreasing intensity of supports for producers could generate incentives to increase productivity in order to compensate decreasing support intensity and to maintain the economic viability of business entities and to help overcome the "subsidy trap" (e.g. Stonkute, 2013) being perceived in Lithuania's agriculture.

5. The decreasing intensity of structural support for business entities and decreasing maximum amounts of investment support together could initiate some sort of stagnation in structural changes of agricultural sector with still rather small average size of holdings. In that case the policy creating incentives for high value added or exceptional quality in order to overcome structural deficiencies to benefit from economies of scale would be needed and that is rather limited.

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CONDITION AND PROSPECTS OF DEVELOPMENT OF ORGANIC FARMING IN THE EUROPEAN UNION

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Abstract. In recent years, the policy of reducing negative human impact on the natural environment and the fashion for eating high-quality food influenced the development of organic farming. However, that organic crops in the world currently only cover approx. 0.9% of agricultural land, mainly in developed countries. Europe, particularly the European Union countries, besides the North America, is a leader in terms of both the area and the number of farms, and the development of organic products market. The aim of the paper is to present both the status of organic farming in the European Union in the years 2000–2012, and synthetic prospects for the development by the year 2020. Information was analysed on the organic farming i.e. the area and structure of organic crops, and the number of certified farms. An analysis of the basic data concerning the level and rate of the development of organic farming in the European Union confirmed an increase in the significance of this method of agricultural production. As a result of the support under the CAP so far, both the number of organic farms and the area of organic agricultural land have been on the increase.

Key words: organic agriculture, organic farming, European Union, economic development, trends for a change

JEL code: Q10, Q11, Q13, Q18

Introduction

One of the most important trends in the last years in agricultural production is the demand on the domestic and foreign markets for agricultural products produced within safe farming practices that protect consumers' health and the environmental ecosystems. In this case, the most promising farming system is organic farming which provides a crucial element of quality – organic food products (Ciburiene J., 2014). Organic products differ from conventional products with the fact that the first ones are exposed to significant restrictions in use of pesticides and artificial fertilizers in crop production, use of antibiotics in cattle breeding, food additives, processing aids, and other inputs as well as prohibition to use genetically modified

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organisms (Grinberga-Zalite G. et al., 2013). This results in high production cost, which has a significantly effect on the price level.

Organic system of agricultural production is a global process, and is found, although in different dimensions, on all continents. In principle, all analyses and studies concerning the possibilities for the development of organic farming in the world indicate that this is a constant trend, and that the area of organic agricultural land is going to steadily increase in the years to come (Brodzinska K., 2014). However, a very important factor in the development of organic farming is the support of the development of organic methods of agricultural production, coming from numerous countries. The number of operators applying the organic system of agricultural production in the world in 2012 amounted to nearly 2 million, which represents nearly 9-fold increase as compared to the year 2000 (with approx. 233 thousand). In turn, the area of agricultural land under organic crops in the world in 2012 amounted to 37.5 million ha. As compared to 2000, there has been a 2.5-fold increase in the area of land farmed under an organic system. However, it should be noted that organic crops in the world currently only cover approx. 0.9% of agricultural land, mainly in developed countries. Europe, particularly the European Union countries, besides the North America, is a leader in terms of both the area and the number of farms, and the development of organic products market. Unfortunately, demand for such products is not the major factor stimulating the development of organic farming. Another serious problem is the number of entities which are being converted exclusively due to higher agro-environment payments, so-called "sofa farmers" (Dunn J.W., et al. 2014, Pawlewicz A., 2014).

However, it should be borne in mind that the support of such a method of agricultural production in the EU, as compared to the conventional one, is regarded as an activity performed in the public interest, contributing to the conservation of the environment. Therefore, the development of organic farming is closely linked to the theory of sustainable development including the economic, social and environmental objectives. Consequently, not only the organic products market but also the environmental aptitude of a particular region are of importance (Pawlewicz A., Pawlewicz K., 2008).

The aim of the paper is to present both the status of organic farming in the European Union in the years 2000–2012, and synthetic prospects for the development by the year 2020. Information was analysed on the organic farming i.e. the area and structure of organic crops, and the number of certified farms, based on the Eurostat[*] data supplemented with information from yearbooks "The World of Organic Agriculture - Statistics and Emerging Trends" from the years 2000–2014, published by the Research Institute of Organic Agriculture (FiBL) and the International Federation of Organic Agriculture Movements (IFOAM)[†], in horizontal (time) and vertical (countries) arrangement. The study period included the available data from the years 2000–2012. The additional sources of information included both the documentation of institutions supporting the development of agriculture, and the literature on the subject; they

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[*] http://ec.europa.eu/eurostat/web/organic-farming
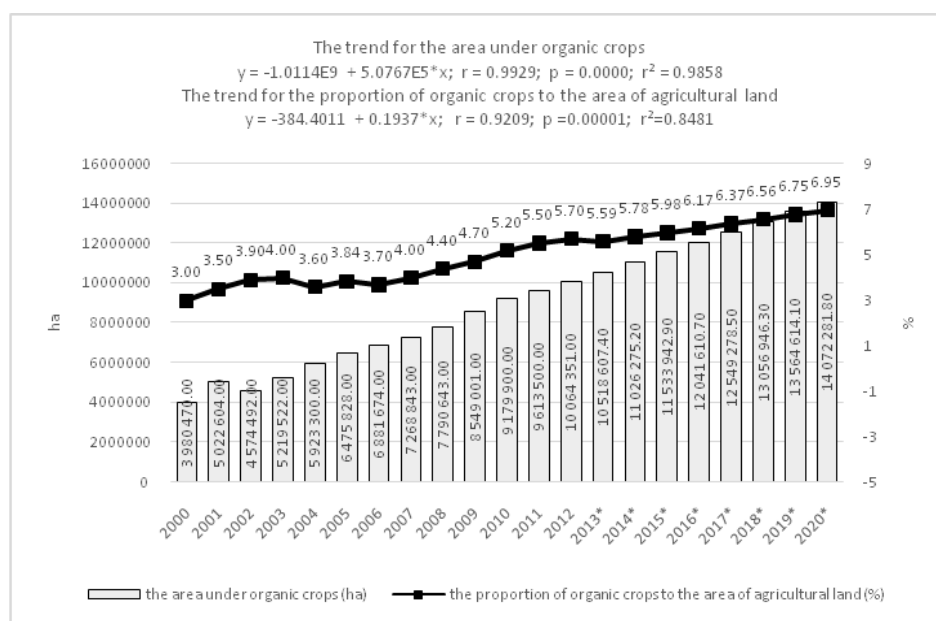[†] http://www.organic-world.net

allowed the obtained results to be properly interpreted and the correct conclusions to be drawn.

In order to determine the anticipated future changes in the years 2014–2020, the author applied the deductive reasoning method based on mathematical analysis of historical data, literature on the subject, and source documents. The author used historical data for the presentation of the trend in development using the linear regression method by estimating the numerical value of the dependent variable y (response variable – numerical values of an investigated phenomenon, e.g. the number of farms, the area of organic agricultural land) based on the values of independent variables x (prediction of the dependent variable based on the independent value, e.g. a year). Trend estimation for the dynamic series was determined using a mathematical function: $y = \beta_0 + \beta_1 x + \xi$, where: β_0 and β_1 are structural parameters of the regression function, and ξ denotes a random component. Parameter β_0 in the linear regression equation denotes the so-called absolute term, and parameter β_1 is a regression coefficient for variable y in relation to variable x. It corresponds to the slope of linear function, and thus provides information on by how much the value of the dependent variable y will change when the independent variable x changes by one unit. In the construction of a synthetic model it was assumed that no significant changes to the existing legislation concerning organic farming would take place, and that the aid amounts would remain at a similar level, which would not affect the current level of prices of raw materials and processed products. This allowed the impact of the random component ξ to be restricted. In order to make certain of the validity of the adopted model of trend, it is necessary to specify the determination coefficient (r^2) which is a measure of the degree to which the model explains the formation of variable y. The closer the value thereof is to 1, the better the fitting of the model is.

Research results and discussion

The area under organic crops in the European Union in the years 2000–2012 was steadily increasing. At the beginning of the period under analysis, the area concerned amounted to nearly 4 million ha, and in 2012 it amounted to over 10 million ha. The trend as described on the basis of the regression equation indicates that the average annual increase in the area under organic farming amounted to over 507 thousand ha. Determination coefficient with a value of 0.9858 indicates that the adopted model very well presents the course of the phenomenon in the period under analysis. On this basis, it may be estimated that under *ceteris paribus* conditions, the trend may continue and, by the year 2020, the area under organic crops in the European Union may increase up to approx. 14 million ha (Figure 1). It should be noted that in the years 2004–2012, the rate of growth was nearly five times higher in the countries which entered the EU structures in 2004 as compared to the old fifteen Member States (Facts and …, 2013). According to Runowski H. (2009b), in the old European Union countries with the longest tradition of organic farming, the rate of development thereof has been slowing down, and even speaking of stagnation and regress may be justified.

At the same time, with the increase in the area managed under the system of organic farming, one may observe a steady increase in the proportion of organic crops to the total area of agricultural land. In 2000, the value concerned amounted to 3%, and reached the level of 5.7% in 2012. In this period, a certain fluctuation may be observed. In the years 2004–2007, a drop to the level of 3.6% occurred (Figure 1). This resulted from the accession of new states in which the area under organic farming was small, and at the same time the area of agricultural land was rather significant, to the EU structures. In accordance with the trend being described by the regression equation, the average annual increase was 0.1937%, which allowed the indication of a forecast according to which the value in question may amount to nearly 7% in 2020. The determination coefficient was 0.8481, which also indicated a high degree of the fitting of the model of trend to the course of this phenomenon.

The trend for the area under organic crops
$$y = -1.0114E9 + 5.0767E5 \cdot x; \quad r = 0.9929; \quad p = 0.0000; \quad r^2 = 0.9858$$
The trend for the proportion of organic crops to the area of agricultural land
$$y = -384.4011 + 0.1937 \cdot x; \quad r = 0.9209; \quad p = 0.00001; \quad r^2 = 0.8481$$

Source: author's construction based on: Organic Farming ..., 2014; The World ..., 2000 - 2014.

Fig. 1. **Changes in the area under organic crops and the proportion of organic crops to the area of agricultural land in the years 2000–2012, and a forecast for the period until 2020 in the European Union**

In terms of space, one may observe significant differences in the area under organic crops in particular countries in the European Union, which are associated with the regional specificity of agriculture. In 2012, the largest area under organic crops was found in Spain, and amounted to nearly 1.6 million ha. In turn, in Italy the area concerned amounted to over 1.16 million ha. These countries were followed by Germany with 1.034 million ha, and France with 1.032 million ha. It should be noted that Poland with 0.66 million ha was also included among the states in which the area under organic crops was large, and was followed by Great Britain with 0.55 million ha, Austria with 0.53 million ha, the Czech Republic with 0.49 million ha, Sweden with 0.48 million ha, and Greece with 0.46 million ha (Figure 2).

The spatial differences in the proportion of organic crops to the total area of agricultural land are somewhat different. This value is not correlated with the previously discussed

indicator, which means that it cannot be concluded that in the countries with a large area under organic crops, one may observe, at the same time, a significant proportion of these crops to the agricultural land in a given country, and *vice versa*. In the European Union in 2012, the highest level of the indicator under analysis was found in Austria, and accounted for nearly a fifth of the area of agricultural land in that country. A high value was also noted in Sweden (15.6%), and in Estonia (15.3%). However, in the latter country, the absolute value of the area under organic crops was small, and in 2012 amounted to over 144 thousand ha. In the Czech Republic and Latvia, one may also observe a rather high level of the indicator being discussed, namely 11.5% and 10.8%, respectively. Another country which stands out is Italy where, in turn, there is a large absolute area, and the relative value amounted to over 9% (Figure 2). The detailed changes for each country has been discussed by K. Brodzinska (2014).
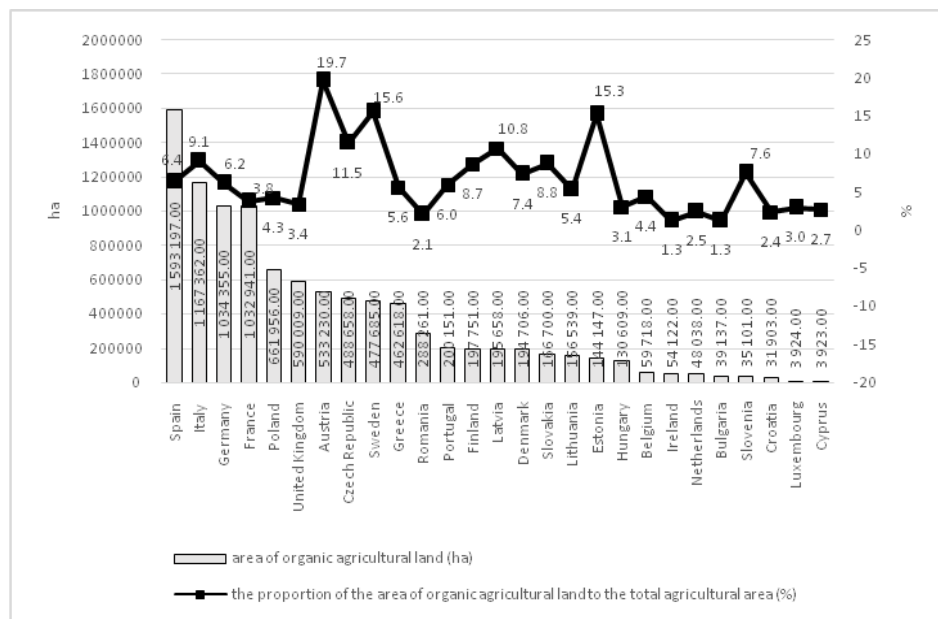

Source: author's construction based on Organic Farming ..., 2014; The World ..., 2000 - 2014

Fig. 2. **The area of organic agricultural land (ha), and the proportion of the area of organic agricultural land to the total agricultural area (%) in the European Union countries in 2012**

The number of organic farms in the period under analysis was increasing rapidly as well. In 2000, records included over 130 thousand registered operators. After the initial increase in 2001 when the number amounted to 143 thousand, there was a short-lived decline which lasted until 2003, when 135 thousand farms one could observe. In 2004, there was another increase in the number of registered operators up to 153 thousand. This was due to the accession of new countries to the European Union, and the beginning of the implementation of financial support for agriculture and rural areas of those states. This resulted in, *inter alia*, an increase in the interest in organic farming, since the aid to the area under organic crops is considerably larger, particularly in the new EU countries. In 2012, over 267 thousand registered operators were recorded (Figure 3), which accounted for over two-fold increase as compared to the year 2000.

An increase in the number of farms, as described using the regression equation, is presented in Figure 3. Determination coefficient with a value of 0.9602 indicates that the adopted model well describes the course of the phenomenon in the period of 2000–2012. It can be noticed that, on average, year after year, the number of operators in question was increasing by over 11.4 thousand. On this basis, it may be assumed that under *ceteris paribus* conditions, the number of organic farms in the European Union may increase up to nearly 350 thousand operators by the year 2020 (Figure 3). However, as Runowski H. (2009a) points out, there are numerous reasons for changes over time in the number of operators that produce using organic methods. The most important ones include differences in the economic effectiveness of organic production between countries, as compared to the conventional production. In the countries where organic production ensures incomes being either lower or comparable to the conventional production, there is a decrease in the interest in the development thereof, while in the countries in which this advantage is clear, an increase therein occurs. It follows from this that the main objectives of organic farming and an increase in the economic effectiveness of organic farming may be primarily achieved by means of incentive aid and intervention of the State.
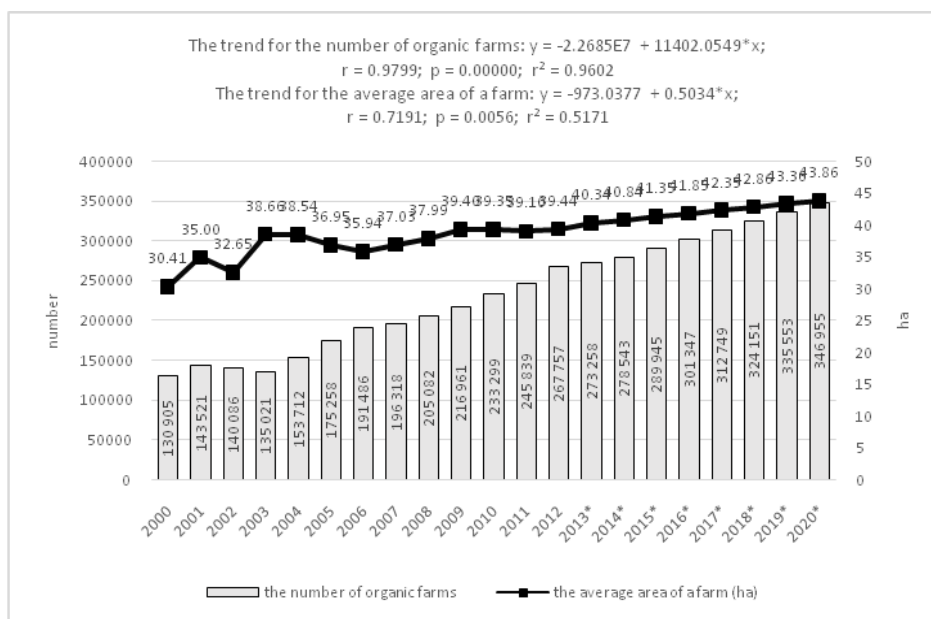
Source: author's construction based on: Organic Farming …, 2014; The World …, 2000 - 2014

Fig. 3.**The trend for a change in the number of organic farms and the average area of a farm (ha) in the years 2000–2012, and a forecast for the period until 2020 in the European Union**

Figure 3 presents changes in the average size of an organic farm in the European Union during the study period. It should be noted that in particular years, the value concerned was characterised by significant fluctuations. In 2000, it amounted to approx. 30 ha, and in 2012 it reached a value higher by only 7 ha. The trend is not unambiguous, since one may observe both significant increases, e.g. in 2001 or 2003, and declines, e.g. in 2002, in the years 2004–2006, and in 2011. However, a statistical analysis indicates that in the period discussed, the

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average increase was 0.5034 ha per annum. The determination coefficient was not as high as for previous analyses, and indicated, with a value of 0.5171, that the fitting of the model is merely satisfactory. It follows from this that in 2020, the average area of a farm may oscillate around 44 ha, which is an increase in relation to 2012 by only 16%.

In particular European Union countries, in 2012, the number of operators involved in organic crop production was greatly varied. Most registered organic farms may be found in Italy, with over 43 thousand, and in Spain, with 30 thousand. These countries are followed by a country newly accessed in 2004, i.e. Poland, with nearly 26 thousand operators. Next countries are France– 24.4 thousand, Greece – 23.4 thousand, Germany – 23 thousand, and Austria – 21.8 thousand (Figure 4).

In 2012, an average area of an organic farm in the European Union was 39.44 ha. The differences between countries are presented in Fig. 4. It should be noted that, after an analysis of this indicator in particular European Union states, the value concerned differed considerably for Slovakia, and amounted to 456.11 ha. A high level of the indicator in question was also noted in the Great Britain with 137.82 ha, the Czech Republic with 124.21 ha, Estonia with97.53 ha, Sweden with 85.29 ha, and Hungary with83.72 ha (Fig 4).
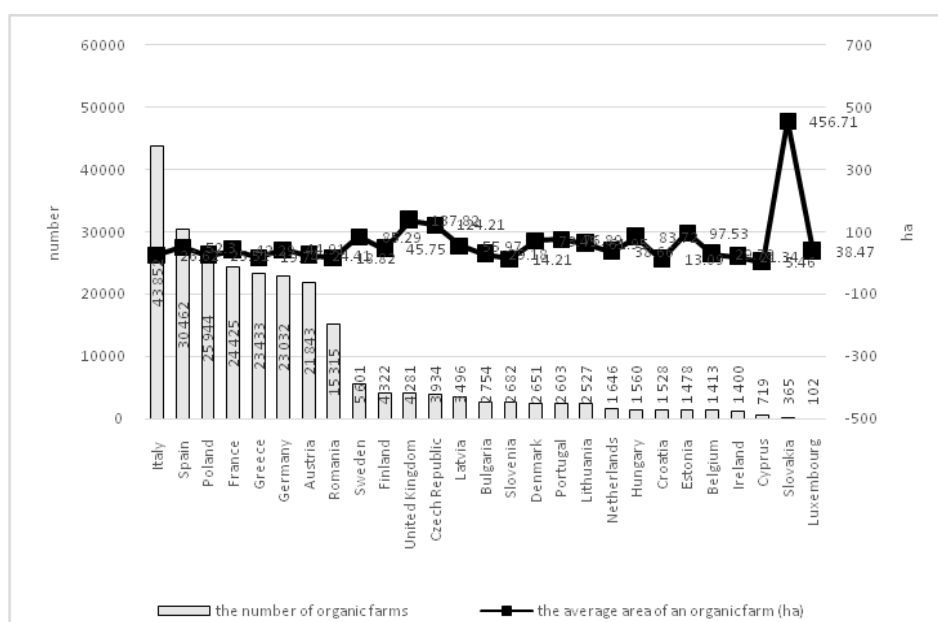
Source: author's construction based on Organic Farming …, 2014; The World …, 2000 - 2014

Fig. 4. **The number of organic farms and the average area of an organic farm (ha) in particular countries of the European Union in 2012**

In the surface structure for the main organic agricultural land, permanent crops slightly prevail, particularly in the countries in which organic animals' production, especially production of milk, is developing (e.g. Austria). In 2012, in the European Union countries, the area in question accounted for 44% of the area under organic crops (more than 4.9 million ha). In turn, the area under arable crops was slightly smaller i.e. accounted for 42% (4.7 million ha), including mainly cereals (almost 2 million ha), green fodder (1.9 million ha), high protein crops (0.24 million ha), oilseed crops (0.19 million ha), and vegetables (0.1 million ha). Perennial

crops covered the area of 10% (1.1 million ha), including primarily olives (0.46 million ha), grapes (0.24 million ha), nuts (0.17 million ha), pip fruit, stone fruit and berries (0.12 million ha) and citrus fruit (0.04 million ha).

The area under the main crops during the period of 2004–2012 was steadily increasing. In 2004, the area under permanent pasture amounted to 3.1 million ha, and reached the value of 4.7 million ha in 2012. The average annual rate of increase in the area, described using the regression equation, amounted in this case to 0.09 million ha, with the determination coefficient of $r^2=0.9439$. On this basis, it may be assumed that under *ceteris paribus* conditions, the area in question may increase to as much as 7.04 million ha by the year 2020. A similar trend may be observed for field crops. In 2004, the area in question amounted to 2.2 million ha, and increased more than two-fold in 2012. An analysis of the rate of change, based on the regression equation, indicates that the average annual increase amounted to 0.3 million ha, with the determination coefficient of $r^2=0.9890$, which shows that more than 98% of the variance of the response variable (the area under field crops) has been explained by the model. Therefore, the area in question may increase to as much as 7.07 million ha by the year 2020. The prospects of changes in the area under perennial crops are analogous. In 2004, the area in question amounted to 0.5 million ha, and increased by over 100% in 2012. The regression equation indicates annual changes by approx. 0.09 million ha. In turn, determination coefficient equal to 0.9516 indicates a well-described model, based on which it can be concluded that in 2020, the area under perennial crops may cover nearly 2 million ha (Figure 5).

The trend for arable crops: y = -598.9333 + 0.3*x; r = 0.9945; p = 0.00000; r²=0.9890
The trend of permanent crops: y= -169.8578 + 0.085*x; r = 0.9755; p = 0.00001; r² = 0.9516
The trend of permanent grassland: y = -169.8578 + 0.085*x; r=0.9755; p=00000
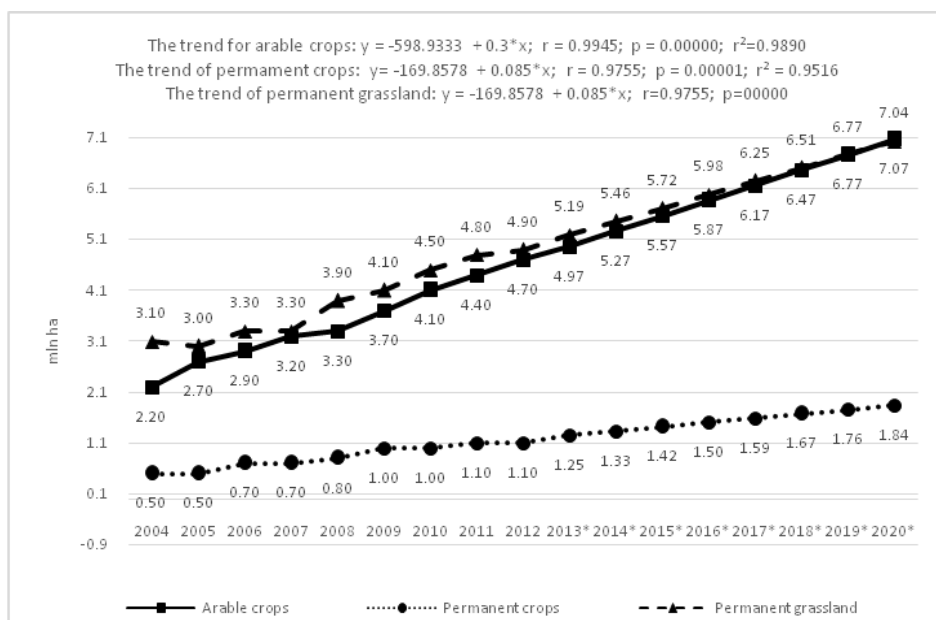
Source: author's construction based on Organic Farming …, 2014; The World …, 2000 - 2014

Fig. 5. **Trends for the area under the main organic crops in the years 2004–2012, and a forecast for the period until 2020 in the European Union (ha)**

The proportion of permanent pasture to the area under organic crops in the years 2004–2007 ranged from 3.1 through 3.0 to 3.3 million ha. At the same time, rapid increase in the

area under field crops from 2.3 to 3.2 million ha could be observed during that period. The area under perennial crops also changed during that period from 0.5 to 0.7 million ha. In turn, in the years 2008–2012, all crop types were characterised by a steady increase in their area. What is significant is that the predominance of permanent pasture in relation to field crops is getting smaller and smaller. In 2004, this difference amounted to approx. 0.9 million ha, and reached the value of 0.2 million ha in 2012. According to the forecast based on a statistical analysis, the trend is going to continue, and in 2020 a scenario is possible in which the area under field crops is larger than the area under permanent pasture by approx. 0.03 million ha (Figure 5).

Conclusions, proposals, recommendations

The conducted research into the trend for the development of organic farming in the European Union allows the following conclusions to be drawn.

1. The area of organic agricultural land in the European Union in the years 2000–2012 was steadily increasing from nearly 4 million ha to over 10 million ha. The area in question increased annually by an average of over 507 thousand ha. Based on this trend, it may be estimated that under *ceteris paribus* conditions, the area under organic crops in the European Union may increase to as much as 14 million ha by the year 2020.

2. The number of organic farms in the period under analysis was increasing rapidly. In 2000, over 130 thousand registered operators were recorded, and in 2012, records included as many as over 267 thousand registered organic farms. In the years 2000–2012, the number of certified agricultural operators was increasing annually by an average of 11.4 thousand. While forecasting the development of organic farming by the year 2020, using the existing course of the phenomenon in time, it may be assumed that there are going to be nearly 3 thousand of them in the European Union.

3. An analysis of the basic data concerning the level and rate of the development of organic farming in the European Union confirmed an increase in the significance of this method of agricultural production in nearly all EU Member States. What deserves special attention is the strong interest in this method of management among new EU members, particularly in Poland and the Czech Republic. These states are characterised by both a large area under organic crops and a large number of organic farms. This results in the level of concentration of organic farming in the EU getting impaired. The previous dominance of Italy, Germany, Spain, Great Britain and France in the development of this system of agricultural production over the other countries has been on the decrease. The EU membership which guarantees both more stable financial and legal conditions and new sales markets has resulted in the EU-12 states farmers' evident increase in the interest in the conversion to management manner being consistent with the organic farming criteria.

4. In the structure of areas under organic crops in the European Union, permanent pasture accounted for 44%, and field crops for 42%, in which cereals (almost 2 million ha) and green

fodder (1.9 million ha) were predominant. It should be noted, however, that since 2000 the predominance of permanent pasture has been getting smaller. While forecasting the development of organic farming by the year 2020, using the existing course of the phenomenon in time, it may be assumed that in the future it is the area under field crops that is going to increase at the expense of permanent pasture, which may indicate an increase in the plant and food commodity production resulting from an increase in demand.

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ECONOMIC RESULTS OF SHEEP FARMS IN POLAND

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Abstract. The aim of this paper was to present economic performance of farms engaged in sheep production. The research was conducted at 11 farms in the Province of Lublin in 2012. The detailed aim of this study was to compare the productivity per 1 ha of AL and per PLN 1 direct costs on farms. Area of the farm did not affect the generated incomes. The performed analyses confirm close relationship between the economic performance, the value of the farm buildings and the value of machinery and equipment. The farm income was negative in two farms with a loss of PLN 164 and PLN 306 per 1 ha of AL; whereas, the top farm generated PLN 3717 income per 1 ha of AL.

Key words: sheep production, gross margin, breeding profitability

JEL code: D-24

Introduction

Historical records highlighted the importance of sheep farming which provided meat, wool, milk and skins. In Poland, only in the 1980s, the sheep population was 5 million (Niznikowski R., 1994). Lowering demand for sheep-farming products in the second half of 1980s and in the first half of 1990s of the twentieth century was the reason for a drastic sheep livestock population drop. Such changes resulted in lowering sheep-farming production profitability. Wool prices fell down and overproduction of this product was a worldwide phenomenon (Klepacki B., 2005). However, the economic reforms that took place in Poland influenced the sheep husbandry sector (Nowoczesny …, 2005). Polish wool had no chance to compete with the cheaper and better quality raw material from countries where production conditions were much more advantageous. Inflation and rising costs of production resources, as well as lack of financial liquidity resulted in liquidation of many sheep herds (Poradnik …, 2005).

Due to interrelations between the farming sector and the national economy, the development of farms is influenced by social and economic conditions of an area. Unfortunately, the free market mechanisms supporting flow of capital to the most efficient areas of economy gave rise to developmental problems in the agricultural sector, including farms. Therefore, both the government and local authorities need to take some action (Wozniak M., 2008). The rules of market economy introduced to the agricultural farm sector displayed negative effects on the market which was totally unprepared for competition (Goraj

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L., 2005, Baran J., Zak J., 2014). In accordance with the concept of Pareto efficiency, the sheep product market functions properly (Gołasa P., Lenort R., Wysokinski M., Baran J., Bienkowska-Gołasa W., 2014). At that time, we could observe a dominant trend in meat production, while wool lost its importance (Rokicki T., 2005). Upon joining the EU structures, Poland became part of the single European market. The opportunity to reach a greater number of consumers was accompanied by fears related to increased competition. All entities operating on the market were forced to adopt EU requirements and legal regulations (Gorna J., 2009). The farming sector requires state intervention. In highly developed countries, agricultural producers are subsidised and domestic markets are protected against import. Yet, governments are abandoning market support to farmers, in favour of direct subventions (Poczta-Wajda A., 2009). Poland's accession to the European Union changed farming conditions. The Biological Progress Fund ceased to provide support to sheep-farming production. Instead, farmers could take advantage of direct payments or agricultural and environmental payments. Incomes and costs generated in sheep-farming production were subject to change. Therefore, factors which affected sheep-farming production profitability in Poland at the beginning of the twenty-first century need to be determined (Rokicki T., 2007). At the beginning of the 21st century, sheep production in Poland is commonly regarded as a branch complementary to other agricultural activities, and the production scale depends primarily on resources of bulky feeds (Rokicki T., 2008).

The studies on sheep farming profitability conducted at the beginning of the 21st century showed its dependence on the lamb sale and the level of subsidy granted. The total cost was dominated by feed costs (Klepacki B., Rokicki T., 2006). Besides, researchers established that in order to reach profitability in sheep farming, farmers had to maintain breeding herds of definitely larger sizes than those in the 1980s and in the first half of the 1990s. Economic effectiveness in sheep farming depended on a number of factors (Klepacki B., 2005, Rokicki T., 2004b). The activity of agribusiness companies is influenced by a number of macroeconomic and microeconomic factors (Rokicki T., 2013).

The aim of this paper was to present economic performance of farms engaged in sheep production. The research was conducted at farms in the Province of Lublin. The detailed aim of this study was to compare productivity per 1 ha of AL and PLN 1 direct costs on farms. The objective of the author was to confirm the relationship between the area of the farm and its productivity. Farm owners were interviewed (a structured interview) in order to obtain information on farm resources. Economic performance was determined on the basis of the crop calendar. Sheep farm owners maintained financial records relevant to their payments and payouts throughout 2012, i.e. from 1st January to 31st December. In these agricultural enterprises, the data were presented in the form of tables, graphic representation, and descriptive or economic calculation. The results calculated on the basis of the data refer to 2012. The studies involved 11 farms – sheep enterprises. The farm with the best income had 15.66 ha of AL, the worst only 7.45 ha of AL, and the "standard" farm 19.07 ha of AL. The

data were presented using descriptive, tabular and graphic methods, as well as correlation coefficient methods.

Research results

In the study, the following profit and loss categories were applied: sales revenues, gross margin, gross value added, net value added, net farm income, family farm income, rural family income (personal income). Positive economic effects were obtained in most sheep breeding enterprises (Table 1). Only two farms made a loss.

Besides, the farms earned their income from other off-farm sources as the personal income amounted to PLN 25 400. The sheep farm with the best results had an income of PLN 58 210, and notably, the sheep farm household was its sole source of income. The farm with the poorest performance made a loss of PLN 2 280. Two farms, of a total of 11 farms subject to the study, made a loss. The negative effects were attributable to deduction of cost of annual depreciation from the revenues obtained. The farm with the best income received PLN 16.9 thousand of direct payment, and the farm with the lowest income - only PLN 3.7 thousand.

Table 1.

Economic results of sheep enterprises subject to the study

Farm Code	Farm area (ha of AL)	Economic results of farms (PLN)					
		Gross margin	Gross value added	Net value added	Net farm income	Family farm income	Rural family income
1	15.66	102964	69660	58210	58210	58210	58210
2	35.70	38980	25462	22050	22050	15350	15350
3	8.22	22016	11293	-1352	-1352	-1352	-1352
4	7.45	8552	1843	-2280	-2280	-2280	-2280
5	38.56	40280	12130	10430	3670	-4080	17924
6	13.82	35540	15050	11200	11200	11200	11200
7	12.75	15640	8980	2005	2005	2005	14305
8	25.64	61813	44970	40270	39470	58670	58670
9	23.53	58910	35800	34800	26960	45560	45560
10	9.21	17859	8099	8099	6844	6844	6844
11	19.23	66507	52826	52826	52826	55286	55286

Source: author's own research

The researched farms were differentiated in terms of potential, land resources and cost level. One of the modes of comparison of farms is to find a common reference. Gross margin was presented per 1 ha of AL (arable land). The farm with the best results earned nearly 3-fold higher direct surplus per 1 ha of AL as compared to the medium one (Figure 1). The farm with the lowest performance made a gross margin of PLN 1045 per 1 ha of AL. There were large differences between farms in the level of gross margin. The resulting correlation coefficient between the gross margin per 1 ha of AL and the farm building value was moderate and amounted to 0.62 (p=0.00). The correlation between gross margin per 1 ha of AL and the

value of machinery and equipment (correlation r = 0.27, p=0.00) and the number of conversion hectares in farms (r = 0.24, p=0.00) was insignificant.

Fig. 1. **Gross margin per 1 ha of AL in sheep farms**

The income of the farm with the best results, per 1 ha of AL, amounted to PLN 3717 (Figure 2). The income of the most profitable farm, per 1 ha of AL, was over 3 times higher than the average, whereas the farm with the poorest performance made a loss of minus PLN 306 per 1 ha of AL. Only two farms incurred losses. Half the farms faced a very difficult situation. The correlation coefficient between the net farm income per 1 ha of AL and the number of conversion hectares in farms amounted to 0.55 (p=0.00). The strength of the impact was moderate. There was an insignificant relationship between income per 1 ha of AL and the farm building value (correlation r = 0.36, p=0.00), and the value of machinery and equipment in farms (r= 0.27, p=0.00).
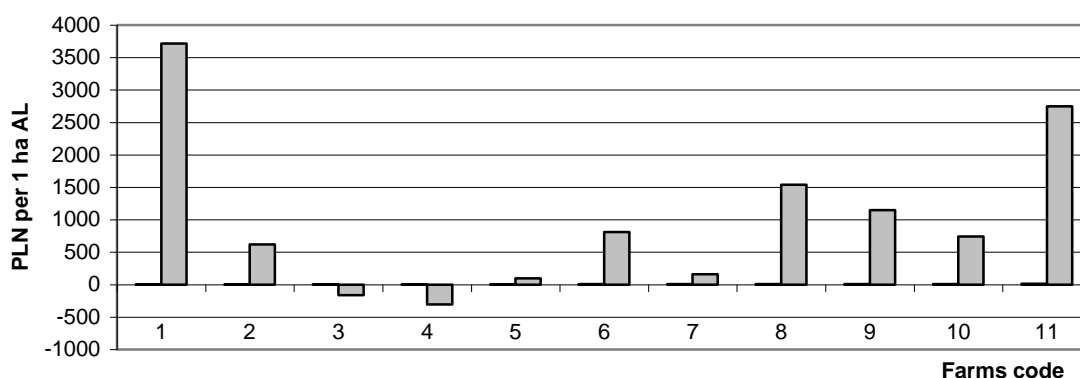
Fig. 2. **Net farm income per 1 ha of AL in sheep companies**

The microeconomic approach to efficiency is linked to the individual enterprise and defined as the relation between the effects obtained by a particular economic operator and its input (Lenort R., Baran J., Wysokinski M., 2014). The larger value of productivity indexes is

indicative of higher efficiency of a particular economic entity (Wysokinski M., Baran J., Gołasa P., Lenort R., 2014). The revenues and direct surplus related to direct costs determine productivity of the direct operating expenses incurred. On average, PLN 1 direct costs generated PLN 5.28 revenues (Figure 3). The best farm had revenues of PLN 11.20 per PLN 1 direct costs, and the worst - PLN 3.27 per PLN 1 direct costs. The differences in the results were significant. The resulting correlation coefficient between the revenues per PLN 1 direct costs and the value of machinery and equipment in farms was strong and amounted to 0.84 (p=0.00). There was an insignificant relationship between revenues per PLN 1 direct costs and the number of conversion hectares in farms (correlation 0.46, p=0.00), and the farm building value (0.37, p=0.00).
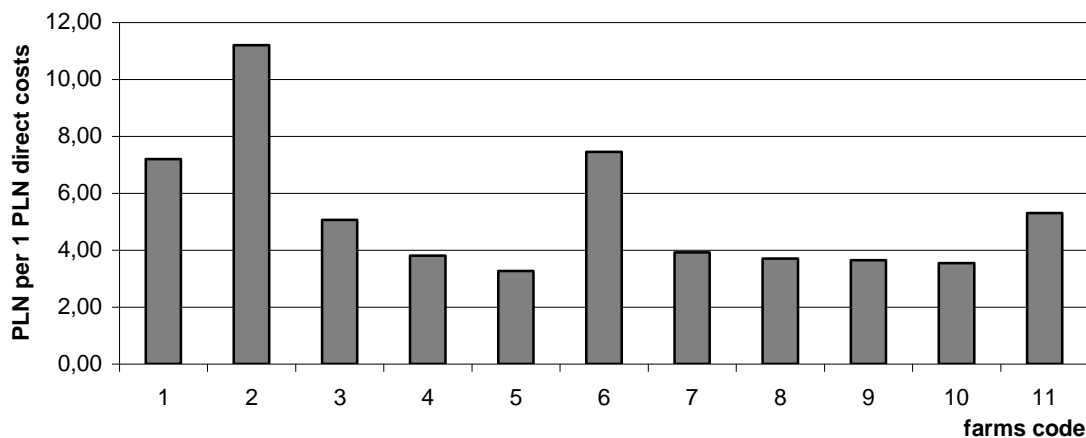
Source: author's own research

Fig. 3. **Revenues per** PLN **1 direct costs in sheep enterprises**

On average, PLN 1 direct costs generated PLN 4.24 gross margin (Figure 4). The most effective sheep farm obtained as much as 10.20 direct surplus from PLN 1 of direct operating expenses, while the most ineffective farm generated a gross margin of PLN 2.27 from PLN 1 of direct costs.
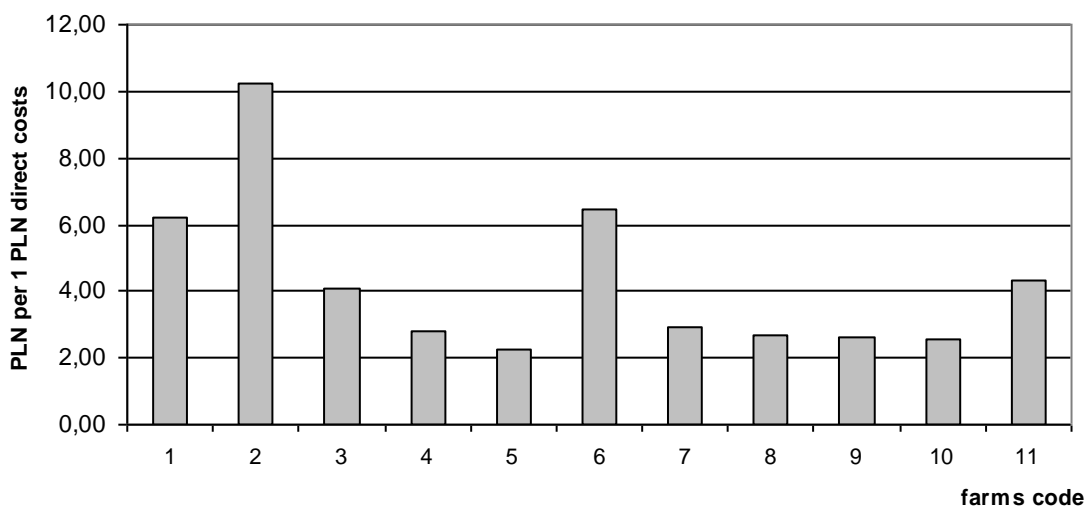
Source: results of own research.

Fig. 4. **Gross margin per PLN 1 of direct costs in sheep enterprises**

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Correlation coefficients for gross margin per PLN 1 of direct costs were at a similar level as in the case of revenue per PLN 1 of direct costs. There was a weak link between the level of the gross margin per PLN 1 of direct costs and the land area of farms (correlation 0.26, p=0.00) and the value of the basic herd of sheep (-0.27, p=0.00).

Conclusions

1. The bigger the area of the farm, the better results were obtained per 1 ha of AL or PLN 1 of direct costs. This regularity has been confirmed in most of the farms subject to the study. The data presented in the graphic form demonstrated a disproportion in productivity of the studied farms. The productivity per 1 ha of AL and PLN 1 of direct costs depends on several factors.

2. The calculated correlation coefficients showed a strong interrelationship between economic performance and potential of farms, such as the value of the farm buildings and the value of machinery and equipment. The effect of the number of conversion hectares was moderate, and the effect of the land area of the farm and the value of the basic herd of sheep was quite insignificant.

3. The sheep farm with the best results earned an income of PLN 58 210 . The one with the poorest results made a loss of PLN 2 280. Two farms, of a total of 11 farms subject to the study, made a loss. Two farms incurred losses: PLN 164 and PLN 306 per 1 ha of AL respectively; whereas the top farm generated an income of PLN 3717 . The negative results were attributable to deduction of cost of annual depreciation from the revenues obtained. The farm with the highest income received direct payments in the amount of PLN 16.9 thousand, and the one with the poorest result – only PLN 3.7 thousand.

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CONCENTRATION OF MILK PRODUCTION IN POLAND

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Abstract. This paper presents selected issues related to the processes of concentration of commercial milk production in Poland. The analysis excludes farms that sell directly to individuals, due to their marginal share in total commercial production (less than 1%). Changes in milk production in Poland as a whole and in individual regions have been analyzed dynamically in terms of quantities delivered, average quantity delivered per farm and number of suppliers. Based on the Gini coefficient, surveys released a steady process of concentrating milk production in certain Polish regions. The research has also shown notable changes in the structure of wholesale deliveries of milk and the structure of suppliers. Research let to observe the decided decrease in importance of producers selling less than 50, 000 kg of milk per year in comparison with those selling more than 200, 000 kg.

Key words: milk production, concentration of production, scale of production

JEL code: Q10

Introduction

Concentration, in most general terms, means intensification, the process of making denser or smaller (Slownik jezyka polskiego, 1988). Concentration of production in an agricultural farm, means nevertheless a process of intensifying (attracting, drawing together) production and the means necessary to achieve it within a separate, self-sufficient economic unit (Encyklopedia ekonomiczno-rolnicza, 1984).

The main aspects of concentration in agriculture include concentration of production (scale of production, cultivation, raising livestock) and spatial concentration while producing specific agricultural products (Zegar J.S., 2009).

According to Rychlik and Kosieradzki, references to concentration of production should be understood as covering a specific branch of production, group of products, or even a single product. Statistically speaking, concentration of production in agriculture refers mainly to the

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mass of a specific agricultural product available to the farm during the year (Rychlik T., Kosieradzki M., 1978).

In literature, assertions have also been made that the notion of concentration is frequently equated with the notion of scale of production. This is the result of a certain interdependence between concentration and scale of production; advances in one lead to increases in the other (Runowski H., 1994).

According to Wos and Tomczak, the scale of agricultural production can be understood not only in quantitative, however also organizational and economic terms. A specific scale of production involves a certain method of organization and economics of production and the consequent effectiveness of production (Wos A., Tomczak F., 1979).

The basic objective of business entities in agriculture is to improve the effectiveness of production with a view to increasing their income. As noted by H. Runowski (1994), every reasonably sized process of concentrating production has a positive impact on the effectiveness of manufacturing processes. An increased scale of production permits effective application of modern production technologies – the main source of economic advances in agriculture, the other being advances in biology – and thereby contributes to better farming effectiveness.

Following the microeconomic approach, the efficiency is its capacity to transform expenditures into effects, where a larger value of productivity indexes is indicative of a higher efficiency of a particular economic entity (Coelli et al., 2005; Lenort et al., 2014; Wysokinski et al., 2014).

Globalization and new technologies are conductive to the expansion of large farms. Globalization is also inherently associated with powerful food processing and retail corporations which show preference for larger agricultural farms either due to new requirements concerning the quality, timeliness and batch size of deliveries, or because of lower transaction costs (Birner R., Resnick D., 2005). Similarly, new capital-intensive technologies and biotechnological advances, as inventions of modern corporations, are more suitable to large agricultural farms, undermining the position and opportunities of family farms (Hazel P., Poulton C., Wiggins S., Dorward A., 2007).

The process of concentration also occurs in family (individual) farming, as evidenced by changes in agrarian structure. Observed trends include a decrease in the number of farms and concentration of land within steadily growing estates. Such transformations in Polish agriculture came, for multiple reasons, with delay compared to Western Europe countries, a fact of some importance considering the integration of the Polish food and agricultural sector into the EU Single Market and the application of the Common Agricultural Policy mechanisms. (Zegar J. S., 2009).

Concentration of production is accompanied by organizational problems, such as inefficient logistics (Rokicki T., 2013; Baran J., Zak J., 2014).

Proceeding to the analysis of concentration of production on the milk market, one can share the assertion of H. Runowski that concentration of production means the process of increasing production within a single economic unit, while scale of production means a specific advanced stage of that process. Scale of production is a specific level of concentration of production (Runowski H., 1994).

Research methodology and sources of materials

The purpose of this study was to identify changes in wholesale milk production in Poland and to estimate the level of concentration in spatial terms.

Research tasks was to identify the level of concentration of wholesale milk production in Poland; to estimate the changes in the structure of supply and wholesale suppliers of milk in Poland; and to analyze the wholesale milk production in Poland on a regional basis.

The research focused on wholesale production due to its dominant role on the Polish market (accounting for more than 99% of total sales during the 2012/2013 quota year[*]). Using data from the Agricultural Market Agency (Milk Production Quota Office), a comparison was made between the structure of deliveries and suppliers in the quota years 2004/2005 and 2012/2013. The analysis was based on the following delivery ranges: A - (> 0 ≤ 20,000 kg per year); B - (> 20,000 ≤ 50,000); C - (> 50,000 ≤ 100,000); D - (> 100,000 ≤ 200,000); E - (> 200,000 ≤ 500,000); F - (> 500,000 ≤ 1,000,000); G - (> 1,000,000);

The study is based on the literature review method, the descriptive method, concentration measures (Gini coefficient, Lorenz curve).

Gini coefficient was used to assess the wholesale milk production concentration level. It is strictly linked with the Lorenz curve (hence its second name – "Lorenz concentration ratio"). Since it is the most commonly used inequality measure, it contains many formal representations. One of such representations is described below (1):

$$G = \frac{1}{2\mu n^2} \sum_{i=1}^{n} \sum_{j=1}^{n} \left| x_i - x_j \right|$$

(1)

μ – average emission;

n – sample size.

Gini coefficient of 0 expresses egalitarian distribution, while a Gini coefficient of 1 expresses maximal inequality. This equation may be interpreted as half of the absolute production difference between all countries in relation to average production. This coefficient satisfies the Pigou-Dalton Principle of Transfers (it changes by transferring production from high-production countries to lower-production countries) and principles of symmetry, homogeneity, replication. It does not, however, satisfy the decomposition principle.

The Lorenz curve illustrates accumulated percentage of wholesale milk production for subsequent countries in order from lowest to highest production. In a theoretical case, when production of all countries is equal, the Lorenz curve becomes a straight line at 45 degrees (curve of absolute equality). However, such situation does not actually occur. The greater the production diversity, the more the actual curve differs from the curve of absolute equality. The Gini coefficient is a quantitative measurement of this inequality, which equals 2 x the field between the actual curve and the curve of absolute equality. It may take values from 0 – absolute equality of production – to 1 – all production is accumulated in hands of one country (Golasa et al., 2014).

Source materials included book publications, journal articles, and statistical data from the Agricultural Market Agency, Central Statistical Office and Institute of Agricultural and Food Economics. The results of research have been presented in the form of tables and figures.

Research results and discussion

Poland is ranked as one of the largest producers of milk in the European Union. Together with Germany, France, the United Kingdom, the Netherlands and Italy, it accounts for 70% of wholesale delivery of milk, an evidence of strong concentration of commercial milk production in the EU. This is confirmed by a high Gini coefficient, which in 2013 was equal to 0.65. The Lorenz curve shows the cumulative percentage of the 2013 production, ranked from highest to lowest, in individual states (Figure 1). The larger the disparity between production values, the more the curve deviates from the line of equality.
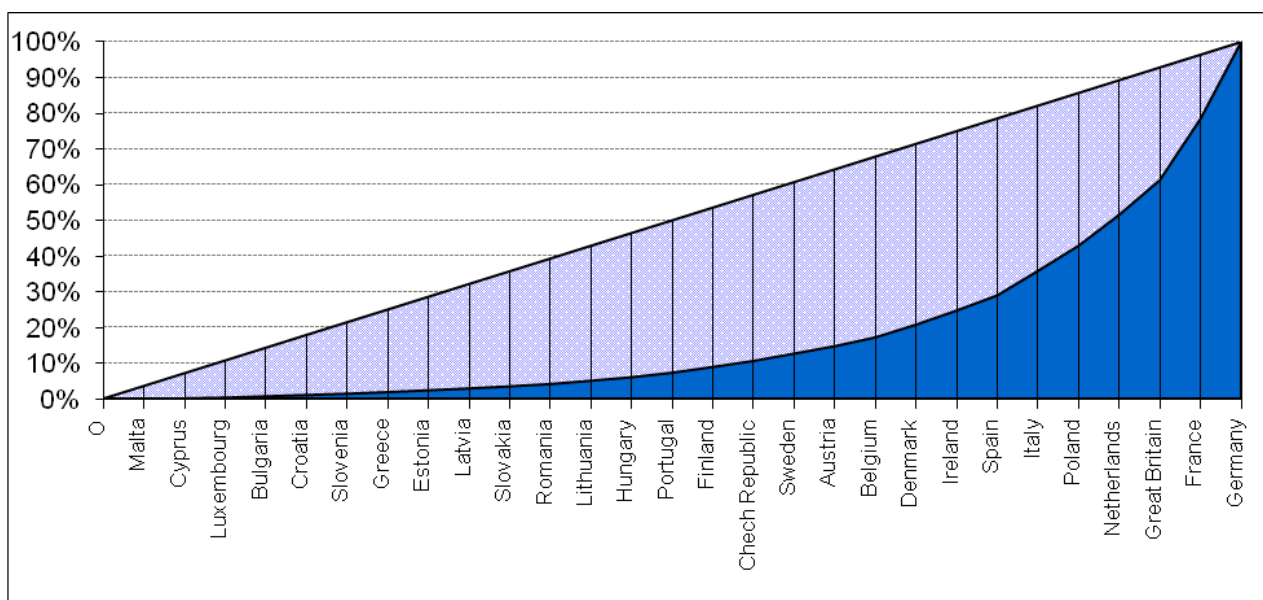
Fig. 1. Concentration of milk production in the EU (Lorenz curve)

Poland's accession to the European Union was a major challenge for the milk industry. Circumstances imposed by the Common Agricultural Policy (compliance with production limits, competition on the unified European market, sanitary and veterinary requirements, increased production costs) served to stimulate the concentration of production and specialization and were the main factor behind the restructuring of the milk sector during the last ten years (Wilkin J., Milczarek D., Malak-Rawlikowska A., Falkowski J., 2007). Factors of importance in this process included, *inter alia*, better product quality, pre-accession support for investments, developing exports, rising prices of milk, introduction of direct subsidies, and the milk quota system. Since 2004, producing, organizational and economic circumstances have changed, resulting in altered behaviours of producers and processors.

In analyzed period during which milk quotas were in effect in Poland (milk production subject to limits envisaged in the CAP and imposed upon accession to the EU), the number of suppliers fell by around 55% (from 316,723 in 2004/2005 to 140,927 in 2012/2013). In each quota year, the number of suppliers decreased by 22,000 on average. This development was more intense in the years immediately following accession to the European Union. The largest decrease in the number of suppliers, over 40,000, was noted between 2006/2007 and 2007/2008. Since 2010, while the downward trend remained steady, the drops were not so pronounced.
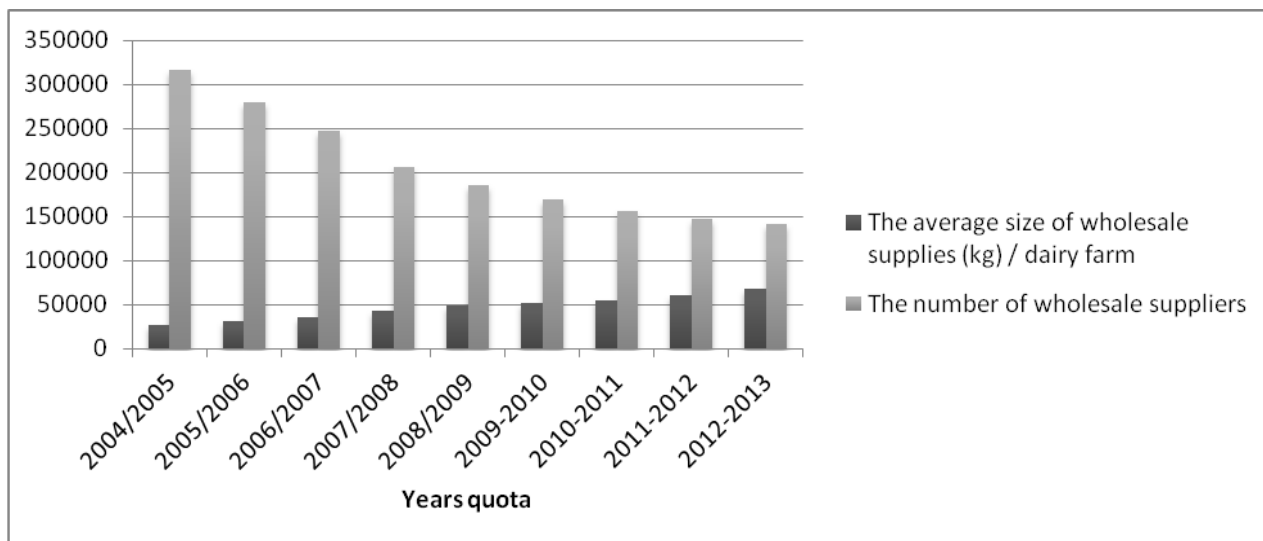
Fig. 2. The number of wholesale suppliers[*] and the average size of milk supply in Poland

The diminishing number of suppliers combined with growing wholesale production of milk means that the average delivery size has increased. Milk production became concentrated in farms that survived on the market. Between 2004 and 2013, the average size of wholesale deliveries to purchasing centres rose steadily, a quite positive sign that the market of milk producers is becoming concentrated (Figure 2).

In the 2012/2013 quota year, the average wholesale delivery to purchasing centres was about 150% larger than in the first year in which quotas were in effect. The average delivery figure rose by more than 5,000 kg per year. The growth dynamics increased year by year as well.

The milk market in Poland is also characterized by strong regional variation. A progressive concentration of production in spatial terms was observed, evidenced, *inter alia,* by the systematic increase of the Gini coefficient in the researched period (Figure 3). An upward trend for the Gini coefficient can be observed since 2004/2005. This means that the diversification of wholesale milk production in Poland is growing, suggesting that the largest producing regions are increasing their production, while others are decreasing it.

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[*] As at the last day of each quota year
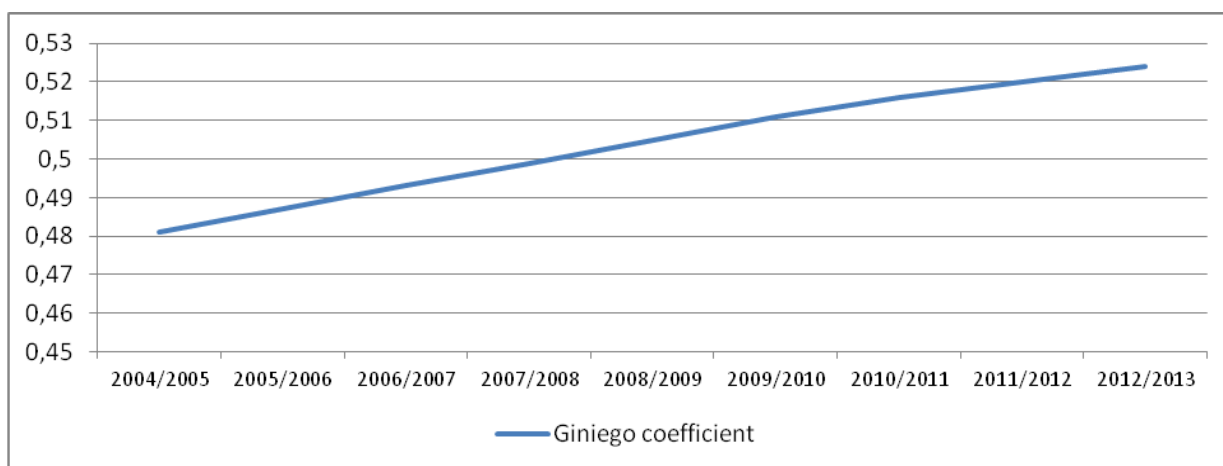
Fig. 3 Value of the Gini coefficient for the wholesale milk production in Poland

Parameters like production size, purchases of milk, milk yield per cow or concentration of production take different values in each region. The accession of Poland to the European Union and attempts to stay ahead of the changing market have further consolidated these differences. As it turned out, regional differences on the milk market (Seremak-Bulge J., 2006) are influenced by factors other than natural conditions, level of agricultural development, or agrarian structure (the strong ties between milk and land notwithstanding) (Wysokinski M. M., Dziwulski M., 2013). The establishment of accelerated milk processing centres, presence of strong processing entities, development of modern consulting, enterprises undertaken by farmers, appetite for risk, aid in the restructuring process (advisory centres) and use of the EU funds are some of the causes underlying the recent rise of milk production outside areas known for their superior natural and production conditions. The current changes in the milk industry run contrary to the common wisdom on agricultural development, according to which the Eastern regions of Poland are characterized by less intensive farming and lower production results. It is exactly these Eastern and Central Poland areas (for example Podlaskie and Mazovia regions) that stand out as strong milk producers, defying general agricultural development trends.

Regions with the largest production (Mazovia, Podlaskie, Wielkopolskie and Lodzkie) have delivered 60% and 64% of commercial milk in 2004/2005 and 2012/2013, respectively. Therefore, one fourth of Polish regions is accounting for more than 60% of milk deliveries to purchasing centres, a tendency that is still on the rise. In the analyzed period, production rose most strongly in Wielkopolskie (33%) and Podlaskie (32%) regions, with the average nationwide growth figure on the level of 18%. Above average results were also noted in Kuyavia-Pomerania, Mazovia and Warminsko-Mazurskie regions. The largest decrease in the number of suppliers was observed in the Lower Silesia and Podkarpackie regions, respectively by 74% and 72%. On average, the number of Polish producers subject to wholesale production limits decreased by 55% in the researched period. Opposite to this tendency, the average size of wholesale deliveries rose by 153%. The largest contribution to this figure came from the

Lower Silesia region (263%). In 2012/2013, the largest average wholesale deliveries were made in Westpomeranian (201,245 kg per year), Lubuskie (177,185) and Opolskie (154,938) regions, leading to the conclusion that these regions contain farms with the highest scale of production. Farms with the smallest average wholesale deliveries came from Podkarpackie (21,751 kg per year), Malopolskie (24,190) and Swietokrzyskie (28,780) regions.

Table 1

Characteristics of wholesale supply of milk in Poland from each region

Region (voivodship)	2004/2005			2012/2013					
	Size of wholesale deliveries [kg]	Number of suppliers 31. 03. 2005	Average size of wholesale deliveries [kg]	Size of wholesale deliveries [kg]	Index 2004/2005 =100%	Number of suppliers 31. 03. 2012	Index 2004/2005 =100%	Size of wholesale deliveries [kg]	Index 2004/2005 =100%
Podlaskie Region	1 500 606 335	33 006	45 465	1 974 442 010	132	22 365	68	88 283	194
Kuyavia - Pomerania	580 691 309	13 025	44 583	740 859 875	128	7 962	61	93 049	209
Pomerania Region	225 087 860	3 666	61 399	251 400 441	112	2 226	61	112 938	184
Lubuskie Region	91 605 305	1 531	59 834	92 667 496	101	523	34	177 185	296
Silesian Region	180 504 493	9 251	19 512	199 081 057	110	4 000	43	49 770	255
Swietokrzyskie Region	186 472 835	17 750	10 506	171 671 669	92	5 965	34	28 780	274
Malopolska	170 061 668	20 070	8 473	145 094 188	85	5 998	30	24 190	285
Lodz Region	742 571 168	42 994	17 272	791 918 288	107	20 084	47	39 430	228
Lubelskie Region	614 967 512	44 270	13 891	541 904 297	88	14 735	33	36 777	265
Warminsko-Mazurskie Region	649 255 682	12 154	53 419	788 571 102	121	7 910	65	99 693	187
Opole Region	205 132 006	3 023	67 857	224 040 672	109	1 446	48	154 938	228
Wielkopolskie Region	1 057 632 936	16 820	62 879	1 411 541 432	133	11 775	70	119 876	191
Podkarpackie Region	128 725 552	17 695	7 275	107 927 325	84	4 962	28	21 751	299
Westpomeranian Region	134 248 469	1 787	75 125	140 670 515	105	699	39	201 245	268
Mazovia	1 713 611 746	69 825	24 542	2 084 968 232	122	32 914	47	63 346	258
Lower Silesia	165 427 931	4 246	38 961	155 824 496	94	1 103	26	141 273	363
Total	**8 346 602 807**	**311 113**	**26 828**	**9 822 583 095**	**118**	**144 667**	**46**	**67 898**	**253**

Source: author`s calculations based on ARR data

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To recognize the changes in the structure of wholesale milk deliveries and suppliers, it was proposed to subdivide all suppliers into seven ranges by delivery size.

In the period chosen for research, the importance of deliveries from each range clearly changed. Firstly, there was a drastic reduction in importance of deliveries originating from farms that output less than 50,000 kg of milk (their share falling from more than 41% in the 2004/2005 quota year to 17% in the 2012/2013 quota year). The share of farms delivering up to 20,000 kg of milk decreased from 18.47% to about 4%, a clear proof of marginal importance of this scale of deliveries in Poland.

Table 2

The structure of supply and suppliers of milk, depending on the compartment of supply

Supply compartments (thousand kg)	Share of supply (%)		Share of suppliers (%)	
	2004/2005	2012/2013	2004/2005	2012/2013
> 0 ≤ 20	18.47	4.34	68.73	33.7
> 20 ≤ 50	22.62	13.31	18.55	27.73
> 50 ≤ 100	22.77	20.62	8.67	20.35
> 100 ≤ 200	15.79	24.51	3.1	12.33
> 200 ≤ 500	7.93	20.29	0.74	4.94
> 500 ≤ 1000	2.89	6.41	0.11	0.67
> 1000	9.53	10.51	0.1	0.28

Source: *author's calculations* based on ARR data

Another observed tendency was the growing share of deliveries in ranges upwards of 100,000 kg (an increase from 36% to 60%). The largest contribution to this growth was definitely the increased share of deliveries in the 100,000 - 200,000 kg and 200,000 - 500,000 kg ranges in the total figure, a rise respectively from 16% to 24.51% and from 8% to 20%. Deliveries in the 50,000 - 100,000 kg range accounted for 20%-22% of the total figure, while deliveries in the 1,000,000+ kg range for about 10% of milk delivered for purchasing centres, these percentages holding steady in every year.

In the entire researched period, the share of producers in the up to 20,000 kg range decreased from 69% to 34%. In 2012/2013, while farmers delivering up to 50,000 kg per year accounted for 62% of all wholesale producers, they delivered only 18% of wholesale milk production in Poland. The average size of deliveries from farms, excluding those contributing less than 50,000 kg per year, would equal 149,000 kg, a figure similar to the average level of deliveries in the EU.

Conclusions

1. Surveys conducted showed the dynamic changes in the sectors wholesale milk producers in the period of 2004-2013. The number of wholesale suppliers fell by 55%, while the average size of deliveries rose by 150%. An increase in wholesale sales was noted in each quota year, leading to a belief that this form of sales will continue

growing in line with more intense concentration of production and the decreasing number of milk suppliers.

2. A steady growth of the level of concentration of wholesale milk production in spatial terms was observed in Poland. The differences between production of milk in individual regions are expanding. In particular, production becomes concentrated in a couple of regions (Mazowieckie, Podlaskie, Wielkopolskie and Lodzkie), while Southern and South-Eastern Poland is pushed to the margin.

3. It has been observed that farms selling less than 20,000 kg of milk per year are becoming steadily marginalized. Nevertheless, there was a sharp rise in the share of producers selling from 200,000 to 500,000 kg per year.

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RISK ASSESSMENT IN HEMP (*Cannabis sativa L.*) PRODUCTION AND PROCESSING

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Abstract. Agriculture (including hemp production and processing) is one of the industries subject to risks due to changing weather conditions, diseases, pests and volatile market prices on inputs and products produced. However, the use of risk assessment methodologies in hemp production and in agriculture as a whole are not widespread. This **article aims** to reflect the preliminary results of the risk evaluation in hemp production and processing. The following **tasks** were set to reach this aim: to analyze the risk evaluation methodology and risk calculation methodology; to determine and systematize risks in hemp production and to carry out a preliminary evaluation for risks in hemp production using semi-quantitative evaluation. For the evaluation purposes the hemp production is divided in five stages - preparation of soil and sowing of hemp; growing of hemp; hemp harvesting; hemp processing; and selling of the produced output. The evaluation of risks was done within a system of 18 risks, divided in six main groups – agro-meteorological; technological and production; personnel; environment; legislative; economic, and market risks. The results indicate that the highest risk level in the entire hemp production and processing process was specific to the group of personnel risks, whereas the lowest – to the group of environmental risks.

Key words: risk management, hemp production, hemp processing, risk evaluation.

JEL code: D81

Introduction

The sector of hemp growing and processing is subjected to significant changes through the past decades. Historically hemp growing was widespread and in Latvia hemp was broadly used in everyday life – in the local cuisine, for feeding animals and also as a building and textile material. In the last decades the amounts of hemp growing reduced but following the global tendencies in agriculture, growing and processing of hemp (*cannabis sativa L.*) is regaining its popularity mainly due to the versatile possibilities of using hemp. Though, the

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total number of hemp growers is significantly smaller nowadays as it has been historically, the use of hemp is expanding and within recent years several enterprises have introduced new products that include using hemp in food production, production of ecological construction materials, paper, production of textiles, biodegradable plastics and renewable energy production.

Agriculture, including hemp production and processing, is one of the industries subject to risks due to changing weather conditions, diseases and pests and volatile market prices on inputs and products produced. However, the use of risk assessment methodologies in agriculture is not widespread but it is specific to the financial and investment sector. Risk assessment is a process in which the significance of risk is determined (Ferraris, s.a.). Risks may be managed in various ways, which, to some extent, allows forecasting the emergence of risks and carrying out activities to reduce the level of risks. Nowadays, risk management is understood as a set of methods, techniques and activities that assist in forecasting risks to a certain extent and in designing activities to avoid the risks or to reduce their negative effects (Rurane, 2001).

Materials and methods

After analysing the term risk in scientific literature (Hardaker, Huirne, 2004; Pettere, Voronova, 2004; Arhipova, 2002; Suskevica, 2005; Boading, 2011; Definitions of Risk, s.a. et al.) and the principles in risk definition set by a German sociologist Ortwin Renn (Renn, 2008), risks within the present research are defined as follows: *risk is a combination of the probability of occurrence of an event and the severity level of negative effects caused by it*.

Risk is calculated by the following formula:

$$R_i = V_i \times B_i ,\qquad\qquad\qquad (1)$$

where

R_i – numerical value of the i-th risk event;

V_i – probability of occurrence of the i-th risk event;

B_i – severity of losses from the occurrence of the i-th risk event.

Formula 1 includes two components: probability of occurrence of a risk and severity of losses from the occurrence of the risk. To calculate the risk, two mentioned components have to be expressed as quantitative values, and scales are often used to express them, defining each interval of the scale in accordance with the specifics of any research performed. Such an approach is employed further in the present research.

A classification of risks was performed by analyzing risk management studies in agriculture and in production of renewable energy that allowed to identify dominant and specific risk groups for the further evaluation. It can be concluded that technological, environmental, legislative, financial and investment risks prevail (Olivier, s.a.; Financial Risk Management, 2004; Froggatt, Lhan, 2010; Ferraris, s.a.), while such groups of risks as social,

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macroeconomic, resource, short-term and long-term operational risks and reputational risks are less frequent (Financial Risk Management, 2004; Froggatt, Lhan, 2010; Aragonés-Beltrán, Pastor-Ferrando, 2009).

Three experts that are connected with growing hemp and/or research in hemp production were questioned to obtain the preliminary risk evaluation results. They determined the probability of occurrence of each risk and the potential severity of losses from these risks. Based on the results, a risk level was calculated for each risk assessed by the experts; from it, in its turn, the average risk level was calculated for all experts' assessments as well as the average risk group level for the six basic groups of risks and for each phase of the production and processing process.

Research results and discussion

Given the above-mentioned, a risk assessment system was developed to assess risks in hemp production and processing; the risks in it were classified into six basic groups: technological and production, personnel, environmental, economic and market, and agricultural and meteorological risks. Within the basic groups of risks, a detailed classification of the specific risks affecting the production process was developed based on the analysis of specific scientific literature (Strazds, et al., 2012; Vilnitis, et al. 2011; Industrial Hemp, 1999; Environmental Risks…, 2013).
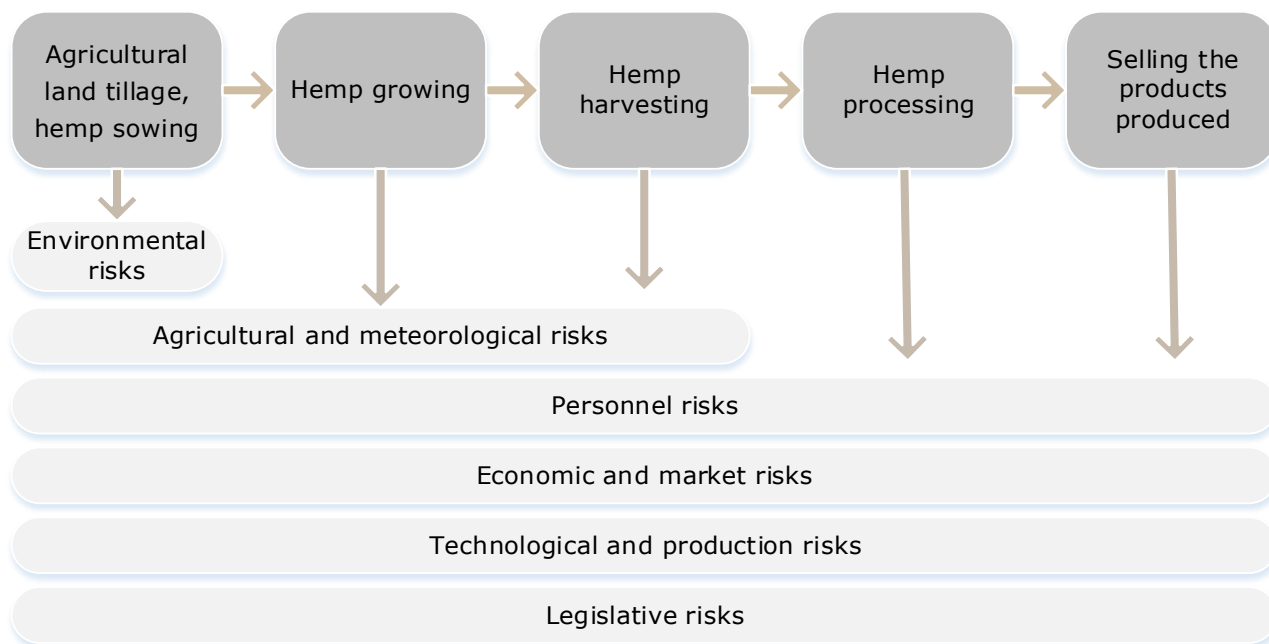
Source: author's construction

Fig.1. **Classification of risks for assessing the risks in hemp production and processing**

The process of hemp production and processing is divided into five phases (Fig.1): **agricultural land tillage and hemp sowing** – this phase involves the choice of hemp seed, which is affected by legal provisions on hemp varieties that are entitled to the EU direct

payments, land tillage and hemp sowing. Both these processes are subject to economic and market risks, agricultural and meteorological risks as well as environmental (use of fertilisers), technological and production risks (working condition of machinery, availability and quality of seed); **hemp growing** is subject to agricultural and meteorological, environmental, technological and production as well as personnel risks. To a lesser extent, it is also subject to economic and market and legislative risks.

Hemp harvesting, just like hemp growing, mainly involves agricultural and meteorological, technological and production as well as personnel risks. The other groups of risks can affect this process but to a smaller extent; at the phase of **hemp processing**, there are no effects of agricultural and meteorological risks, while the effects of technological and production risks increase. **However**, sales of the products produced are affected by the demand for these products and their market price; accordingly, economic and market risks affect the sales in the most direct way. Yet, even at this stage legislative risks might have their effects through setting quality standards for product sales and changing taxes and in other cases.

A specific effect area and a risk level were determined for each of these factors. The risks in hemp production and processing were classified based on an analysis of specific scientific literature (Strazds, et al., 2012; Vilnitis, et al., 2011; Industrial Hemp, 1999; Environmental risks…, 2013; Olivier, s.a.; Financial Risk Management, 2004; Froggatt, Lhan, 2010; Ferraris, s.a.). To assess the risks, the mentioned six groups of risks were divided into 18 particular factors (Table 1). According to Formula 1, before assessing the severity of a risk probability of occurrence of the risk and severity of losses from the occurrence of the risk have to be determined. The risk level is calculated by multiplying the two parameters. For each of the 18 factors, a specific effect area was determined and the risk level was calculated using a scale of 1 to 25, where 1-3 points meant acceptable risks, 4-9 – medium significant risks, 10-19 – significant risks, and 20-25 – extreme risks (Guide to Risk Management, 2004).

Table 1

Characteristics of the risks in hemp production and processing and their distribution by group of risks

Characteristics of risks	Group of risks
Low qualification of personnel and the lack of their responsibility	Personnel risks
Violations of occupational safety rules	
Low quality of seed	Technological and production risks
Unavailability of machinery	
Machinery operational problems	
Low quality of agricultural and technological operations	
Delayed deliveries of spare parts for equipment and delayed maintenance services	
Changes in sale prices on products	Economic and market risks
Changes in purchase prices on inputs (seed, plant protection chemicals, fertilisers etc.)	
Changes in other fixed and variable costs	
Effects of meteorological conditions	Agricultural and meteorological risks
Effects of pests and birds	
Inadequacy of agricultural land for growing hemp	
Environmental risks when fertilising fields	Environmental risks
Environmental risks when processing hemp	
Limitations of receiving direct payments	Legislative risks
Changes in the tax policy	
Changes in the quality and safety standards for the products produced	

Source: author's construction

The results obtained from the risk assessment showed (Fig.2) that, on average, the highest risk level in the entire hemp production and processing process was specific to the group of personnel risks (6), whereas the lowest – to the group of environmental risks (1). The group of personnel risks was the only group of risks that was homogenously assessed by the experts as medium significant for all the phases of hemp production and processing. However, some risks were assessed as the highest for the group of technological and production risks, for instance, the unavailability of machinery during hemp harvesting and processing.
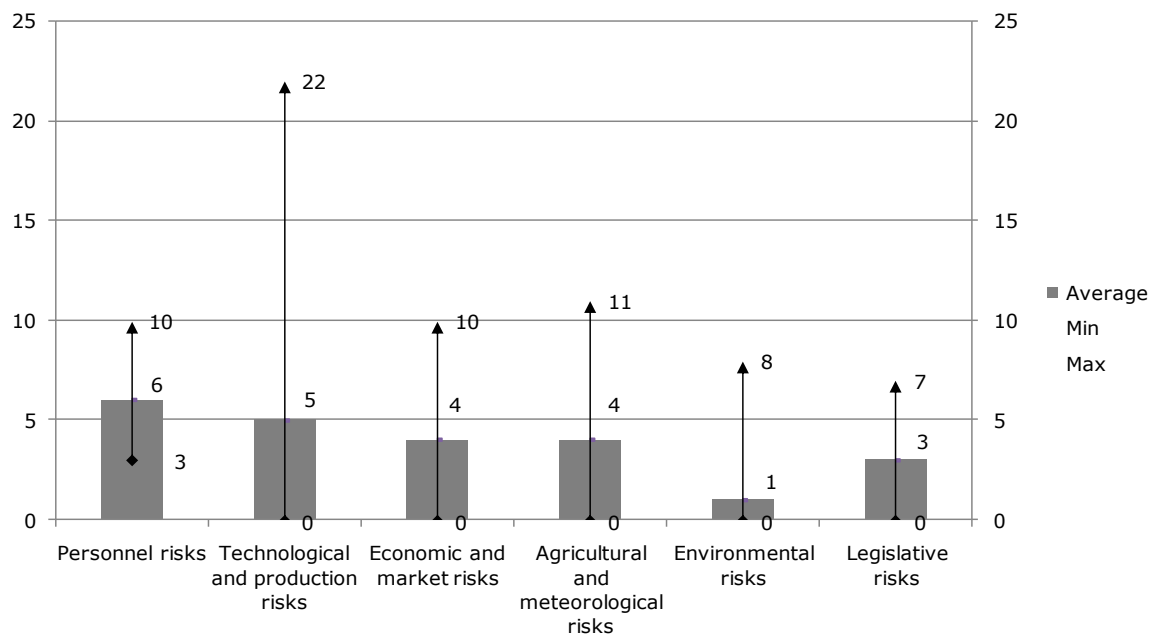
Fig.2. **Dispersion of the significance of risks for the groups of risks for all the phases of hemp production and processing**

After analysing the results for each phase of hemp production and processing (Fig.3), one can find that, on average, the risk effects were assessed as the highest for agricultural land tillage and hemp sowing, while some very significant risks were specific to hemp harvesting and processing, at 22 and 20 points, respectively, and, as mentioned before, this was the risk of unavailability of machinery.
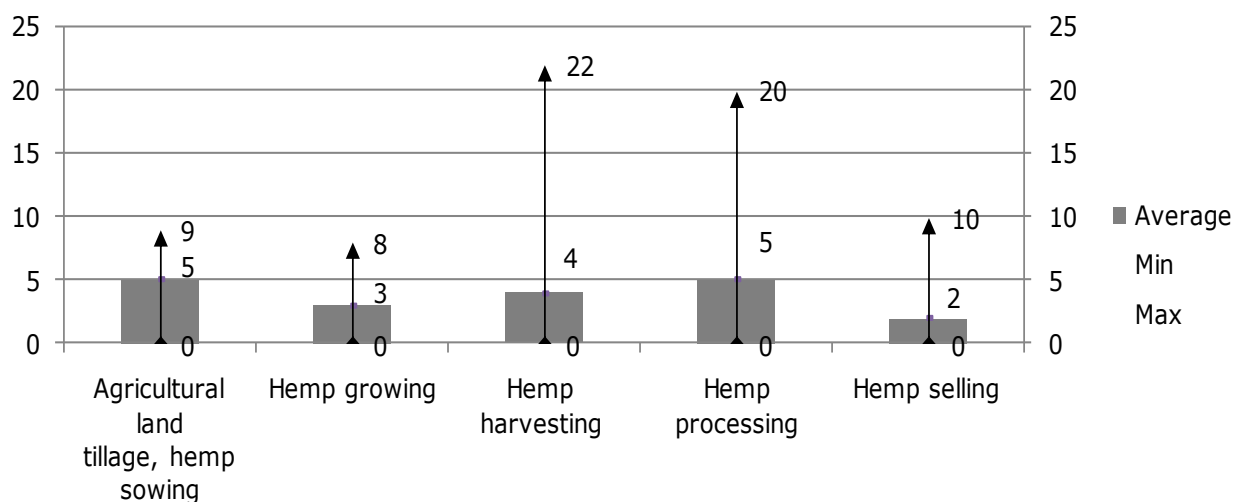
Fig.3. **Dispersion of the significance of risks for the phases of hemp production and processing**

After analysing individual risks for each phase of hemp production and processing, it can be concluded that the experts' assessments for **agricultural land tillage and hemp sowing** were quite different – on average, the most significant were the risk of changes in purchase prices on inputs (seed, plant protection chemicals, fertilisers etc.) (9), the risk of low quality of seed (7) and the risk of changes in the tax policy (7). For **the phase of hemp growing**, the most significant were agricultural and meteorological risks, especially effects of pests and birds, with the maximum of 20, and the inadequacy of agricultural land for growing hemp; however, this phase does not involve several risks associated with hemp sowing and processing. For **the phase of hemp harvesting**, the risk of unavailability of machinery was extremely significant, 22 points; making this the most significant risk not only for a particular phase but for the entire risk assessment. The following risks, for the same phase, were also significant: effects of meteorological conditions, low quality of agricultural and technological operations and low qualification of personnel and the lack of their responsibility, while machinery operational problems were a medium significant risk. For **the phase of hemp processing**, too, the most significant risks were unavailability of machinery (20) and machinery operational problems (11); the two personnel risks, with 10 points, were also significant. As regards the **phase of sales of products**, the risk effects were comparatively lower; on average, significant risks were: changes in sale prices on products (10) and low qualification of personnel and the lack of their responsibility (7). On the whole, the lowest assessments were given to the groups of environmental and legislative risks – environmental risks quite insignificantly affect the phases, while legislative risks can more affect several phases; yet, since presently no changes are expected regarding legal provisions, standards or taxes, the effects of these risks are small.

Further, the research will focus on the differences in risk effects depending on the ways of using hemp. Since the present results show the distribution of significance of risks for hemp production and processing but the experts, when doing their assessments, admitted that this was a quite complicated and time-consuming activity the further research will omit insignificant risks and will focus only on those presently having medium significant and significant effects.

Conclusions

The obtained results showed that, on average, the highest risk level in the entire hemp production and processing process was specific to the group of personnel risks, whereas, the lowest – to the group of environmental risks. That indicates that the actions and the decisions made by the employees are the one that affect the hemp growing and processing process the most. However, some risks were assessed as the highest for the group of technological and production risks, for instance, the unavailability of machinery during hemp harvesting and processing.

The significance of risk groups and also individual risks differed among the risk groups, for example, for the phase of hemp growing, the most significant were agricultural and meteorological risks, especially effects of pests and birds, with the maximum of 20, and the inadequacy of agricultural land for growing hemp but for the phase of hemp harvesting, the risk of unavailability of machinery was extremely significant, and reaching 22 points.

The process of getting preliminary results showed that making the risk evaluation is rather complicated and time-consuming for the farmers therefore in the further research insignificant risks (following the results of the preliminary evaluation) would need to be omitted.

Acknowledgements

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THE RELATIONSHIPS OF ECOLOGICAL AND ECONOMIC USE OF NATURAL RESOURCES

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Abstract. The objective of the study is to assess natural resources and draw attention to economic and environmental aspects of natural resource management. It has been confirmed that the economic perception of nature and its resources differs from the environmental perspective. The necessity to reconcile these two approaches has been indicated in the present work. In order to run a business and preserve the qualities of the natural environment at the same time, it is necessary to use renewable resources in a manner that warrants that the level of consumption of these is not higher than the level of production. The issue of balance of pollutants entering the natural environment seems to be of essential significance. They must not be generated in quantities that exceed the assimilative capacity of the environment.

Key words: ecology, economy, natural resources

JEL code: Q5

Introduction

The current model of processing of natural resources creates many environmental and social problems. Disharmony between human activity and the functioning of nature is even more visible. It is associated mainly with such phenomena as environmental pollution, contamination, soil erosion, depletion of mineral deposits due to overexploitation, climate changes etc. It seems necessary to verify the present rules of management. I.G. Simmons (1979) summarizes this statement, quoting G. P. Marsh: "Man has too long forgotten that the earth was given to him for usufruct alone, not for consumption, still less for profligate waste". Nowadays, however, human activity is focused mainly on making profits, which, to some extent, shapes the human-nature relationship, in which man exercises (or wants to exercise) "sovereign power" over nature. Yet, it is also becoming increasingly visible that the condition of natural environment has impact on the quality of human life. Therefore, people have started to pay attention to adequate use and consumption of the environmental resources. Unfavourable changes taking place in the environment indicate the necessity to maintain balance in natural resource management. If economy and the environment are to grow in harmony, two principles must be respected: 1) it is necessary to use renewable resources in a

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manner that warrants that the level of consumption of these is not higher than the level of production, 2) pollutants must not be generated in quantities that exceed the assimilative capacity of the environment (Wos A., Zegar J., 2002). Therefore, M. Deszczka and M. Wasowicz rightly claim (2013) that the interdependent systems of economy and the environment should always be reviewed and analysed together, from local to global level.

The objective of the study is to assess natural resources and to define an approach taking into account the economic and environmental aspects of natural resource management. Attention has been drawn to the fact that the economic perception of nature and its resources differs from the environmental perspective. The following research tasks have been performed:

- description of categories of natural resources
- explanation of the meaning of undeveloped areas and their protection
- presentation of the diversified quantities of municipal waste processed in the EU member states
- presentation of the level of financing of environment protection measures in the EU member states.

Research results and discussion

Natural resources, their significance and use

Exhaustible and inexhaustible natural resources can be distinguished (Fig. 1). From the economic point of view, the problem of scarcity is related to the concept stating that a limited quantity of resources is at the disposal of individual participants of the management process. Therefore, it seems necessary to choose the resources and their quantity to be dedicated to produce specific economic goods. The problem of scarcity corresponds mainly to exhaustible resources of quantity limited with regard to space and time, and it depends primarily on the intensity and method of human exploitation of the natural environment (Deszczka M., Wasowicz M., 2013). The pace of consumption of resources mainly depends on intensity of this exploitation.

Before man started to exploit the natural resources, the ecosystems were unspoilt (Fig. 2). Nowadays, they are few places on Earth, in which they have been preserved in an unchanged condition. Land transformation is defined as the ratio of the level of changes to the natural conditions.

Fig. 1 diagram:

Natural resources → exhaustible → renewable → mineral; biological

exhaustible → non-renewable → with a possibility to be used many times in a production process and be recovered; of single use in a production process

Natural resources → inexhaustible
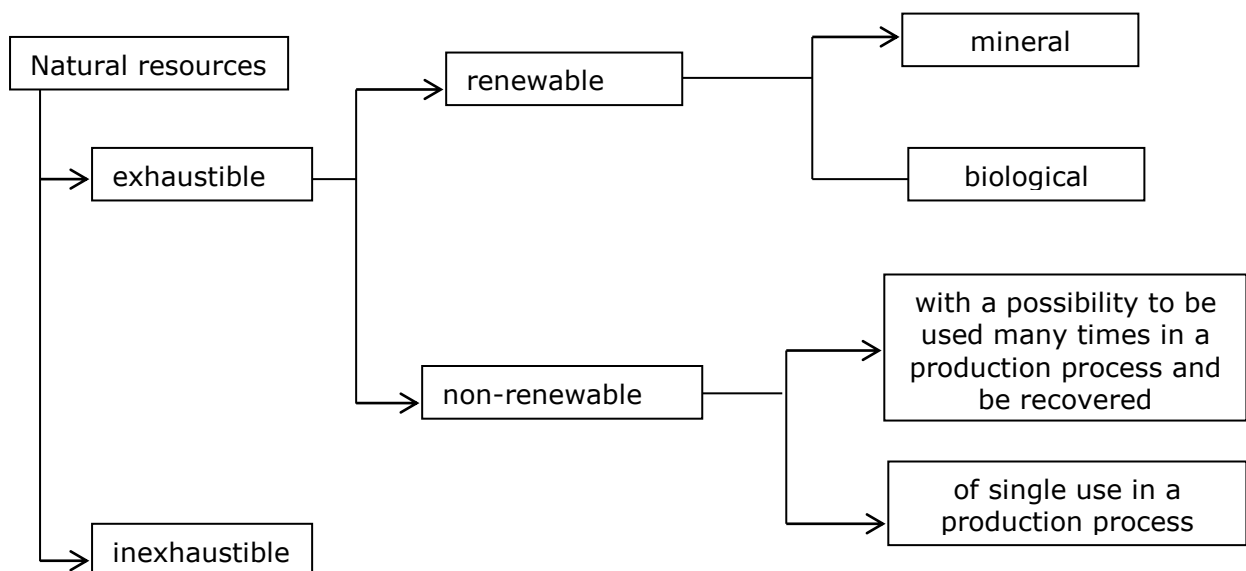
Source: Deszczka M., Wasowicz M., 2013: Economy, ecology, technological progress. W: Marciniak S. (ed.) 2013: Macro and micro economics. PWN, Warsaw, p. 116.

Fig. 1. **Division of natural resources**

Undeveloped and natural areas can be found only in areas, in which human settlements are scarce and simple processing technologies are used.

Fig. 2 diagram:

Natural and undeveloped areas → Uninhabited areas; Presence of people

Uninhabited areas → Planned protection i.e "areas of natural life"; Residua natural areas

Presence of people → Scattered human settlements; Hunters; undeveloped lands
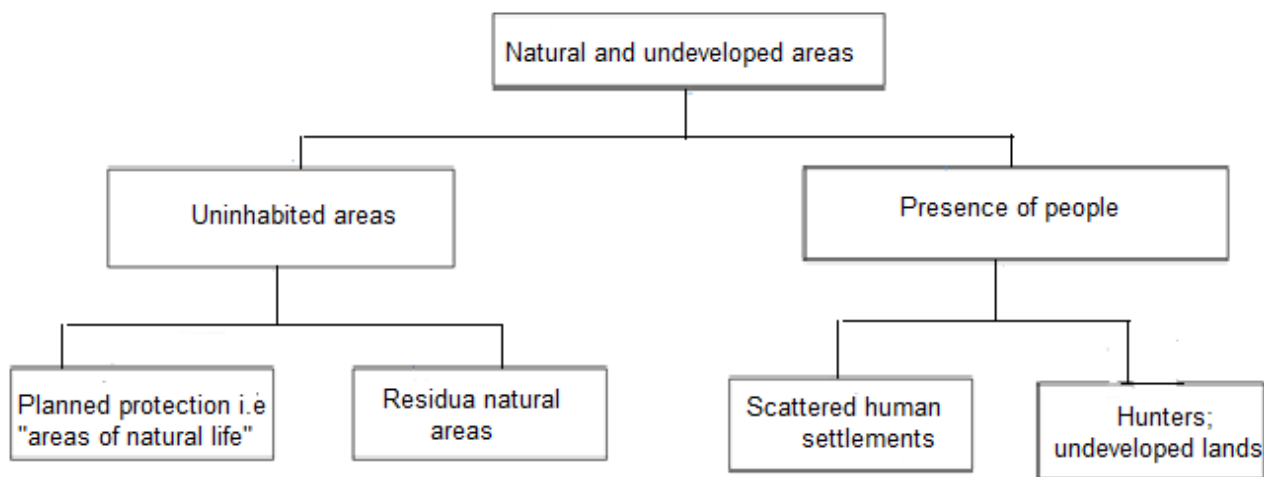
Source: Simmons I.G. 1979: Ecology of natural resources. PWN, Warsaw, p. 75.

Fig. 2. **Undeveloped areas and natural ecosystems**

According to I.G. Simmons (1979), nowadays, natural areas include those in which natural condition is maintained deliberately due to its value. These are the main national parks and reserves. However, the advantages of protection of such areas (in their natural condition) are often disregarded, as the author claims. Such protection is described as an asset that only

wealthy countries can afford. However, the problem with pollution has reached a level that poses a threat to human health and life. Therefore, it is necessary to control business activity and poorer countries sometimes are forced to bear the negative consequences, if the problem of pollution is related to increasing prosperity. Here emerges the issue of relations between economy and ecology. Are the two interdependent? Should they be? To what extent are they in conflict?

The environment-focused perception of nature and its resources differs from the economic approach. Under conditions of scarcity of resources, ecology stresses the necessity of restrictions, whereas economy aims at continuous development. According to A. Hlobil (2009), when it is necessary to give up the advantages of our civilization in order to protect nature, the human race will always choose the comfort of civilization at the expense of the environmental values. Figure 3 presents the relations between economy and ecology.
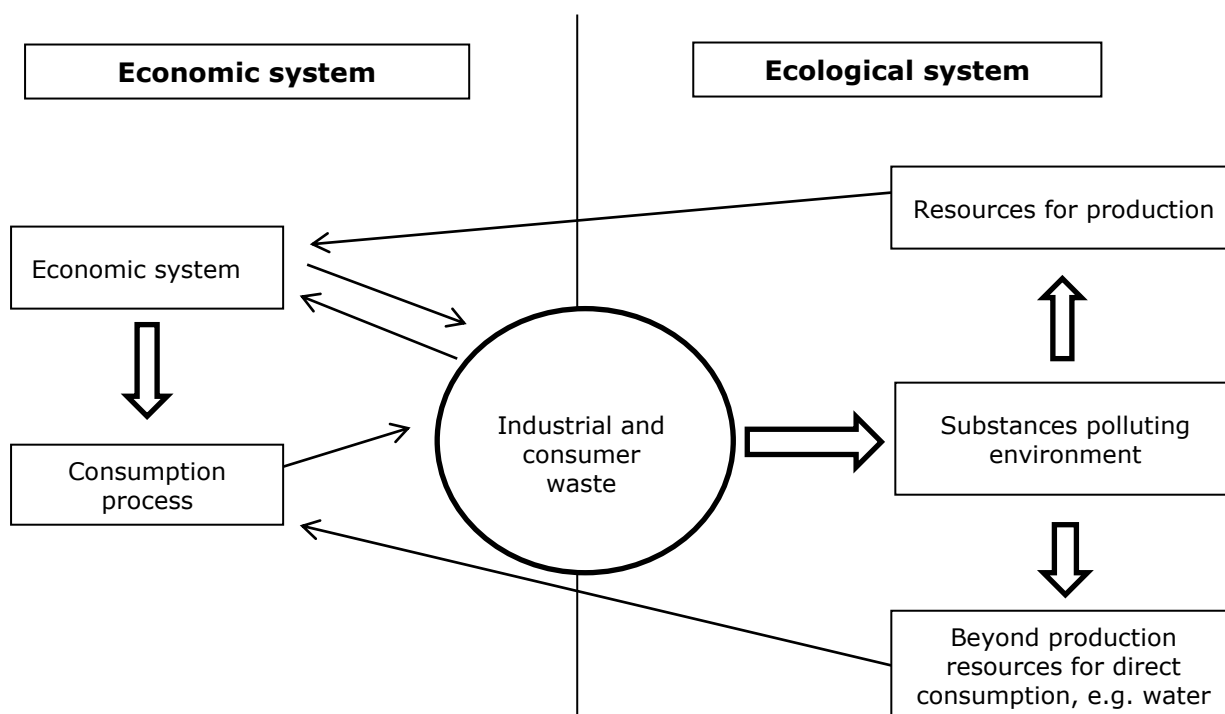
Source: Deszczka M. and Wasowicz M. (2013). Economy, ecology, technological progress. W: Marciniak S. (ed.), Macro and micro economics. PWN, Warsaw, pp. 114.

Fig. 3. **Relations between economy and ecology**

As the diagram indicates, economic goods are made to satisfy the human needs; however, the process of production and consumption generates (industrial and consumer) waste. Generated waste can be reused in economy (economic advantage) or stored at a certain cost. If stored waste is not properly protected, it has negative impact on the environment, leading to its destruction. Resources used for production and for direct consumption by households or other entities are subject to destruction. Contaminated and harmful substances reduce the quality of goods produced and consumed. Generated waste can be recycled and re-used as raw materials

(the so-called secondary raw materials), at the same time reducing consumption of environmental resources (Deszczka M., Wasowicz M., 2013).

It is an undeniable fact that in the 20th century, people started to consume too much resources, generate too much waste and inflict irreversible damage to the environment. People "return" various types of substances, often unfavourable for the environment or even poisonous, while using natural resources, in order to extract or transform them. In the past, the environment was able "to absorb" all pollution "generated" by man. The current regenerative abilities are not sufficient, and negative results of production and consumption for the environment keep increasing. All countries face the challenge of reducing of the pace of economic growth and mitigating the impact of consumption of natural resources and waste production, which is harmful for the environment (Zrownowazona .... 2007).

The impact of factors, which are harmful to the environment is associated, above all, with industrial activity; however, statistical data indicate that exploitation of products and the related post-consumed waste are more hazardous (Adamczyk W., 2004). The main sources of waste in Poland are mining and quarrying (about 52% of the total quantity of generated waste), industrial processing (20%) and production and transmission of electrical energy (Environment 2014). Municipal waste is of lesser significance; however, it causes serious problems in terms of waste disposal; it seems that the simplest method is to remove it to waste dumps. Among the EU member states, Denmark, Cyprus and Germany produce the highest levels of municipal waste (Fig. 4). Poland has one of the lowest indices, which kept decreasing slowly between 2000 and 2012. However, as it was indicated in the Fourth Assessment Report - European Environment (Zrownowazona ... 2007), the quantity of municipal waste keeps increasing on average by 2% annually in the pan-European region.

There are considerable differences between individual countries as regards per capita consumption of natural resources and effectiveness of their use. In Poland, effectiveness of resource management is still lower than in the majority of the EU member states (Strategia... 2012). Consumption models change as a result of progressive social and economic changes. Consumption categories, which are most burdensome for the environment, include food and beverages, private transport and the residential sector.
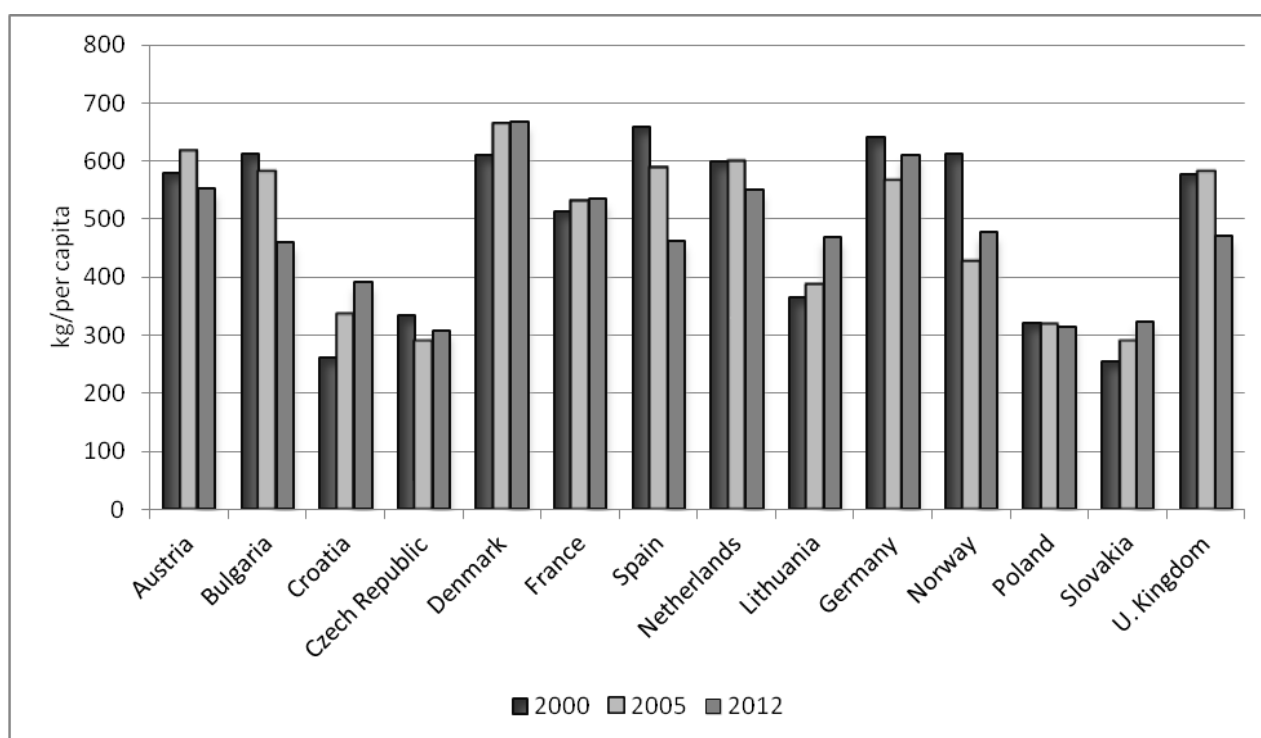
Fig. 4. Changes in the quantity of municipal waste generated in the selected EU member states in years 2000, 2005 and 2012.

In total, these three areas of consumption are responsible for 70-80% of overall environmental impact (Zrownowazona ... 2007). However, in economy, production and delivery of electrical energy, gas and water, transportation services and agriculture exert pressure on the environment. Modern intensive farming often has negative impact on the environment due to the associated exploitation and pollution of the air, water and soil. It has been indicated in the studies of K. Piekut and M. Machnacki (2011), in which the authors claim that intensification of agricultural production is still profitable and even environmental charges do not encourage farmers to reduce it. The studies of B. Golebiewska (2012a) confirm this finding. In analysis of environmental aspects of farming, it was indicated that contribution of agri-environment payments and other payments to development of rural areas (including i.a. payments aimed at maintaining ecological balance of the forest environment) was diversified depending on the impact of individual farms on the environment. The highest payments were charged for extensive farming (Golebiewska B., 2012b).

Economic issues associated with environmental pollution include financing of protective measures. Involvement of individual countries in this respect can be assessed i.a. by analysing the share of expenditures on environmental protection in gross domestic product (GDP). In general, the share of public sector expenditures for environmental protection in the gross domestic product varied, but it did not exceed 1.5% in any EU member state (Fig. 5). The

highest increase was recorded in Lithuania and in Poland, reaching the level of expenditures of about 1.1% in GDP.
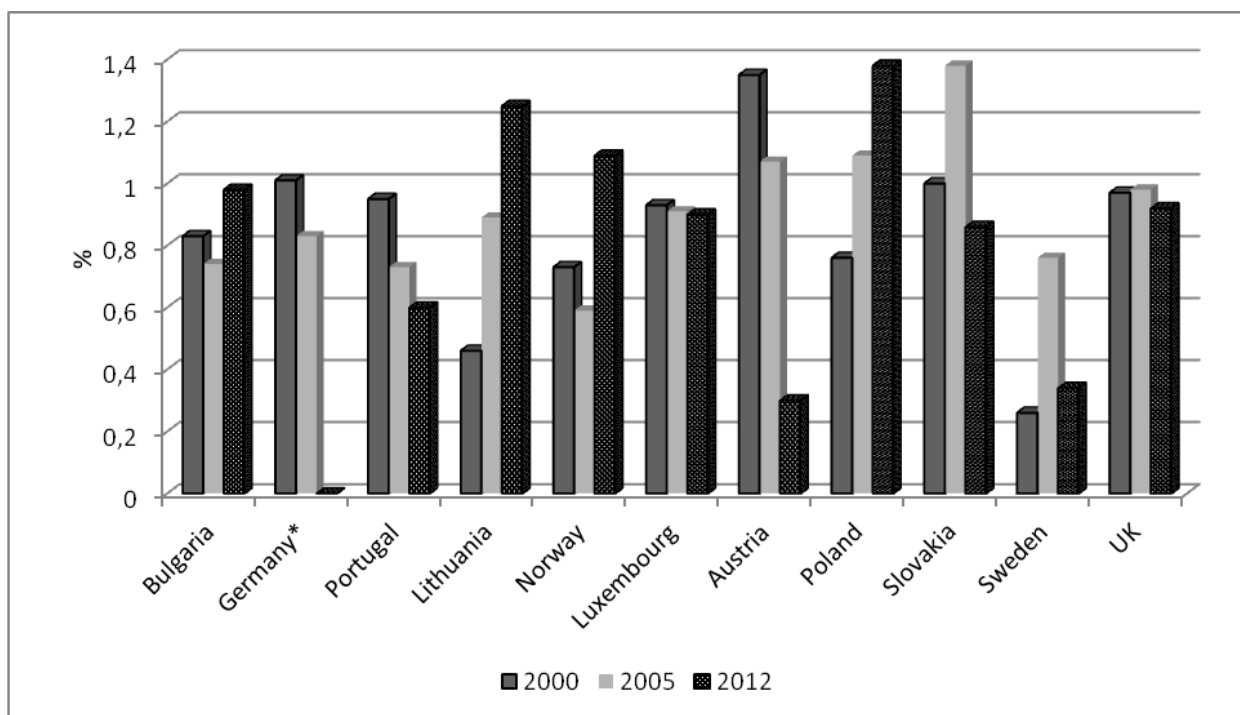
Fig. 5. The share of investment and current expenditures for environmental protection in the gross domestic product in selected EU countries

The share ranged between 0.7-0.9% of the gross domestic product in the 1990s. It was reduced to about 0.55% in 2004 – in the first decade of the 21st century. The index kept increasing after this point (accession of Poland into the EU); however, it had not reached the level of 1995 until 2011 (Golebiewska B., 2013). It was not until the year 2012 that a considerable increase (1.38%) was noted.

Conclusion

It is an undeniable fact that rational use of natural resources and reasonable development of environment are currently recognized among the most significant duties of the human race. Unfavourable changes taking place in the environment indicate the necessity to maintain the balance in management of natural resources. In order to reconcile business activity and preservation of qualities of the natural environment, it is necessary to use renewable resources in a manner that warrants that the level of consumption of these is not higher than the level of production. The issue of balance of pollutants entering the natural environment seems to be of essential significance. They must not be generated in quantities that exceed the assimilative capacity of the environment.

As it has been indicated in the Assessment Report of the European Environment Agency, one of the most significant objectives of the EU environmental policy is to eliminate the correlation between economic development and growing consumption of resources and energy and the associated environmental impact. It also seems necessary to aim at limiting consumption of natural resources per product or service unit at all stages of production and consumption.

Therefore, at the current stage of societal development, it seems necessary to reconcile the economic and the environmental perspective. The increasing environmental hazards, associated with human activity, make it necessary to educate societies in order preserve the Earth for future generations.

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LAND MANAGEMENT PATERNS IN LATVIA AND ITS REGIONS

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Abstract. Efficient land use plays an important role in the context of sustainable agricultural development. Assuming that it will be viable only in cases when individuals employed in agriculture can ensure themselves an income equivalent and not less than the average wage in the national economy. Certain sizes of agricultural area, which are different for every key agricultural sector, are required to achieve it. The present research analyses the minimum land area needed in field crop, dairy and grazing livestock farming in Latvia and its regions depending on land quality and the amount of support payments received. The research sets the following **aim**: to identify the minimum areas needed in agriculture in Latvia in order to ensure sustainable farm management depending on land quality and, in the regions, the amount of support payments received. A minimum land area for sustainable farm management in Latvia per individual varies from 48.3 ha in dairy farming to 65.5 ha in field crop farming. However, there are major differences depending on land quality and in the amount of support payments received.

Key words: agricultural land, area, income.

JEL code: Q01, Q15.

Introduction

Integrating the principles of sustainable development within sector policies is one of the main strategic objectives of the European Union. As pointed by E.Majewski (2013), the concept of "Sustainable Development" is multidimensional, and sustainability can be measured on various levels, in space and time. This provides a wide field for the search of methods of measuring "sustainability", which are addressed to different sustainability aspects.

Every day, farmers and ranchers around the world develop new, innovative strategies to produce and distribute food, fuel and fibber sustainably. While these strategies vary greatly, they all embrace three broad goals or the 3 Pillars of Sustainability: 1) profit over the long term; 2) stewardship of a nation's land, air and water; 3) quality of life for farmers, ranchers

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and their communities (Sustainable Agriculture Research…, s.a.). As farmers assume more responsibility for managing natural resources, they play an increasingly important role in assessing sustainable agriculture (Belanger et al., 2012). Serageldin I. (1999) stresses that rethinking resource use is a major issue in terms of sustainability in the medium- to long term, because it is a given that population pressure is going to be there. This also refers to land as the key natural resource exploited in agricultural production.

Antonella Trisorio (2004) emphasises that the economic dimension of sustainability mainly refers to: a) efficient use of resources; b) competitiveness and viability in the agriculture sector; c) profitability of the agriculture sector; d) agriculture's contribution to the development and/or conservation of rural areas; e) the diversification of sources of income within farming families.

Agriculture income derives from the revenues received from the labour input, interest payments, rent of land payments and profit from agriculture activities. All these income flows are generated by the factors of agriculture production: land, labour, capital and entrepreneurship (Cepaitiene, Vinciuniene, 2009). But land is the key resource without which no production and income generation in agriculture is possible.

Efficient land use in the context of sustainable agriculture has been widely researched by scientists of various countries, for instance, C.Gutzler, K. Helming, D. Balla et al. (2015); H.Wiggering, U.Steinhardt (2015); V.Popescu, G.Popescu, C. Popescu (2015); M. Hartvigsen (2014); L.Latruffe and P. Laurent (2014) and others.

Since the potential of land use in agriculture in Latvia has not been fully exploited (Dobele, 2005; Baumane, 2012; Pilvere, Nipers, Upite, 2014 and others), it is important to identify the minimum land areas, the management of which is profitable in various agricultural industries, and the factors affecting it.

Therefore, the research sets the following aim: to identify the minimum areas needed in agriculture in Latvia in order to ensure sustainable farm management depending on land quality and, in the regions, the amount of support payments received (in this case term sustainable farming is understood as one where individuals can ensure themselves an income equivalent and not less than the average wage in the national economy).

In accordance with this aim, the following specific research tasks were defined:

- to analyse the effects of land quality on land management in Latvia;
- to assess the role of financial support in land management in Latvia and in its regions.

Analysis, synthesis, logical and constructive methods were employed to tackle the research tasks. The study analysed information and data from the Central Statistical Bureau (CSB) and the Farm Accountancy Data Network (FADN).

In Latvia, the minimum land areas needed to ensure sustainable farm management are different among various agricultural industries; accordingly, for a detailed analysis, the key

agricultural sectors associated with land use were selected: a) field crop farming; b) dairy farming; c) grazing livestock farming, as these sectors contributed to 66% of the total output of agricultural goods at base prices (product subsidies included) in Latvia in 2012 (MoA, 2013).

The research assumes that individuals employed on agricultural holdings can provide themselves with an income equivalent to at least the average wage in the national economy. Otherwise, one can consider that the mentioned way of earning one's living is not sustainable. It is assumed that in order an agricultural holding is viable, at least one individual has to gain an income from agricultural activity that is equivalent to the average wage in Latvia (with labour taxes paid). A widespread model of agricultural holdings in Latvia is a family farm in which two adults work, as the average number of agricultural annual work units is equal to 2.2 (CSB, 2010). Therefore, calculations are performed also for an assumption that in order an agricultural holding is viable, at least two individuals could gain an income from agricultural activity that is equivalent to the average wage in Latvia (with labour taxes paid). The average wage in the country is calculated based on the CSB data for 2013, and the calculations employ the minimum income level (MIL): EUR 10 619 per employee and EUR 21 238 per two fulltime employees (CSB, 2013).

With increase in the size of land area, farms gain greater revenue per ha. The increase may be characterised by a function, according to which, on farms with a smaller land area, every additional hectare of land increases total revenue (in the form of profit and wages) more than on large farms. This situation may be described by a logarithmic function:

$$\pi / ha = b \cdot \ln (ha + a) + c \qquad\qquad [1]$$

where π – revenue;

ha – land area of the farm;

a, b, c – equation coefficients.

At the same time, greater revenue per ha directly affects the area needed for ensuring the minimum income level. In this case, the minimum land area for ensuring the minimum income level may be expressed by means of the following equation:

$$ha_{min} = \pi_{min} / (\pi / ha) \qquad\qquad [2]$$

where π_{min} – minimum revenue for sustainable farm management;

ha_{min} – minimum land area for sustainable farm management.

By combining both equations, the functional dependence of the minimum land area on the total area of a farm is as follows:

$$ha_{min} = \pi_{min} / (b \cdot \ln (ha + a) + c) \qquad\qquad [3]$$

The present research employed the FADN data. The FADN is a survey carried out by the EU Member States. It was established in 1965 in accordance with Regulation No 79/65 of the Council of 15 June 1965 setting up a network for the collection of data on the incomes and

business operation of agricultural holdings in the European Economic Community. The target size of the sample for the FADN in Latvia is 1000 farms (Bratka, Praulins, 2007).

Based on the FADN data, the minimum income level is calculated as revenue made up of the value of products, financial support for production and investment support minus the cost of goods and services, depreciation of fixed assets, interest payments, rent and production taxes. Accordingly, the revenue used in the analysis is calculated by the following formula:

$$\pi = q + sp + si - ic - d - i - r - t \qquad\qquad [4]$$

where π – revenue of the farm;

q – total output of the farm;

sp – financial support for production received by the farm;

si – investment support received by the farm;

ic – intermediate consumption by the farm;

d – depreciation of the farm's fixed assets;

i – interest payments made by the farm;

r – rent paid by the farm;

t – production taxes paid by the farm.

In this case, the farm's revenue is the remaining value that may be used for paying wages, offsetting a decrease in equity capital and for profit.

The revenue calculated are then expressed per ha of farmed land, and the minimum area is calculated by dividing the minimum income level that was set for ensuring sustainable farm management by the return on land (according to Formula 2).

The calculations of minimum land areas needed to ensure a minimum income per employee were performed based on the FADN data for groups of farms with standard outputs (SO) of, on average, EUR 4-15 thou, EUR 15-25 thou or EUR 25-50 thou for a 5 year period (2008-2012). Average land areas, which determine an approximate productivity level at a certain quantity produced, are calculated for the groups of farms of particular specialisation.

The overall economic performance of farms of particular specialisation is assessed for identifying the minimum land area in the particular industry.

The minimum land area in Latvia's regions was identified taking into account only the differences in land quality among the regions (average agricultural land qualitative estimates were calculated and employed to provide the characteristics of the differences) and the related Rural Development Programme measure "Payments to Farmers in Areas with Handicaps, Other than Mountain Areas" (LFA). LFA support rates for the regions in accordance with the LFA categories set for the level of rural territories were employed to identify the LFA support level. The minimum land areas for the regions were calculated by adjusting the average farm performance results in the country.

Sensitivity for a minimum land area needed, depending on land quality, was calculated based on the FADN data, using only the data on products associated with a particular industry and related costs. Given the fluctuations in land quality, a minimum land area was calculated as follows:

$$ha_{min}' = п_{min} / (п' / ha) \qquad\qquad [5]$$

where ha_{min}' – minimum land area needed for sustainable farm management, taking into consideration the changes in land quality;

$п_{min}$ – minimum revenue needed for sustainable farm management;

$п'$– revenue of the farm, taking into consideration the changes in land quality.

In the EU, the FADN data are classified by region, using the territorial division in accordance with the Nomenclature of Territorial Units for Statistics (NUTS) classification. In Latvia, the following administrative and territorial division exists in accordance with the NUTS classification: the whole territory of the country corresponds to Level 1 and Level 2, there are five agricultural regions at Level 3: Pieriga, Vidzeme, Kurzeme, Zemgale, and Latgale (LSAEI, 2012).

Research results and discussion

1. Effects of land quality on land management

Land quality directly affects the return on land. With costs being equal, quantities of products produced on quality and low quality land are different, thus, affecting revenues and, in their turn, incomes. Yet, it has to be stressed that these calculations were performed for equal support payments (the payments were equal to the average national support payment level in the period 2008-2012) for various land quality groups.

In case of high quality land, the minimum land area has to be smaller than the average. However, in case of low quality land, the minimum land area has to be greater than the average. To understand the scale of this effect, calculations were performed for field crops (grains and rapeseed) and the results are presented in Table 1.

Table 1

Average minimum land areas required in field crop farming depending on land quality in Latvia in the period 2008-2012

Indicators	Land quality					
	25 points	32 points	Average field crop land quality in the country – 40 points	45 points	50 points	60 points
Minimum area, ha (MIL 1)	444.5	120.1	65.5	51	41.7	30.6
% of the average value	679	183	100	78	64	47
Minimum area, ha (MIL 2)	889.1	205.3	108.9	84.1	68.6	50.1
% of the average value	816	189	100	77	63	46

Source: authors' calculations based on LSIAE 2009, 2010, 2011, 2012a, 2013

As shown in Table 1, given the different land quality in Latvia's regions and, accordingly, different rates of return on land, the minimum land area for a farm was adjusted based on agricultural land qualitative estimates measured in points. The result obtained reflect the situation for farms with a SO within a range from EUR 15 000 to EUR 25 000 at a MIL 1 and a SO from EUR 25 000 to EUR 50 000 at a MIL 2. For farms with a higher agricultural land qualitative estimate, the minimum land area is smaller. For instance, if the land qualitative estimate is 60 points, on average, 30.6 ha had to be exploited to provide a MIL 1 in the period 2008-2012, while for a MIL 2 this required 50.1 ha. With decrease in land quality, the minimum area to be exploited for ensuring a minimum income level increases. For example, at a land qualitative estimate of 25 points, an agricultural area of more than 400 ha was needed to provide a MIL 1 in the period 2008-2012. Yet, it should be emphasised that these calculations were performed for equal financial support payments (the payments were equal to the average national support payment level in the period 2008-2012) for various land quality groups.

The calculation methodology provides that livestock farming – dairy and grazing livestock farming – is associated with the areas of permanent grasses sown in arable land (PGSAL) and permanent meadows and pastures (PMP), as these areas are the basis for milk and meat production. The cost of milk production as well as the revenue from sales of milk was calculated to determine the cost of producing permanent grasses sown in arable land. The production cost of PGSAL and that of milk are interrelated to each other by a coefficient that reflects the area needed per animal, taking into account the yield of sown grasses. In a similar way, the area of PMP needed for raising grazing cattle was also determined.

The average quality of land under PMP and PGSAL in the country is equal to 36.9 points, while changes in the minimum land area were assessed at agricultural land qualitative estimates within a range from 25 to 60 points. As land quality varies, the minimum land area for a farm was adjusted to examine the effect of the change. One has to conclude that the effect of land quality change in dairy farming is smaller than for field crops. For example, if the land quality declines from 36.9 to 32 points, the minimum land area needed increases by only 18%. If the land quality, in points, increases from 36.9 to 45, the minimum land area needed decreases by 17% (Table 2).

Average minimum land areas required in livestock farming depending on land quality in Latvia in the period 2008-2012

Indicators	Land quality				
	25 points	32 points	Average PMP and PGSAL land quality in the country – 36.9 points	45 points	60 points
Dairy farming					
Minimum area, ha (MIL 1)	79.4	56.8	48.3	39.9	32.8
Minimum area, ha (MIL 2)	138.8	99.2	84.4	69.8	57.2
% of the average value (MIL 1 and MIL 2)	164	118	100	83	68
Grazing livestock farming					
Minimum area, ha (MIL 1)	82.9	62	53.7	45.2	37.7
Minimum area, ha (MIL 2)	155.6	116.4	100.8	84.8	70.7
% of the average value (MIL 1 and MIL 2)	154	115	100	84	70

Source: authors' calculations based on LSIAE 2009, 2010, 2011, 2012a, 2013

The range of change in the minimum land area, depending on land qualitative estimates, in the sector of grazing livestock is smaller than for field crop farms and slightly smaller than in the sector of dairy livestock. So, one can conclude that in the sector of grazing livestock, the effect of land quality is not as important as for field crops. For instance, if the land quality is as high as 60 points, in the period 2008-2012, 37.3 ha had to be exploited to provide a MIL 1 and 70.7 ha for a MIL 2. In contrast, at a land qualitative estimate of 25 points, 82.9 ha and 155.6 ha were needed to provide a MIL 1 and a MIL 2, respectively, in the period 2008-2012.

2. Effects of financial support on land management in Latvia and its regions

To take into account the differences in support payments, the minimum land area was calculated not only for the entire country but also for its regions (Table 3).

Average minimum land areas required to achieve a MIL 1 in Latvia and its regions in the period 2008-2012

Indicators	National average	Average in Pieriga	Average in Vidzeme	Average in Kurzeme	Average in Zemgale	Average in Latgale
Field crop farming						
Total support per ha, EUR	177.1	163.9	188.4	178.2	172.1	202.4
Revenue per ha, EUR	162.2	161.5	158.3	167.5	185.2	158.4
Minimum area, ha (MIL 1)	65.5	65.8	67.1	63.4	57.3	67.0
Dairy farming						
Total support per ha, EUR	236.6	205.2	239.3	227.9	249.3	243.9
Revenue per ha, EUR	219.8	198.4	214.9	216.0	248.9	213.4
Minimum area, ha (MIL 1)	48.3	53.5	49.4	49.2	42.7	49.8
Grazing livestock farming						
Total support per ha, EUR	287.4	232.5	283.3	263.6	286.1	291.7
Revenue per ha, EUR	197.9	165.3	191.1	184.6	208	193.4
Minimum area, ha (MIL 1)	53.7	64.2	55.6	57.5	51.1	54.9

Source: authors' calculations based on LSIAE 2009, 2010, 2011, 2012a, 2013

Receiving a total support of EUR 177.1 per ha, the production of field crops in Latvia provides an income of EUR 162.2 per ha, and, in order to achieve a MIL 1 within a year, a farm has to exploit at least 65.5 ha. Regionally, a substantially lower minimum area was identified for farms in Zemgale region – 57.3 ha or 13% less than on average in the country (even though support payments per ha were smaller there than on average in the country). This is associated with higher returns on land for the farms located in this region. An income, too, per ha on the farms of this region is much greater – by 14% more than in comparison with the average situation in the country. In the regions of Latgale and Vidzeme, farms need a greater minimum land area to provide a MIL 1, 67 ha and 67.1 ha, respectively, which may be explained by the smallest quantity of products produced per ha.

In the five-year period, the situation in Latvia's regions on dairy farms differs both in terms of value of products produced and in terms of income and, accordingly, minimum land area. In Latvia, dairy farms with a SO of EUR 15-25 thou, which employ one AWU, need to exploit, on average, 48.3 ha. Such a performance result can be achieved producing products worth EUR 563.8 per ha, while the total cost is equal to EUR 580.6 and the investment and production financial assistance amounts to EUR 236.6. The total income per ha on farms is equal to EUR 219.8. In Latvia's regions, the minimum land area to provide a minimum income level varies from 42.7 ha in Zemgale to 53.5 ha in Pieriga. Zemgale region is characterised by the highest value of products produced per ha (EUR 641.3), which is 14% more than on average in Latvia. An income per ha, too, is the highest, which results from the smallest difference between the value of sold products and the total cost as well as the large amount of support.

In Pieriga region, however, farms need the largest area – 11% more than on average in Latvia. A significantly lower total value of products per ha (94% of the average in Latvia) as well as the smallest amount of support for this region's farms generate the lowest income per ha (EUR 198.4 or 90% of the average in Latvia). In Vidzeme, Kurzeme and Latgale, the minimum area is relatively similar in size despite the differences in production efficiency, which determines the value of products per ha.

Receiving a total support of EUR 287.4 per ha, the production of products of grazing livestock generates, on average, an income of EUR 197.9 per ha in Latvia, and, in order to achieve a MIL 1 within a year, a farm has to exploit at last 53.7 ha. Regionally, a slightly smaller (5%) minimum area was identified for farms in Zemgale, 51.1 ha. The quantity of products produced and an income per ha are greater on farms of this region in comparison with the average situation in the country. One has to note that the amount of support received by Zemgale region's farms is among the highest (second position behind Latgale region). The poorest performance results were presented by farms in Kurzeme and especially in Pieriga where the largest minimum land area is required to provide a MIL 1, 57.5 ha and 64.2 ha, respectively. The key reason relates to the facts that the smallest quantity of products and the lowest amount of support per ha are observed for these regions.

Table 4

Average minimum land areas required to achieve a MIL 2 in Latvia and its regions in the period 2008-2012

Indicators	National average	Average in Pieriga	Average in Vidzeme	Average in Kurzeme	Average in Zemgale	Average in Latgale
Field crop farming						
Total support per ha, EUR	215.3	198.3	225.1	214.7	209.8	240.7
Revenue per ha, EUR	195.0	193.7	188.3	200.5	223.2	187.7
Minimum area, ha (MIL 2)	108.9	109.7	112.8	105.9	95.2	113.2
Dairy farming						
Total support per ha, EUR	265	219.5	256.3	244.5	269.4	260.9
Revenue per ha, EUR	251.6	218	236.2	238	275.7	234.4
Minimum area, ha (MIL 2)	84.4	97.4	89.9	89.2	77.0	90.6
Grazing livestock farming						
Total support per ha, EUR	297.1	247.5	300.5	280.2	304.7	309.1
Revenue per ha, EUR	210.7	181.1	208.6	201.8	226.9	211
Minimum area, ha (MIL 2)	100.8	117.3	101.8	105.3	93.6	100.6

Source: authors' calculations based on LSIAE 2009, 2010, 2011, 2012a, 2013

To provide a MIL 2, a minimum land area for field crops, on average in Latvia, is equal to 108.9 ha. The calculations showed that to provide a MIL 2, the situation across the regions was similar to that for a MIL 1. The smallest minimum land area is needed in Zemgale region, 95.2 ha, whereas the largest one is required on Latgale region's farms, 113.2 ha. Like in Latgale, about 113 ha for field crops are needed to provide a MIL 2 in Vidzeme, too, where farms generate the largest income without financial support, while the financial support is EUR 15.6 per ha smaller there.

The situation in dairy farming in Latvia's regions on farms employing 2 AWU and generating a SO of EUR 25-50 thou is characterised by similar trends. On average, in the country, the total quantity of products and the cost per ha make up a gap of EUR 13.1; an income per ha is EUR 251.6, which is substantially affected by the total assistance of EUR 265 per ha. Accordingly, on average, an area of 84.4 ha has to be annually exploited in Latvia to achieve the required income level.

The smallest minimum area is needed on dairy farms in Zemgale, 77 ha or by 9% less than on average in the country, whereas the largest one is required on farms located in Pieriga region, 97.4 ha or by 15% more than on average in the country. The difference in the minimum area is mainly determined by the differences in the total value of products produced as well as the size of total cost per ha.

To provide a MIL 2 in the sector of grazing livestock, on average, a minimum area of 100.8 ha is needed in the country. According to the calculations, to provide a MIL 2, the situation across the regions is similar to that for a MIL 1. The smallest minimum land area is needed in Zemgale region, 93.6 ha (the quantity of products produced is the greatest as well as the amount of support received is the greatest), whereas the largest minimum land area is needed on Pieriga region's farms, 117.3 ha.

A similar situation is observed on grazing livestock farms in Latgale and Vidzeme as well as in Kurzeme where farms are only slightly in a poorer situation, receiving a comparatively smaller amount of support.

Conclusions

Yields of agricultural crops and, thus, the size of land area needed to provide the minimum income are significantly affected by land quality. In field crop farming, at the average land qualitative estimate of 39.6 points, the minimum land area needed is 65.5 ha , while at a lower estimate, 32 points, it is 120.1 ha and at an estimate of 50 points, the area needed decreases to 41.7 ha. In dairy farming and in the sector of grazing livestock, the smallest effect of the difference in land quality is observed for field crop farming, as the minimum land area needed to generate the minimum income varies from 32.8 ha to 79.4 ha, while for grazing livestock it ranges from 37.7 ha to 82.9 ha.

Regionally, the financial assistance received only partially offsets the differences created by land quality. Regardless of the sizes of support payments, among the groups of farms specialising in dairy and meat livestock, slightly better performance results are presented by Zemgale region's farmers; to earn the minimum income, 57.3 ha are needed in field crop farming, 42.7 ha in dairy farming and 51.1 ha in grazing livestock farming, while 65.8 ha, 53.5 ha and 64.2 ha, respectively, are needed in Pieriga.

Acknowledgment

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AGRICULTURAL BIOGAS PRODUCTION AND THE DEVELOPMENT OF PROSUMER ENERGY IN POLAND[*]

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Abstract. The first part of the article presents basic information affecting the development of renewable energy sources (RES) and the theoretical basis for state activities resulting from the concept of external effects and public goods. In the second part data from the Agency for Restructuring and Modernisation of Agriculture (ARMA) were used to estimate the possibility of establishing agricultural biogas plants on Polish territory as well as their current number and installed capacity. It has been found that the potential for production of agricultural biogas is used to a small degree and by very large installations, which is not conducive to the development of prosumer energy. Two reasons have been identified for the aforementioned situation: the high start-up costs of such operations and inconsistent state policy aimed at supporting RES. The situation is further worsened by a lack of RES legislation and the directions of proposed changes, which are shifting to support for large energy producers at the expense of prosumers.

Key words: agricultural biogas, renewable energy, prosumer

JEL code: Q5

Introduction

According to the latest results of observations conducted by the World Meteorological Organization (WMO), the year 2014 has been the warmest year in the history of official measurements (WMO, 2014) and even since the year 1500. This is confirmed by data from the Polish Institute of Meteorology and Water Management (IMWM). What is more, the ten warmest years in the history of observations have occurred since 2000 (National Climatic Data Center). Therefore, an increasingly large part of society is taking notice of the changes in climate and the need to take actions aimed at halting them. Despite significant problems of a

political and economic nature, the UE implemented such actions. During a summit of the EU leaders held in October 2014, they reached an agreement on climate protection. According to it, firstly, the EU shall, as a whole, reduce CO_2 emissions by 2030 by at least 40% when compared to the year 1990. Secondly, the share of renewable energy sources in total electrical energy used is to reach a minimum share of 27% by 2030. It remains an open question whether these goals are not overly ambitious, taking into account the delays and resistance of other countries to bearing the costs of climate protection (Golasa, P., Lenort, R., Wysokinski, M., Baran, J., Bienkowska-Gołasa., 2014). However, the development of renewable energy sources forced by this agreement has become a chance for the development of said sources, especially in rural areas.

The aim of this article is to determine the possibilities for agricultural biogas production in Poland and the opportunities for development of prosumer energy. To achieve the aim, the following research tasks were set:

- to analyse agricultural biogas production opportunities in particular regions in Poland;

- to identify existing biogas plants and to characterise their average power.

The first part of the article presents the theoretical basis of environmental economics, while the second part uses data from the Agency for Restructuring and Modernisation of Agriculture on farms, and from the Energy Regulatory Office (ERO) on the number and capacity of biogas plants, in order to execute the study objectives.

Research results and discussion

Theoretical economic basis for RES support

With current technical capabilities, production of renewable energy production is significantly more expensive than conventional energy. In order for it to develop, countries must establish special conditions and support systems. Thus the question arises regarding the theoretical basis for such an intervention, its sources and methods. This issue is the subject of environmental economics. The problem can be approached from the perspective of two imperfections in the market of external effects and public goods (Stiglitz I. E., 2004)

The first one occurs when the actions of one entity impact the state of other individuals. This effect can generate costs for them, which is when negative external effects occur, or give benefits (positive external effects). This results in sub-optimal allocation of resources, as per the Pareto principle, as one of the optimum conditions, on the equality of marginal transformations and substitutions, is broken (Acocella N., 2002). In the case of negative external effects, entities behind them fail to bear the full costs of their actions, which leads to the scale of their operations becoming excessively large. If the issue is examined from the

perspective of the environment being as a public good, there is a problem of no disclosure of preferences in terms of both demand and supply of these goods. Public goods are used by everybody, regardless of whether they bear the costs of their maintenance or not. Accordingly, the phenomena of external effects and public goods are mutually aligned, since in both cases discrepancies occur in terms of private and social costs (Fiedor B., 2002).

The question arises whether the state should intervene in such a situation. According to Coase, it should not because each party, the one injured and the one benefiting, can conduct negotiations on the removal of the effects in questions, so as to obtain the socially desired effect (Coase R. H., 1960). In the current economic situation, negative external effects resulting from the impact of businesses on the environment, have the most significance. As negotiations between the parties polluting the environment and the rest of society are difficult for organisational and technical reasons, it seems that Coase's approach is not really fitting and the existence of these effects is the justification for state intervention. Society as a whole is interested in increasing the scale of activities generating positive external effects and reducing the negative effects, so the role of the state is to provide an appropriate framework for this type of actions (Wysokinski M., Baran J., Gołasa P., Lenort R., 2014) . Meanwhile, the answer to the question of whether these actions are to be performed by means of administrative instruments - standards, or economic instruments (e.g. based on the Pigou tax) remains up to the authorities of the particular state.

Biogas production

Biogas is a mixture of gases, consisting mainly of methane and carbon dioxide, produced by microorganisms in the process of decomposition of organic substances under anaerobic conditions. It includes - depending on the raw materials, conditions and technology - methane (CH_4) - 50% to 75%, carbon dioxide (CO_2) - 25% to 45%, hydrogen sulphide (H_2S) 20-20000 ppm, hydrogen <1% , carbon monoxide (CO) - 0.1%, nitrogen <2%, oxygen <2%. The larger the share of methane in the biogas, the higher its calorific value. With a methane content of 65%, a calorific value of 23 MJ/m^3 is assumed. In practice, there are several types of biogas plants, mainly differing by the substrate used for the creation of biogas. There are biogas plants for agricultural materials, landfills, sewage treatment plants and mixed sources.

Currently, a major substrate for the production of agricultural biogas is animal excrement, slurry in particular (Wysokinski, M. Dziwulski, M., 2013). The problem lies in its low dry matter content and hence - low biogas production potential. For this reason substrates used in a biogas plant are supplemented with energy crops. Corn is the prevalent choice. This is supported by its extremely high energy yield per hectare, with German studies showing 45 Mg of fresh weight per hectare. In addition, the plant is quite easy to grow, it does not require specialised equipment and storage is not a major problem. It can be placed in a silo, covered with foil and subjected to an ensiling process. Although production of agricultural biogas from corn itself is possible, for process technology reasons: stability of the process as well as an

increase in the production of methane, it is desirable to use slurry as a second substrate. (Institut fur Energetik und Umweltg, 2005).

Photo 1: Corn storage facility for a biogas plant

Photo 2: Co-generation engine

Source: author's photos

The final product from a biogas plant is biogas (with parameters similar to natural gas), electricity, or electricity together with generated heat. The last of these products is the most widespread for practical and economic reasons (high efficiency of cogenerative devices and the possibility of selling both electricity and heat).

Production capacity in Poland

Agricultural biogas plants currently operating in Poland are focused on the following substrate: corn, slurry, urine, solid manure. Consequently, the research has focused on these substrates. It has also been taken into account that for technological reasons biogas plants require substrates of vegetable and animal origins. Knowing the requirements for substrates for a biogas plant with a capacity of 0.1-1 MWel (megawatt of electricity) and the number of farms producing such materials from the Agency for Restructuring and Modernisation of Agriculture (ARMA), estimated the possibilities for biogas plant development in Poland.
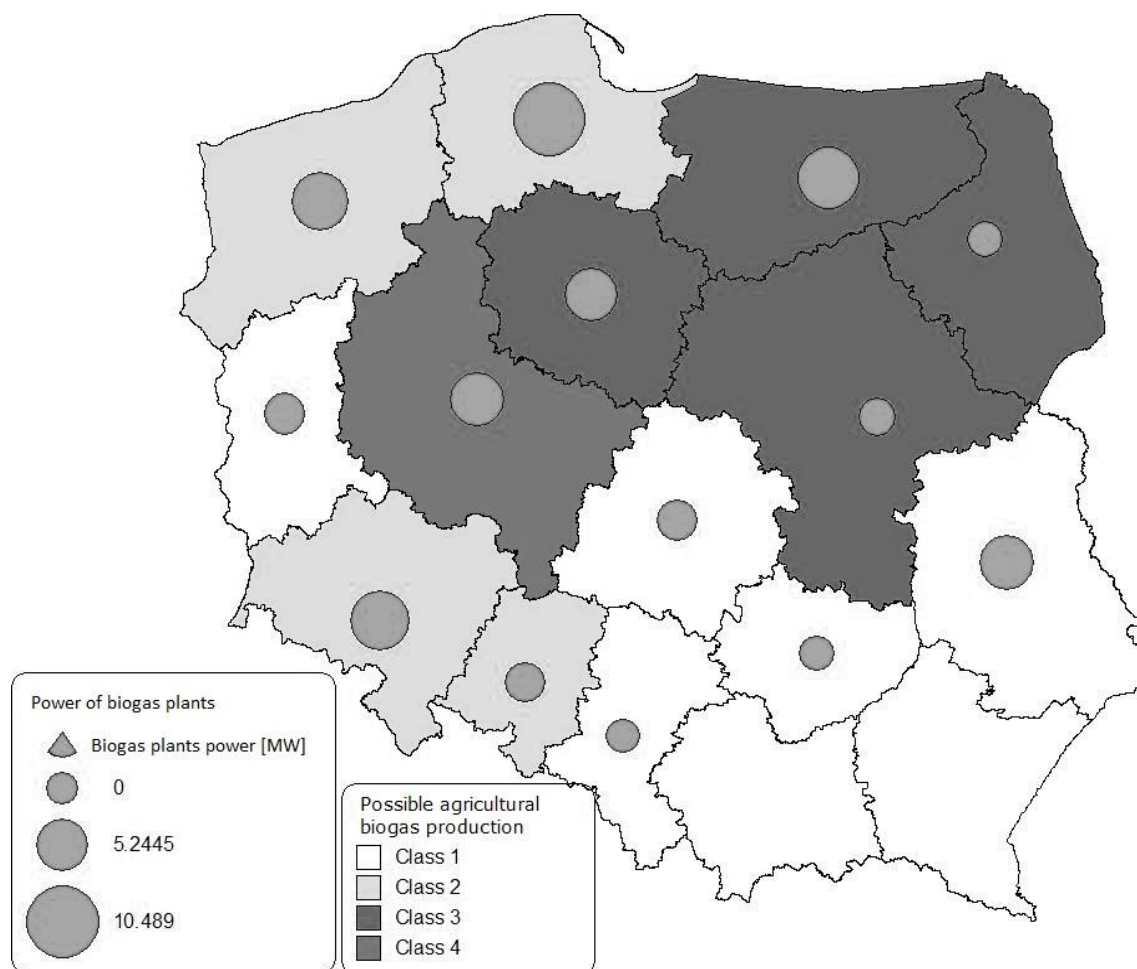
Fig. 1. **Possible agricultural biogas production in individual regions and its use**

The best opportunities for agricultural biogas production were observed in the Wielkopolskie region. There are nearly 4000 farms in whose case the scale of production would allow for the operation of at least a small agricultural biogas plant. The possibilities for the Mazowieckie, Kujawso-Pomorskie, Warmińsko-Mazurskie and Podlaskie regions are at a slightly lower, albeit also high level, whereas in the case of regions in the South-East of Poland, the capacity is at its lowest. In the document Directions for Development of Agricultural Biogas Plants in Poland in the years 2010-2020, the Ministry of Economy has drawn up a plan to build one agricultural biogas plant on average per commune. Theoretically, this should mean that almost 2000 such installations should be built in Poland. The current state is much less optimistic.

Table 1

Agricultural biogas plants in Poland in 2014

	Region	Number of biogas plants	Power [MW]	Average power [MW]
1	Dolnośląskie	6	7,123	1,19
2	Kujawsko-Pomorskie	4	7,401	1,85
3	Lubelskie	5	5,661	1,13
4	Lubuskie	3	2,391	0,80
5	Łódzkie	2	2,498	1,25
6	Małopolskie	0	0	
7	Mazowieckie	2	2,26	1,13
8	Opolskie	1	2	2,00
9	Podkarpackie	0	0	
10	Podlaskie	1	1	1,00
11	Pomorskie	9	10,489	
12	Śląskie	1	0,526	0,53
13	Świętokrzyskie	1	0,8	0,80
14	Warmińsko-Mazurskie	7	7,726	1,10
15	Wielkopolskie	7	7,482	1,07
16	Zachodniopomorskie	6	6,678	1,11
	Total	55	64,035	1,16

Source: author`s calculations based on data from Energy Regulatory Office (ERO)

Currently, 55 such facilities are operating in Poland, most of them in the Pomorskie (where the highest capacity of such installations exists), Warmińsko-Mazurskie and Wielkopolskie regions. In Poland, at a country level, large or very large installations with a capacity starting at 600 kWel and up to even 2 MWel dominate. There are practically no small facilities up to 100 kWel. This is contrary to the idea of prosumer energy.

Prosumer energy

The concept of prosumer energy appeared in Jeremy Rifkin's works along with the concept of the third industrial revolution based on the following pillars: transition to renewable energy, equipping all buildings with micro-installations generating renewable energy on-site, use of the Internet to build and manage an energy exchange network, so that excess energy can be sold to other users (Rifkin I. R., 2012). Although the overall concept is utopian at this point in time, this prosumer approach to energy production is absolutely practical. It is based on a micro-generation of power, which entails producing energy primarily for one's own use in systems based on renewable energy sources. Entities undertaking such activities are prosumers - playing the roles of both producer and consumer of energy, with sales limited to excess energy. Such a solution has many advantages, ranging from eliminating losses associated with excess energy through to mitigating the risks of power station or transmission network failures. Moreover, such prosumer energy systems generate additional jobs, especially important in the case of rural areas (Bienkowska W., 2013).

The assumptions of this model for biogas development were presented in the aforementioned government document. The creation of a so-called distributed energy infrastructure was planned, which would contribute to an increase in its safety. It would allow a significant portion of the gas, electricity and heat supply to be based on many local biogas production plants (Ministry of Economy, 2010). Unfortunately, given the previously presented data on the number and size of agricultural biogas plants in operation at the beginning of 2015, it can be said that these plans are impossible to achieve. The main causes can be attributed to two issues:

- high start-up costs. For a typical prosumer installation with an installed capacity of 40 kWel they amount to about PLN 1.5 million[*]. These are extremely high costs and only farms with the most robust income are able to meet this challenge;

- uncertainty regarding the support system for renewable energy produced in biogas plants. Late stage work on a new act on renewable energy sources is currently underway in Poland. Unfortunately for the smallest installations, one can increasingly observe a departure from the prosumer ideals to the benefit of large power generators. On 16 December 2014, the Parliamentary Extraordinary Commission working on the RES act draft rejected an amendment covering the introduction of guaranteed tariffs for the smallest producers of energy from renewable sources - microprosumers. (IEO, 2014). This results in reduced support for small energy producers, which translates directly into an increased operational risk.

Conclusions, proposals and recommendations

1. The project of developing agricultural biogas plants in rural areas based on the idea of prosumer energy is a very interesting concept. Poland, as a country with a large number of farms and regions of high agricultural biogas substrate production capabilities, is a place where this could be implemented in practice, as in Germany.

2. Currently, with 55 agricultural biogas plants operating, this potential is virtually unrealised.

3. Taking into account the theoretical premises of environmental economics and commitments undertaken in the international arena, state activities in this area are essential. The deciding factor will be the act on renewable energy sources planned for 2015.

4. Act on renewable energy sources will determine the direction for the development of renewable energy sources in Poland in the coming decades - large power plants based on co-generation or distributed power generation (prosumer-based) using more

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[*] At a rate of 4.3 PLN/EUR = 348837 euro

expensive, but environmentally friendly, technologies. It is strongly advised to give a chance to prosumer energy development.

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PROVISION OF PUBLIC GOODS BY AGRICULTURE IN POLAND

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Abstract. The concept of public goods connected with agriculture and environment gains more and more attention of societies. It is taken into consideration by the environmental, rural and agricultural policies as well. The aim of the paper is to examine the dimensions and the particular features of the provision of the public goods by agriculture and to demonstrate the involvement of the Polish agriculture in supply of such goods. The analyses showed that the concept of public goods in agriculture evolved from externality oriented approach to very board holistic approach. The provision of public goods is strongly supported as a part of the Common Agricultural Policy. The interest of the Polish farmers in provision of public goods is quite high. About 50% of famers got subsidies due to different measures connected with this activity.

Key words: public goods, agriculture, externalities, farmers, support

JEL code: H4, Q1, Q5

Introduction

Agriculture naturally linked with the nature is not longer seen only as a provider of food that is a good essential for human existence but as an important producer of many other kinds of goods which become important and desirable for modern societies. Among them, the so-called public goods deserve a special attention. The concept of public goods connected with the agriculture and environment develops gradually and influences noticeably the shape and scope of environmental, rural and agricultural policies. The significance of agricultural public goods is used to justify the support for agriculture as a sector of the economy.

The aim of the paper is to examine the dimensions and the particular features of the provision of the public goods by agriculture and to show the involvement of the Polish agriculture in supply of such goods.

In the paper the following questions were raised: (i) what is the scope of public goods connected with agriculture, (ii) what is the nature of public goods provided by agriculture, (iii) what is the scope of the provision of agricultural public goods by the Polish farmers.

The paper starts with the discussion on the origins and definitions of the public goods,

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next the characteristics of agricultural public goods is presented. It is followed by analysis of the provision of public goods by the Polish agriculture.

Materials and methods

There are several sources of materials used in the paper. The theory is based on scientific literature on public goods and other relevant problems. The empirical data for the examination of the Polish experiences were taken from the Reports of Agency of Restructuring and Modernization of Agriculture which is responsible for the distribution of subsidies under the frame of the Common Agricultural Policy (CAP) in Poland.

The study of literature and descriptive method supported by simple statistical analyses of data are the main methods used in the article.

Research results and discussion

Public goods – theoretical background

The concept of public goods originates from two well-known papers published by Samuelson in 1954 and 1955 (Samuelson, 1954, 1955). However, as Samuelson indicated, some economists who did not neglect the problem of the theory of optimal public expenditure - E. Sax, K. Wicksell, E. Lindahl, R. Musgrave, H. Bowen could be treated as precursors of the concept[*]. Samuelson distinguished two types of goods: private goods and public goods[†]. Private consumption good can be parcelled out among individuals and total consumption of particular j-good is the sum of individual consumptions[‡]. In the case of public good, each individual's consumption of such a good does not lead to subtraction from any other individual's consumption of that good so the individual consumption of any consumer equals total consumption[§]. Defined in such way, the goods are extreme polar cases. The rivalry in consumption is the criterion of division. The papers drew great attention and caused discussion among scholars. The participants undertook problems of such aspects as congestion or excludability from consumption. In result, many different classifications of goods were recommended[**]. The classification joining two criteria: rivalry in consumption and excludability became very popular. The result of the combination of these two criteria is shown in Table 1.

Public goods are those goods which simultaneously perform conditions of non-rivalry and non-excludability. In real world not many goods have such characteristics so different authors propose using different degrees of rivalry, excludability and congestion. Such solution was used by Cooper et al. (2009). In their study they distinguished three kinds of rivalry (rival,

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[*] The first three were named by R. Musgrave as Voluntary Exchange Theorists (Dougherty, 2003).
[†] The term of public goods was introduced in the second paper in the first Samuelson used the term "collective consumption goods"
[‡] $Xj = \sum_{i=1}^{s} X_j^i$ where Xj-the total consumption of j-good, X^1_j....X^s_j individual consumers of j-good
[§] $x_j = x_j^1$ and $x_j = x_j^2$ and $x_j = x_j^s$
[**] See: Davis O.A., Whinston A. B (1967), A. Randall (1983), E. Romstad (2002), Cooper T., Hart K., Baldock D. (2009)

non-rival for a small user group, non-rival), three kinds of excludability (excludable, excludable only at high costs, non-excludable) and different levels of congestion risk (small group, congestion as the number of users increases, certain degree of congestion, high risk of congestion). As a result, they got three groups of goods according to the degree of publicness: with low, medium and high degree of publicness. The last group includes two groups of public goods: pure public goods and impure public goods. In both cases, there is no rivalry in consumption but different kinds of excludability and susceptibility for congestion take places. Although, it is a very valuable characteristics, it misses commons which are characterised by no excludability[*] and rivalry in consumption.

Table 1

The classification of goods by excludability and rivalry in consumption

		Excludability	
		YES	NO
Rivalry in consumption	YES	Private goods (*bread*)	Commons *(see shore, fishes in ocean)*
	NO	Club goods *(cinema, swimming pool)*	Public goods *(national defence)*

Source: **Jakubowski, M. (2012). Dobra publiczne i dobra wspolne (Public Goods and Commons). In: Wilkin, J. (ed.).** *Teoria wyboru publicznego: glowne nurty i zastosowania (Public Choice Theory: Mainstreams and Applications).* **Wydawnictwo Naukowe SCHOLAR. Warsaw**

Public goods are considered as market failure because the market cannot resolve the problem of their optimal provision as no competitive market pricing mechanism for such goods exists. When individual consumption equals total consumption there is no incentive for each consumer to reveal his/her preferences for public goods consumption and even "it is in the selfish interest of each person to give false signals to pretend to have less interest in a given collective consumption activity than he really has" (Samuelson, 1954). The inclusion of the excludability criterion makes the problem more complex.

Agriculture as a source of public goods

The concept of agricultural public goods underlines importance of agricultural goods for human wellbeing and connections of agriculture with the environment. As Heal and Small (2002) note, agriculture is the most important of the activities through which humanity interacts with the natural world; farming's impact on the global environment is greatly disproportional to its share in the total economic activity. The list of agricultural and environmental public goods in literature is long and not fixed. This phenomenon can be connected with the approaches to multifunctional agriculture (Vanni, 2014). The supply-side approach considers agricultural public goods as by-products stemmed from the phenomenon of multiple joint outputs of a typical agricultural activity or of a combination of activities. The "non-intentional" output can be positive (public goods as positive externality) and negative (public bads as negative externality). The demand-side approach focuses on society demand

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[*] Unless eligible agents do not resolve this problem

on different goods and services, which agriculture can provide. In this concept many aspects of agricultural production, its characteristics and specific features are regarded as required, useful, valuable. The third approach (holistic) goes further pointing out that the multifunctional agriculture is a consequence of the changing needs and demands of consumers and society (Van Huylenbroeck et al., 2007).

Short review of the lists of public goods considered by different authors shows the prevalence of the last approach. In 2002, in the FAO's publication "The State of Food and Agriculture" the following environmental public goods (essential from global perspective[*]) were discussed: ecosystem stability, biodiversity, wildlife, reduction of greenhouse gas emission from forest fires, carbon sequestration, protection of water bodies, hydrological stability. Several years later, Cooper et al. (2009) examined such public goods as agricultural landscapes, water quality and water availability, soil functionality, air quality, resilience to flooding, resilience to fire, rural vitality, food security, farm animal welfare and animal health and Jürgen Fröhling (2007) included recreational value of the countryside, jobs and employment in rural areas, sufficient feed, renewable resources and bio energy. The above mentioned list of public goods shows that such goods can take a variety of forms: physical goods like renewable resources, required features of goods like air quality, services like resiliencies to fire, ethic value like animal welfare or even culture value like rural vitality. It seems that nearly every positive phenomenon in agriculture, rural development or environment can be called a "public good". Such a broad attitude results a great ambiguity. Nearly each presented public goods encompasses a collection of different goods and values of a very subjective character. Moreover, it is worth to mention that unlike the supply side approach in which negative externalities (sometimes called "public bads") are considered and discussed, the two other approaches focus on positive public goods as demanded by the society. It can lead to the undermining and neglecting the importance of "public bads" connected to agricultural production or to multiplication of expectations and requirements from farmers conducting an agricultural activity.

A search for justification of governmental or the EU intervention involving great subsidies for agriculture and rural areas is one of the main sources of such a vast range of agricultural public goods. This problem can be examined from the perspective of rent-seeking theory[†] or theory of the groups[‡].

The provision of public goods in Poland

The concept of agricultural and rural public goods has gained more and more attention in Poland within last years. The impact on the rise of such interest in that issue was given by the Poland's accession to the European Union followed by the Common Agricultural Policy. It is

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[*] The goods have regional and local dimension too
[†] G. Tullock and A. Krueger are prominent representatives of that theory.
[‡] See M. Olson The Logic of Collective Action: Public Goods and the Theory of Groups Harvard University Press. 1971

difficult to point any scientific publications on this problem till late 90's of the 20th century. Some economic scientific papers on relations between environment and agriculture were published only in 1998, 1999[*] but there were no analyses from the perspective of market failures. It does not mean that some important problems as biodiversity or water pollution by fertilisers (positive and negative externalities) were not recognised and neglected in Poland. Generally, they were examined by researchers directly connected to the particular problem but not by the agricultural economists. Certain law regulations against particularly negative externalities of agricultural production existed too. But the awareness of the problem from economic perspective was rather low.

With the accession to the EU the provision of public goods became one of required activities of agriculture and has gained the financial support. What is more, the support encompassed the decrease in production of negative externalities (public bads), as well.

In financial perspective 2004-2006, measures aimed at provision of public goods by farmers were offered in the frame of Rural Development Plan (RDP[†]) 2004-2006 and Sectoral Operational Programme (SOP) Restructuring and Modernisation of the Food Sector and Rural Development 2004-2006. Under the RDP 2004-2006 two measures were aimed to encourage farmers to provide public goods: Measure 4 "Support for Agri-environmet and Animal Welfare" and Measure 5 "Afforestation of Agricultural Land". Part of funds under the SOP was directed for decreasing negative externalities of agricultural production like solid waste (production of fuel from biomass such as hay, meadow and wood waste etc., within measure: "Diversification of agricultural activities and activities close to agriculture to provide multiple activities or alternative incomes"), waste water (measure: "Development and improvement of the infrastructure related to agriculture"), animal waste (measure: "Investment in agricultural holdings"**).**

Steady development of the concept of agricultural and environmental public goods from supply-side approach towards holistic approach was fully reflected in the next financial perspective (2007-2013) in the form of much longer list of measures connected to the problem of public goods by agriculture. Two differences between that and previous perspective were of general character. First, the number of measures related to the provision of public goods by agriculture increased noticeably. Second, the measures focused generally on provision of the public goods not only in the form of positive externalities but new services (non-tradable goods) as well while the reduction of agricultural public bads gained relatively much less attention. Two out of four axes of the RDP 2007-2013: Axis 2: Improvement of the environment and the countryside and Axis 3 Quality of life in rural areas and diversification of rural economy were explicitly connected with the environment, countryside, quality of life in rural areas and diversification of rural economy as well as with general support for the provision of vast range of positive public goods. Axis 2 encompassed four measures: **"**Support of management in mountain areas and in less-favoured areas (LFA)", "Agri-environmental programme", "Afforestation of agricultural and non-agricultural land", "Restoring forestry

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[*] The list of such publications encompasses publication of Institute of Agricultural and Food Economics: W. Michna "Program of pro ecological development of the country, agriculture and food economy till 2015. Synthesis, and A. Wos "Tools of Environment Policy in the Process of Restructuring and Modernisation of Agriculture" (Zegar, 2002)
[†] In Poland, PROW is the acronym of the name of this program.

production potential damaged by natural disasters and introducing appropriate prevention instruments". Axis 3 involved such measures like: "Diversification into non-agricultural activities", "Establishment and development of micro-enterprises", "Basic services for the economy and rural population", "Village renewal and development". Of course, not all measures in every axes could support farmers' activity, some of them were offered to rural communities or other agents in rural areas (RDP 2007-2013).

Moreover, in Axis 1, the measure "Modernisation of agricultural holdings investment" was directed to diminish public bads as it supported investments which contributed to improvement in holdings as far as environmental protection or animal welfare was concerned.

Results of the support

The result of the support can be estimated by the number of measure participants and value of the support. In some cases other indicators are available, for example, in the case of afforestation the number of hectares of afforested land.

Table 2

The number of participants and value of subsidies under measures supporting farmers' provision of positive public goods and reduction of public bads

Programme	Measure	Number of Participants	Support value (mln PLN)[3]	Remarks
		2004-2006		
RDP	Measure 4. "Support for Agri-environment and Animal Welfare" [1]	79 867	approximately 3 000.0	
	Measure 5. "Afforestation of Agricultural Land"[1]	9 006 (new applications)	385	
SOP	Priority I: measure: "Investment in agricultural holdings"	24 231	2 209	(only 4% of investment were connected to environment)
	Priority II: measure: "Diversification of agricultural activities and activities close to agriculture to provide multiple activities or alternative incomes"	4 108	279	(2 075 new places of job connected to handicrafts and craftsmanship or agro tourism
	Priority II: measure: "Development and improvement of the infrastructure related to agriculture"	3 394	146	967 sewage treatments (37% of investment were connected to wastes of water and energy)
		2007-2013		
RDP[2]	Axis 1. Measure "Modernisation of agricultural holdings investment"	60 212	8 495	only 9% applications were not for movable machines
	Axis 2. "Improvement of the environment and the countryside" Measure: "Agri-environmental programme"	126 866	4 590	
	Measure: "Afforestation of agricultural and non-agricultural land"	13 825	271	72 600 ha of new forest
	Axis III. "Quality of life in rural areas and diversification of rural economy" Measure: "Diversification into non-agricultural activities"	15 369	1 357	only 8.2% of applications were connected to handicrafts and craftsmanship or agro tourism

[1] the measure was continued in financial perspective 2007-2013. Year of 2011 was the last year in which farmers could apply for support under this measure
[2] data at the end 2013
[3] the value of agreements

Source: author's calculations based on data Annual Reports on Activity of the ARMA (2008 - 2013), ARMA 2007-2014

Data in Table 2 show that environmental measures were very popular among farmers. During two financial perspectives approximately 200 thousand of farmers participated in these measures. In financial perspective 2004-2006 the package "Soil and water protection" was the most popular (ARMA, 2008). Its share in the total support value equals 50%. The least interest was in package "Maintenance of extensive pastures". In the RDP 2007-2013, package "Organic

farming" was on the first place, whereas, "Buffer zone" on the last[*]. What is remarkable, the package "Sustainable farming" (with the share 1,5%) was rather unpopular in the RDP 2004-2006, however, in the next perspective it gained farmers' attention and its share in support exceeded 20%. It is necessary to add that in both financial perspectives measure "Support for less-favoured areas (LFA)"[†] was available. Every year, 600 – 700 thousand farms got subsidies of total value approximately EUR 300 million (ARMA, 2014).

The measure "Afforestation of agricultural and non-agricultural land" attracted nearly 23 000 participants; within this measure 76 000 ha of forest was planted (ARMA, 2014).

Other measures had only a very small contribution to provision of public goods. For example, in the SOP 2004-2006 only 4% of investments supported under the measure "Investment in agricultural holdings" were connected with environment and in the similar measure in the RDP 2007-2013 ("Modernisation of agricultural holdings investment") merely 1% of investment were used for improvement of soil quality while 91% were used for movable machines (ARMA, 2014).

The great support for provision of agricultural public goods is continued in financial perspective 2014-2020. In the RDP for that period two out of six priorities are connected strictly to environment protection. They are: "Restoring, preserving and enhancing ecosystems related to agriculture and forestry" and "Promoting resource efficiency and supporting the shift toward a low-carbon and climate-resilient economy in the agriculture, food and forestry sectors" (European Commission, 2013). The particular measures will start operating in 2015.

Conclusions

From its nature, agriculture is connected with environment and generates positive and negative effects for it. The concept of public goods in agriculture has been evolving from supply oriented approach to holistic approach. As a result, the number of "public goods" recognised is steadily growing and the list of such goods encompasses not only strict environmental goods but social, ethical cultural values and climate phenomena. The public goods as one of the market failures justify the support for agriculture. As the scope of the term has been broadening steadily, the scope and value of support has increased.

The interest of the Polish farmers in provision of public goods has been quite high mainly due to subsidies. Approximately 50% of them got subsidies. Farmers learn very quickly how to apply for the support. Some ideas like sustainable and multifunctional agriculture develop gradually and gain more and more farmers' attention. So one can conclude that low interest in particular measure in one perspective does not mean low interest in next perspective because farmers and other agents should have time to get used to new ideas or phenomena and adapt to them.

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[*] It stemmed from the scope of the package and low level of support (PROW 2007-2013, 2014)
[†] the measure is to prevent depopulation of LFA and losing their agricultural character, economic and environmental effects (Rural Development Programme for 2007-2013, 2007).

The outcomes of the support are undoubtedly positive but the question arises, if farmers adjust their behaviours only to get subsidies or if they become gradually convinced of the significance of public goods that they provide.

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ECONOMIC EFFICIENCY OF FEEDING A PROTEIN CONCENTRATE ADDITIVE TO BROILER CHICKENS

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Abstract. The EU Member States have a high deficit of domestic protein feeds, and approximately 70% of protein products are imported; thus, feed price fluctuations make the European livestock industry economically vulnerable. It is possible to use domestic agricultural by-products as a feed for agricultural animals in order to reduce the deficit of protein feeds and the cost with regard to purchasing such feeds. To tackle the problem regarding reducing the production cost of livestock products, a feeding experiment on broiler chickens was conducted using protein concentrate Baltiprot – an ethanol production by-product with high protein content – produced in Latvia.

The hypothesis is as follows: using the ethanol industry by-product – protein concentrate – in diets of poultry could increase broiler chicken productivity and reduce feed cost. In this aspect, the aim was to identify the most economically efficient amount of protein feed in the diet of broiler chickens. The research results showed that a greater slaughter weight of poultry (+6.48%), a lower production cost per kg of poultry meat (-7.11%), a higher production efficiency (386.2) and a lower feed conversion ratio (1.77) could be achieved by using the protein additive in the diet of broiler chickens.

Key words: poultry production, production efficiency

JEL code: O 13

Introduction

In Europe, meat and other livestock products comprise 45% of the total value of products produced by agriculture (Eurostat, 2013; Broring, 2010). Regardless of the significant proportion of livestock farming, the total area sown with protein crops in the European Union (EU) occupies only 3% of the total arable area, and this industry supplies only 30% of the total quantity of protein crops consumed as animal feed (Report on…, 2011). As the deficit tended to increase over the last decade, according to Eurostat, 70% of protein products, especially soya flour, were imported mainly from Brazil, Argentina and the USA. Such large imports of

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protein products make the European livestock industry vulnerable as well as cause feed price fluctuations, reducing the profitability and stability of the livestock industry.

A significant economic effect on raising the production efficiency of livestock products and the industry's stability can be ensured by consuming domestic by-products of agricultural processing (McDonald et al., 1995). The by-products of oil crops and grains produced by domestic enterprises are extensively used in animal diets. The use of these by-products, instead of imported ones, in animal diets may considerably enhance the quality of agricultural products and increase the revenues of domestic enterprises.

As it is known, the need for protein among agricultural animals and poultry is different, depending on the species, the kind of products produced, the physiological condition, etc.

Poultry, especially broiler chickens, feature an intensive growth rate and a high genetic potential of productivity (Marcu A. et al., 2013); accordingly, broiler chickens need feed with a high crude protein content (19.00-24.00%), while the cost of feed accounts for 60-75% of the total production cost for poultry enterprises in the EU and Latvia (Damme, 2010; Demircan et al., 2010; Poultry Meat and…, 2010; Onu et al., 2010; Adewunmi, 2008). So, in order to reduce the costs of feed and production, relatively cheap quality protein-rich feeds have to be used in poultry diets. In this aspect, it is required to assess the opportunity to use domestic feeds – ethanol production by-products – in poultry diets.

It is economically efficient to produce ethanol from grain, and wheat is the best choice. The main problem in the use of a by-product of the ethanol industry for poultry is its high variability of nutrient content and availability (Bregendahl, 2008). Therefore, literature says that different amounts of feed additives containing bio-ethanol industry by-products are used in broiler chicken feed. By applying innovative solutions and technologies, ethanol production waste is reprocessed in Latvia into a feed supplement registered as Baltiprot produced by EthaProt^{TM} Process technology (Bosenko et al., 2008). On average, it consists of 55-60% crude protein, 1.28% lysine, 0.52% methionine, 1.71% arginine, and 94.5% dry matter. During the production process the grain is divided into brans and milled endosperm, which contains starch and protein. The starch is converted into ethanol, through the instrumentality of ferments and food yeast Saccharomyces cerevisiae. Grain protein and yeast, that is, protein biomass is dried using a stream of CO_2 and dry concentrate containing protein is obtained – a feed additive (hereinafter referred to as the protein concentrate) (Martinez-Amezcua et al., 2007; Noll et al., 2007). The concentrate of protein feed, contrary to the mentioned one in literature, is of better quality, as it contains relatively more crude protein and amino acids.

The obtained protein concentrate may be used in agricultural animal diets; yet, few studies are available on its economic efficiency in poultry feed. The hypothesis is as follows: using the ethanol industry by-product – protein concentrate Baltiprot – in total mixed diets of poultry could increase broiler chicken productivity and reduce feed cost.

In this aspect, the aim was identify the most economically efficient amount of protein feed in the diet of broiler chickens. The following research tasks were set: 1) to identify the effect of the protein concentrate on the productivity of broiler chickens; 2) to determine the economic efficiency characteristics of broiler chicken meat production.

Materials and methods

The main objective of this experiment was to evaluate the economic effects of incorporating different amounts of protein concentrate in broiler performance trials. Commercial hybrid ROSS-308 animals were used in an intensive system on a permanent litter, with a density of 12 chicks per m^2. Broilers were randomly assigned into 4 equal groups in equal number per each sex. Broiler chickens were reared in the same housing and environmental conditions, and the composition of the basic diet was balanced according to the feeding instructions for the commercial hybrid ROSS-308 (Ross Broiler Management Manual, 2009). The growth technological system was in accordance with new European Union regulation on animal welfare compulsory from 2012 in all EU Member States (Laying down…, 2007).

In order to define the most economically viable amount of protein concentrate for use in broiler chicken feed, a feeding experiment using broiler chickens of cross ROSS 308 was performed according to the scheme shown in Table 1.

Table 1

Experimental design

Group	Protein, %	Lysine, %	Methionine, %	In basic diets, %	
				Fodder yeast	Protein concentrate
Broiler chickens aged 0-27 days					
Group 1 – control	21.0	1.23	0.45	2.5	–
Group 2 – trial	21.0	1.23	0.45	–	2.5
Group 3 – trial	21.0	1.23	0.45	–	5.0
Group 4 – trial	21.0	1.23	0.45	–	6.0
Broiler chickens aged 28-42 days					
Group 1 – control	19.0	1.0	0.37	3.0	-
Group 2 – trial	19.0	1.0	0.37	–	3.0
Group 3 – trial	19.0	1.0	0.37	–	5.0
Group 4 – trial	19.0	1.0	0.37	–	6.0

Broiler chickens of all the groups were fed with feed containing the same amounts of crude protein, lysine, methionine, Ca, P and other nutrients according to the requirements of the cross *ROSS 308* standards. Feed and water were given ad libitum.

The feed of Group 1 broiler chickens contained 2.5–3.0% fodder yeast. The feeds of Group 2, 3 and 4 broiler chickens contained different amounts of protein concentrate to be studied (2.5-3.0, 5.0 and 6.0%) instead of fodder yeast. The feeds of these groups' broiler chickens contained no fodder yeast.

The protein concentrate samples were analysed for dry matter (ISO 6496-1999), crude protein (LVS EN ISO 5983-1:2005) and amino acids (LVS EN ISO13903:2005).

The optimal amount of protein concentrate used in broiler chicken feed was evaluated in terms of productivity, live weight, carcass weight, breast muscle weight, and feed cost. Live performance, feed conversion ratio (FCR), and the production efficiency factor (PEF) were assessed at 42 days of age. Feed conversion ratio (FCR) (calculated as the amount of feed consumed divided by the live weight of birds); the production efficiency factor (PEF) was calculated by the formula:

$$\frac{\text{Liveability \%} \times \text{Live weight in kg}}{\text{Age at depletion(days)} \times \text{FCR}\left(\text{Feed conversion ratio, kg kg}^{-1}\right)} \times 100$$

(Ross Broiler Management…, 2009).

Breast muscle weight was determined using gravimetric measurements after deboning sampling 8 carcasses from each group, in equal number per each sex.

Results and discussion

Broiler chicken productivity

The efficiency of protein concentrate in the diet of broiler chickens was evaluated based on the most important productivity indicators: live weight change, daily live-weight gain and feed conversion ratio, production efficiency factor productivity index.

By feeding the broiler chickens with feed containing different protein concentrate amounts, the live-weight thereof ranged within 2840.0–2894.0 g, the average live-weight gain per day 67.6–68.9 g, the feed consumption per 1 kg live-weight 1.77–1.94 kg, the pectoral muscle mass 545.28–577.34 g and the production efficiency factor ranged within 349.20–386.20 (Table 2).

It means that 5% and 6% protein concentrate amounts in poultry feed promoted the productivity of broiler chickens, though the feed contained the same amount of nutrients. It is likely to be related to better availability of nutrients from the protein concentrate in the digestive tract of broiler chickens. The 5.0% protein concentrate in the content of broiler chicken feed (Group 3) ensured a higher PEF of poultry productivity.

The live-weight of broiler chickens accordingly increased by 3.54% (p<0.05) (Group 4), the feed conversion – positively – decreased by 4.7% (p<0.05) (Group 3) and the PEF increased by 28.5% (p<0.05) (Group 3), in comparison with the control group.

Table 2

Impacts of different protein concentrate amounts on the productivity of broiler chickens

Parameters	Groups			
	Group 1 – control	Group 2 – trial	Group 3 – trial	Group 4 – trial
Live-weight at the age of 42 days, g	2795.0±47.0	2840.0±65.4	2876.0±66.5	2894.0±58.7
% to control	-	+1.61	+2.89	+3.54
Feed conversion ratio (FCR)	1.86	1.94	1.77	1.80
% to control	-	4.1	-4.7	-3.4
Production efficiency factor (PEF)	357.70	349.2	386.2	383.50
± to control	–	-8.5	28.5	25.8
Live-weight gain per day, g	66.5	67.6	68.5	68.9
Breast muscle mass, g	536.64±21.0	545.28±34.1	557.34±19.8	558.54±22.1
Breast muscle mass, % of live-weight	19.2	19.2	19.4	19.3

When the amount of protein concentrate in feed was increased from 5.0% to 6.0%, that is by 1.0%, the live-weight of broiler chickens tended to increase ($p > 0.05$), whereas the production efficiency factor decreased. The breast muscle is the most valuable portion of the chicken carcass on the market; even small differences in breast muscle yield among broiler chickens could have significant economic impact. The breast muscle mass of broiler chickens of the experiment groups at the age of 42 days ranged within 536.64–577.34 g, which was 19.2–19.4% of their live-weight. The differences in breast muscle mass between the groups were not significant ($p > 0.05$).

Expenses and revenues in broiler production

All the expenses associated with raising broiler chickens and all the revenues gained from selling live broiler chickens were calculated to determine the most economically efficient size of protein concentrate portion in a broiler chicken feed mixture. The total variable cost included expenses on infrastructure, wages, etc., which were equal for all the groups (Table 3).

The lowest consumption of feed per 1000 broiler chickens raised was observed for Group 3, 5100.0 kg, or 1.9% less than for the control group. The cost of feed, too, to raise 1000 broiler chickens in Group 3 was lower by EUR 111.6 or 5.5% in comparison with the cost of feed for the broiler chickens of the control group.

However, the highest consumption of feed (5500 kg) and accordingly the highest cost of feed (EUR 2114.18) were registered for Group 2.

The cost of feed per 1000 broiler chickens raised was determined by the cost of 1 kg feed and the quantity of feed consumed. The price of 1 kg of feed for the control group was 0.39 EUR kg^{-1}. The cost of complete feed for the experiment groups of broiler chickens was determined by the cost of the protein concentrate incorporated in feed (2.5-6%).

The lowest cost of 1 kg of feed was achieved for Group 3 because the 5.0% protein concentrate was incorporated in the feed mixture, which was 3.65% less than for the control group.

Table 3

Economic characteristics of feeding the protein concentrate
(in raising 1000 broiler chickens on the experimental conditions)

Parameters	Groups			
	Group 1 – control	Group 2 – trial	Group 3 – trial	Group 4 – trial
Number of poultry raised	1000	1000	1000	1000
Total slaughter weight of broiler chickens, kg	1956.5	2025.8	1988.0	2083.2
± against the control group, kg	-	+69.3	+31.5	+126.7
Feed consumption for raising broiler chickens, kg	5200	5500	5100	5200
Price of 1 kg of feed, EUR	0.390	0.384	0.376	0.386
Feed cost in raising broiler chickens, EUR	2028.47	2114.18	1916.86	2006.6
Feed cost to produce 1 kg of products, EUR	1.037	1.044	0.964	0.963
Total variable cost of broiler chickens (feed costs excluded), EUR	845.67	845.67	845.67	845.67
Total cost, EUR	2874.15	2959.85	2762.53	2851.94
1 kg slaughter weight price, EUR	2	2	2	2
Revenues from selling live chickens, EUR	3913.0	4051.6	3976.0	4166.4
± against the control group, %	-	+3.54	+1.61	+6.48
Difference between revenues and expenses, EUR	1038.85	1091.75	1213.47	1314.46
± against the control group, %	-	+5.09	+16.81	+26.53

The economic efficiency of feed may be determined based on the cost of producing a unit of products. The feed was most efficiently used for Group 4, as the cost of producing 1 kg of broiler chicken meat was EUR 0.963, which was 7.11% less than for the control group.

In the aspect of production, meat quality, to a great extent, is determined by the proportion of meat in animals' live weight, as the remaining part is composed of sub-products, by-products and waste (Melece, 2004). For this reason, bioeconomic aspects refer to the effects of the entire set of these indicators on economic performance results.

In the aspect of meat production, the quality of products produced, which is mainly determined by the proportion of meat in poultry's live weight, as the rest is composed of sub-products, by-products and waste, directly affect revenues from the products produced. The largest quantity of products (2083.2 kg) and accordingly the greatest revenue from the products sold (EUR 4166.4) was provided by Group 4, which was 6.5% more than by the control group. Group 3, in contrast, provided the smallest quantity of products (1988.0 kg) and the lowest revenue from the products produced (EUR 3976.0), which might be explained by a smaller quantity of feed consumed during the experiment and a lower proportion of meat in the poultry's carcasses. Yet, it has to be emphasised that all the experimental groups of poultry provided greater amounts of products and revenues, compared with the control group.

The difference between revenues and expenses shows that the greatest profit is gained if feeding broiler chickens with the 6% protein concentrate. In contrast, the 2.5-3.0% protein concentrate fed to the broiler chickens of Group 2 did not produce a sufficiently positive result – this was indicated by the high consumption of feed, the high feed cost and the high production cost per kg of meat (EUR 1.044) reducing the profit.

Conclusions

To tackle the problem of how to reduce the production cost of broiler chicken meat, a feeding experiment on broiler chickens was conducted using feed concentrates – by-products from industrially processed agricultural products – produced in Latvia.

The feeding experiment used a feed of high protein content – high protein concentrate Baltiprot.

1. The experimental results evaluated in terms of live weight of broiler chickens showed that compared with the control group, Group 3, in which the broiler chickens' feed was supplemented with the 5% protein concentrate, presented:
   - the highest production efficiency (386.2),
   - the lowest feed conversion ratio, i.e. the necessary quantity of feed per kg live weight gain (1.77 kg);
2. An analysis of the quantities of meat produced as well as the revenues and expenses leads to a conclusion that, compared with the control group, Group 4, in which the broiler chickens' feed was supplemented with the 6% protein concentrate, presented:
   - the highest slaughter weight of poultry (+6.48%),
   - the lowest production cost per 1 kg of meat (-7.11%),
   - the highest profit (+26.53%).

3. The most economically efficient ration of protein concentrate in the diet of poultry is 6% of the total quantity of feed.

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DEVELOPMENT OF SUSTAINABLE INTENSIFICATION EVALUATION METHODOLOGY FOR FARMLANDS IN LATVIA

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Abstract. Land resources are not fully exploited for agricultural production in Latvia. According to the Rural Support Service, in 2013 approximately 400 thousands ha of agricultural land were not declared for Single Area Payment Scheme. Increases in bioresources and food production in the world have become objective needs. Exploiting these land resources provides a possibility to increase agricultural output and economic efficiency in Latvia's rural areas. Yet, agricultural growth in Latvia's rural areas may not be in contradiction with sustainable development principles. It is necessary to intensify agricultural production by increasing agricultural output and contributing to comprehensively achieving sustainability indicators. To ensure sustainable intensification of Latvia's land resources, a theoretical model for calculating sustainable intensification indicators for agricultural holdings in Latvia, which involves social, economic, environmental and innovative sustainability, is being developed.

Key words: agriculture, sustainability, indicators, intensification.

JEL code: Q12, Q18 Q56

Introduction

According to Agricultural Census data, the utilized agricultural area (UAA) occupied 40% of the EU-28 territory in 2013. In the EU, 12.2 million agricultural holdings farmed 174.1 million UAA ha. The average size of agricultural holdings was 14.2 UAA ha. The greatest UAA per agricultural holding was reported in the Czech Republic (152.4 hectares) and in the United Kingdom (90.4 hectares). In Romania, 2/3 of the total agricultural holdings had less than 2 UAA ha (Eurostat, 2013).

UAA is an essential resource in any country's national economy. Its use requires an appropriate climate, rich soils and an advantageous geographic location. Research on the use of land resources conducted by scientists plays the leading role in meeting the increasing demand for food in the world, while at the same time avoiding global climate change. The basic idea of **sustainable intensification** (SI) of agricultural production is to increase the productivity of land resources, while at the same time enhancing environmental management.

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This means that the combination of factors of production used in agricultural production will not be the same for all management systems and industries.

The origin of the term sustainable intensification dates back to 1990 when development professionals sought ways how to tackle the increasing deficit of food in developing countries (Pretty J., 1997), (Beddingtonetal J.R., 2012), (De Schutter O., 2010) and (The Future of Food…, 2011). The sustainability of agricultural production, under the conditions of intensification, has to be measured. According to some authors, the most important dimension of agricultural production is the social sustainability of agricultural holdings (David S., 1989 and Webster P., 1999). Social sustainability indicators are subjective in nature and differ among farmers and other social groups in the way they are perceived (Van Calker et al., 2007). From the perspective of farmers, the economic sustainability of agricultural holdings is the most important. In scientific research, most often, the improvement of economic indicators of agricultural production is associated with more intensive and sustainable uses of land resources (Van Cauwenbergh N., et al., 2007). Scientific researches by some authors compare the model of organic and conventional agricultural holdings in the context of sustainability (Rasul G., Thapa G.B., 2003 and Proc R., Soc B., 2014). Yet, the newest scientific researches involve in-depth examinations of all the dimensions of sustainability in order to find the solutions to the use of land resources that balance the provision of socio-economic and eco-system services (Pretty J., 2011, Foley J., 2011 and Geraldo M.B., 2012). An opinion is supported that agricultural productivity has to be increased by employing innovative solutions on the present land area without changing rural landscapes (FAO, 2010 and Jaggard K.W., 2010). Such a development scenario may be provided by simultaneously controlling all the indicators of sustainability dimensions to achieve the targets set.

An understanding of term sustainability improved since 1987 when the UN World Commission on Environment and Development (the Brundtland Commission) produced a report Our Common Future. Systems for tracing sustainable development have been designed by creating indicators of progress. Some sustainable development indicators employed are as follows: Indicators of Sustainable Development (UN, 2007); Eurostat Sustainable Development Indicators (Eurostat, 2014); OECD Environmental Indicators (OECD, 2001); Environmental Performance Index (EPI) (Environmental..., 2014); Ecological Footprint (Working Guidebook..., 2014).

Under agricultural intensification, it is important to identify sustainability at the level of farms. Farms producing agricultural products are very diverse in terms of economic size and specialisation. Based on SI indicators, it is possible to compare these different farms in terms of social, economic, environmental as well as innovation sustainability.

Latvia's Rural Development Plan 2014-2020 has set a target to exploit up to 2.1 million UAA ha for agricultural production (Rural Development…, 2014). The total land area under crops will increase by 11% in Latvia. Researches on efficient uses of land resources in Latvia have

been done (LLU, 2014), (Pilvere I., 2013) and (Lenerts A., 2013a), yet, opportunities for the SI of UAA at the level of farms have not been scientifically assessed and compared.

In the present research, the author sets an aim to develop a theoretical model for calculating sustainable intensification indicators (SIIs) for agricultural holdings in Latvia. The research object is the sustainable intensification of UAA and the research subject is a theoretical model for calculating SIIs of UAA. To achieve the aim, the following tasks were set: 1) to analyse the development of use of land resources in Latvia; 2) to define the indicators of SI of UAA; 3) to develop a theoretical model for calculating SIIs.

To execute the research tasks, analysis, synthesis, the logical and constructive methods, induction and deduction were employed. The study design process used special and general literatures, methodological materials on land use etc.

The research results are useful for national institutions, for example, the Ministry of Agriculture and the Ministry of Environmental Protection and Regional Development in order to provide a long-term and sustainable land use in Latvia.

Research results and discussion

For a situation analysis and a selection of indicators, data of the Farm Accountancy Data Network (FADN) and the information of Latvia's Central Statistical Bureau (CSB) and National Inventory Report (NIR, 2014) were employed. Researches by scientists of Latvia University of Agriculture were used for identifying the potential of UAA.

1. Development of use of land resources in Latvia

Since the accession to the EU in 2004, agricultural production has grown in Latvia. With a growth rate of 5.6%, agriculture is the second fastest growing sector in Latvia (Agriculture in Latvia, 2014). Bioresources of agricultural origin are also used for biofuel (Lenerts A., 2013a) and biogas production (Lenerts A., 2012). Increases in output and economic activity in Latvia have to be ensured without increasing greenhouse gas (GHG) emissions from agriculture (European Parliament…, 2009).

Agriculture faced a decrease in output in the 1990's. Until 2000, the GHG emissions from agriculture declined 67%.
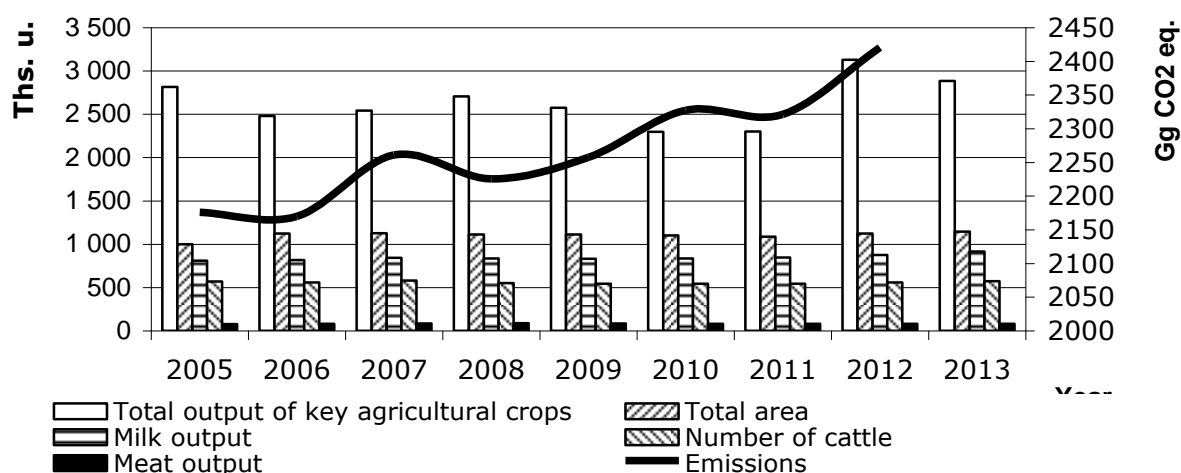
Fig.1. Changes in the main GHG emissions caused by agriculture

Yet, since 2000, with agricultural production growing, a gradual and stable increase in GHG emissions has been observed in Latvia (Fig.1, +15% from 2005 to 2013). Latvia's agricultural sector contributes to about 22% of the country's total GHG emissions (NIR, 2014).

Compared with the average EU indicators, agricultural production is still extensive and inefficient in Latvia. It is indicated by agricultural value added and GHG emissions. In the period 2005-2012, the use of fertilisers increased 52%, reaching 65.2 thousands a year, while an increase in productivity varied within a range of 20-30% (Agriculture in Latvia, 2014).

The conception of SI of agricultural production became topical in the beginning of the 21st century, responding to food security challenges in the world. Two clear trends emerged in rural areas: 1) a decrease in the agricultural area; 2) a decrease in the available agricultural area per capita (Koning N., 2009) and (Cassman K.G., 2010). In the period 2005-2012, according to the FAO Statistics Division, the agricultural area decreased by 5470 ths ha in the world, accounting for 0.2% of the total land area.

In Latvia, free agricultural land resources may be engaged in agricultural production by accepting the SI model. It will contribute to an increase in agricultural output, reducing effects on the environment. An indirect stimulus for assessing the sustainability of Latvia's agricultural production is the initiated negotiations on joining the Organisation for Economic Co-operation and Development. Achieving the sustainability indicators of agricultural production is an essential criterion for joining this organisation.

2. Indicators of SI of UAA

Agricultural sustainability is regarded as the key precondition for long-term agricultural production profitability in rural areas. To fully assess and comprehend the sustainability of a rural enterprise, indicators that are widely used and contain information on environmental quality, economic viability, employment, social environment and innovation have to be selected. The indicators may be used individually or as a component of a complex index. The primary aim of the present research is to select SI indicators that make significant effects on

the social, economic, environmental and innovative sustainability of Latvia's farms. These indicators may be acquired from FADN, RSS and CSB databases compiling information on the performance of rural enterprises. The calculation methodology is explained in the next chapter of the paper.

The most characteristic indicator of SI is chosen for each dimension of sustainability based on a methodology developed by S.Bell and S.Morsi in their work „Sustainability Indicators: Measuring the Immeasurable?" (Bell S. and Morse S., 1999). Indicators are used in the EU to achieve the targets set, as ..."*indicators provide the basis for assessing progress towards the long-term objective of sustainable development. Long-term targets only have meanings as policy goals if progress towards them can be assessed objectively*" (European Commission, 2001). So, sustainability indicators are needed to assess the implementation of sustainability measures under the EU CAP.

Economic Indicators. The economic sustainability of farms in Latvia is strongly associated with economic processes in global markets. Product prices and demand make significant effects on these indicators. Five indicators, which indicate the productivity, profitability and viability of farms, were selected in the present research. Ensuring the economic sustainability of farms is not always possible by meeting environmental and sustainability requirements. The source of indicator data is the FADN, and the data are summarised in Table 1.

Table 1

Economic sustainability indicators of agricultural holdings

Indicator	Measure	Unit
Productivity of labour	Income per unpaid labour unit	EUR/labour unit
Productivity of land	Gross output per hectare	EUR/hectare
Profitability	Market based gross margin per hectare	EUR/hectare
Viability of investment	Farm is economically viable	1=viable, 0= not viable
Market orientation	Output derived from the market	%

Source: author's construction

Environmental indicators. Scientific experience about the effects of farms on the environment has become more profound. The leading EU Member States in agricultural production have introduced a precise data collection system to determine the effects on the environment. Latvia will have to introduce a similar data collection system for the purpose of calculating environmental SIIs. The indicators of environmental sustainability are selected taking into account the following: air quality/climate change; risk to water quality; habitat and biodiversity.

Table 2

Environmental sustainability indicators of agricultural holdings

Indicator	Measure	Unit
GHG emissions per farm	IPCC estimate/ farm	Tonnes CO2 equivalent/farm
GHG emissions per kg of output	IPCC estimate/ kg of output	Kg CO2 equivalent/kg output
Nitrogen (N) balance	Risk to water quality	Kg N surplus/hectare
Nitrogen (N) use efficiency	Nitrogen use efficiency /product	Kg N surplus/unit product
Emissions from fuel and electricity	CO2 equivalent/kg output	Kg CO2 equivalent/kg

Source: author's construction

GHG emissions are the primary cause of global warming. One of the most pressing challenges for Latvian agriculture will be to produce more food while reducing the GHG emissions. Agriculture was Latvia's second largest emission source by sector, accounting for 22% of the total GHG emissions in 2013 (NIR, 2014). Two greenhouse gas emission indicators are developed. Both indicators are calculated using IPCC coefficients and conventions. One is expressed on a per farm basis while the other is expressed per unit of product.

Social indicators. Agriculture provides the viability of rural environment and develops territorial infrastructures. It is usually the only economic activity in rural areas.

Table 3

Social sustainability indicators of agricultural holdings

Indicator	Measure	Unit
Household vulnerability	Farm business is not viable - no off-farm employment	Binary, 1= Yes, 0= No
Education level	Educational attainment	Count variable 1 - 51
Isolation risk	Farmer lives alone	Binary, 1= Yes, 0= No
High age profile	Farmer is over 60 years of age and no household member is less than 45	Binary, 1= Yes, 0= No
Work life balance	Work load of farmer	Hours worked on the farm

Source: author's construction

When defining social SIIs, life quality indicators have to be considered depending on the kind of chosen occupation. Farm revenues are not regarded as an indicator of social sustainability because it is more important to assess the overall wellbeing and life quality of rural communities in accordance with sustainability principles.

Innovation Indicators. The market of agricultural goods and the market of resources used in production are constantly changeable. Innovation enables farms to remain competitive by introducing innovations and producing more products with fewer resources. Innovation is a broad term, as it means "new to the firm, new to the market or new to the world" (OECD and Eurostat, 2005). Innovation is regarded as: a new process; a new product; new forms of management; and new supply sources used.

Table 4

Innovation sustainability indicators of agricultural holdings

Dairy	Cattle	Sheep	Tillage
Milk recording	Quality assurance member	Quality assurance member	Forward selling
Discussion group member	Reseeding	Reseeding	ICT usage
Spring slurry spreading	Soil testing	Soil testing	Soil testing

Source: author's construction

At the level of farms, there are a lot of innovations referring to the process of innovation: new production techniques; higher resource use efficiency; new cooperation models etc. More efficient uses of resources (land, livestock, fertilisers, labour and technologies) will lead to reductions in production costs. Accordingly, the introduction of new technologies and participation in advanced training courses are used as innovation sustainability indicators.

Regularly collecting such data allows assessing the efficiency of innovations and technologies in the future. Employing SIIs enables assessing innovations at the level of farms, thus identifying their economic efficiency and environmental protection effectiveness in achieving the overall sustainability of farms.

3. Theoretical model for calculating sustainable intensification indicators

The present research aims to assess the sustainability of a particular industry numerically. The most precise way of assessing it involves calculating a synthetic SII for various factor groups. It is important that it is possible to identify changes in a process in time, and it is desirable to shape a notion of the period when negative effects have been minimal. At the same time, the indicators have to be instruments assisting in simplifying the obtaining and analyses of information and in identifying problems well as in formulating and making a government policy aimed at solving the problems.

Pair-wise analysis was employed to identify the significance of effects of the factors affecting the sustainability of an industry. An analysis involved a matrix in which the factors affecting the sustainability of an industry were put horizontally and vertically. The number of a factor that is superior over another is written in an appropriate cell in the horizontal row. The final cell of the row shows the number of advantages of the given factor. The total number of advantages for all the factors is calculated summing up the values in the vertical column. This sum is assumed to be equal to 1. The proportion of each factor's number of advantages

indicates the given factor's relative weight of effects in a range from 0 to 1. So, each factor's significance of effects is assessed. The SI model takes into consideration a factor's numerical value by multiplying it by the coefficient of significance.

Further, the indicators are normalised, the key purpose of which is to avoid a situation when one or several factors may prevail, as the range of factor values may be very diverse. The normalised indicators are derived from the initial indicators that are expressed in different units of measurement. In the result of normalisation, the initial units of measurement disappear and, consequently, different indicators become comparable. After analysing the most popular data normalisation methods, the author has chosen min-max normalisation [from 0 to 1] in calculating the SIIs, which is performed if values are only positive and, in the result of normalisation, they will be within a range from 0 to 1. The normalisation is performed according to Formula 1:

$$a_i^{'} = \frac{a_i - a_{\min}}{a_{\max} - a_{\min}} \text{, (1)}$$

where: $a_i^{'}$ - normalised value of a factor;

a_i - actual value of a factor;

$a_{\min}$ and $a_{\max}$ - minimum and maximum values of a factor.

The next stage involves the composition of a SII function. The sustainability model developed by the author for Agricultural Industries III involves four groups of factors affecting sustainability and is expressed with Formula 2:

$$IINI = (\alpha_1 F_E + \alpha_2 F_S + \alpha_3 F_V + \alpha_4 `F_{IN}) \to 1 \text{, (2)}$$

where: SII – sustainable intensification index of an industry;

$\alpha_1 ... \alpha_7$ - relative weights of factors;

F_E - economic sustainability index;

F_S - social sustainability index;

F_V - environmental sustainability index;

F_{IN} - innovation sustainability index.

In Formula 2, the agricultural industry's SI tends towards 1, as a min-max normalisation was performed, which means that a maximum value the SII can reach is 1. Each factor group indicator F_n is computed taking into account the indicators of the given factor groups, applying the above mentioned min-max normalisation. To hold the index value within a range from 0 to 1, an arithmetic mean of the indicators of certain factor groups is computed (Formula 3).

$$F_n = \frac{1}{N}\left(\frac{f_1 - f_{\min_1}}{f_{\max_1} - f_{\min_1}} + \frac{f_2 - f_{\min_2}}{f_{\max_2} - f_{\min_2}} + ... + \frac{f_n - f_{\min_n}}{f_{\max_n} - f_{\min_n}} \right) \text{, (3)}$$

where: F_n - index of the group of factors affecting the agricultural industry's SI;

$f_1...f_n$ - actual values of factor indicators;

f_{min}, f_{max} - minimum and maximum values of factor indicators;

N – number of factor indicators.

Conclusions

1. The UAA in the EU and Latvia is a significant resource and occupies 40% of the total territory.

2. In Latvia, 1815.9 thousands ha of agricultural land is exploited in agricultural production, and 400 thousands UAA ha are additionally available.

3. The agricultural sector contributes to 22% of Latvia's total GHG emissions, with an increase of 15% from the base year, which will surge owing to an increase in the UAA.

4. Employing adequate indicators of agricultural holdings, it is possible to compute SIIs in order to identify sustainability in agricultural production in Latvia.

Acknowledgement

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TENDENCY OF CHANGES IN EXPENDITURES FOR ENVIRONMENTAL PROTECTION IN THE EUROPEAN UNION

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Abstract. The problem of protection of the natural environment has been underlined more and more frequently by the academic world and by politicians alike. The EU legislation is increasingly focused on environment-friendly activity. The private and the public sphere are equally obligated to protect the natural environment. Expenditures of the European Union for environmental protection are increased every year, which is associated with the development of numerous environment-friendly investment projects.

Keywords: environmental protection, agro-environmental measures, funding

JEL code: ESRD 057

Introduction

Environmental protection is becoming an increasingly important issue for its citizens, one of the key areas of activity of the state[†]. The global climate change is a new dimension of the environmental protection policy. For the first time, this problem has been mentioned in the international debate in the mid-1980s, and it became visible even more clearly in the last decade[‡]. The issue of environmental protection exerts impact on every sphere of social and economic life. Both economic operators and natural persons are obligated to comply with legal provisions on protection of the natural environment. The scale of this activity is illustrated by the level of expenditures designated for environmental protection, which is growing.

Expenditures for environmental protection constitute the total of the investment capital and the running expenses for activities aimed at environmental protection[§]. Running expenses are expenditures associated with prevention, limiting, eliminating or managing pollution and other environmental losses due to day-to-day activity of business entities. These are internal costs (including costs of operation and maintenance of environmental protection

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installations and environmental charges), costs of services rendered by external entities, payments for sewage treatment and collection of waste, costs of control systems, monitoring, lab tests, management. Investment projects and running expenses for environmental protection depending on the ownership sector include[*]:

- the public sector;
- the sector of enterprises;
- manufacturers specializing in environmental protection, for whom the main field of operation are environmental protection services, first of all, collection and treatment of sewage;
- the sector of households.

The mode of financing of activity in the field of environmental protection is subject to evolution processes. There are several sources of funds for environment-friendly investment projects. New foundations, banks and investment funds that provide support for environment-friendly activity keep emerging. The share of the private sector is increasing, including the internal funds of enterprises. It should be kept in mind that enterprises – through the obligatory payments and fines charged   – are the main source of funds for environmental protection and water management, which makes this share even more significant[†].

One of the main tasks of the European Union is protecting for the natural environment. There are many instruments that contribute to this goal, funds for this purpose being of the greatest significance. The most important tool that supports the environmental policy of the European Union is the LIFE programme, established in 1992. It is increasingly focused on programmes aimed at protection of the natural environment. The LIFE funds are used to support strategies aimed at dealing with such issues as decreasing biodiversity, loss of habitats, effective use of resources and responses to climate changes.[‡] An important role in the environmental policy of the European Union is also played by the Common Agricultural Policy.

1. The objective and method of research

The aim of this study was to present changes in expenditures designated for environmental protection in the European Union in the years 2003-2012. The number on expenditures of the governmental sector and the local government sector for environmental protection was analyzed. These expenditures included all activities aimed directly at preventing, reducing and eliminating pollution or any other environmental degradation. Graphics were used to present changes in the expenditures of the public sector for

* Broniewicz E., 2011, Environmental… , p. 22
† Fura B., 2010. Nakłady inwestycyjne w ochronie srodowiska a realizacja zalozen rozwoju zrownowazonego, Zeszyty Naukowe Uniwersytetu Rzeszowskiego, Nierownosci społeczne a wzrost gospodarczy. Spojnosc społeczno-ekonomiczna a modernizacja gospodarki, Zeszyt 17, p. 309
‡ The EU explained: Environment, European Commission, Directorate-General for Communication, Publications, 2013, http://europa.eu/pol/pdf/flipbook/en/environment_en.pdf [access date: 10.01.2015] p. 7

environmental protection. It should be underlined that the numeric values presented in the charts are estimates, published by Eurostat – the statistical portal of the European Union.

It should also be noted that the criteria, applied in Eurostat, distinguish nine areas of environmental protection, in which investment projects were implemented. These include: air and climate protection, sewage management, waste management, protection and rehabilitation of the soil, groundwater and surface waters, noise and vibration reduction, protection of biodiversity and the landscape; protection against radiation, other tasks in the field of environmental protection and research and development[*].

2. The environment-friendly policy under the Common Agricultural Policy of the European Union

A significant role in emergence of global threats to the natural environment is said to be played by developing countries and states of the Central and Eastern Europe. In general, the poor condition of the natural environment is associated with the rather poor socioeconomic status of these countries[†]. Environmental protection is thus a set of ideas, means and activities aimed at retaining of the condition of the natural environment that going to warrant optimum living conditions for humans and continuity of the key processes in the biosphere as the basis for human production and consumption. Environmental protection is the activity aimed at more comprehensive meet of needs of the human beings. It is not an antithesis to economic business activity but a factor that regulates the scope and direction of this activity in the best interest of the human race. Activities, which are aimed at environmental protection, should not exert negative impact on other spheres of human activity. First of all, they should not cause an additional financial burden in countries characterized by a low level of economic development.

The sector, which uses most natural resources in all of the Member States of the European Union, is agriculture. Agricultural activity exerts strong impact on the environment in the EU – both positive and negative. Due to the fact that the Common Agricultural Policy (CAP), and, in particular, the institution of agricultural-environmental programmes, are the main driving force behind the agricultural sector, it makes an excellent tool for environmental management in the rural areas[‡]. Acceding to the European Union, Poland had to accept the mechanisms of the Common Agricultural Policy, including the instruments of the agricultural-environmental policy. It should be underlined that the scope of tasks associated with environmental protection was broadened substantially after Poland's succession to the European Union. The numerous commitments, included in the accession treaty, obligate the entrepreneurs to implement the environmental standards of the European Union[§]. It should be stated that the principle confirm that the costs of prevention and of measures to deal

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[*] Eurostat, http://ec.europa.eu/eurostat/cache/metadata/en/env_ac_exp1r2_esms.htm, [access date: 31.12.2014]
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with pollution should be borne by the polluter removal is of the greatest fiscal significance in the environmental protection policy of member states of the European Union.[*]

As a result of the reform of the Common Agricultural Policy (CAP) of 1992, the Member States were obligated to introduce the agricultural and environmental programmes. The reform of 2003 maintained the compulsory nature of agricultural and environmental programmes for the Member States. Two types of these programmes are implemented: zone-based (limited strictly to specific areas and associated mainly with protection of biodiversity) and horizontal, which may be implemented across the entire country. Each Member States develops their own agricultural and environmental programme, which should specify problems and define objectives precisely[†].

Environment-friendly activity in Poland in the years 2004-2006 was implemented within the framework of the Programme for Development of the Rural Areas and the Sector Operational Programme "Restructuring and Modernization of the Food Sector and Development of the Rural Areas." Allocation for environmental purposes amounted to about ¼ of all funds designated for these programmes. In September 2005, a reform of the Common Agricultural Policy was adopted for the years 2007 – 2013, focused on the policy of development of the rural areas. The mode of financing of this policy was very much simplified[‡]. The European Agricultural Guidance and Guarantee Fund, which had been the source of financing of the agricultural policy of the European Union until the year 2006, was divided into two separate funds: the European Agricultural Fund for Rural Development and the European Agricultural Guarantee Fund, for expenditures associated with the market and direct payments[§]. Total expenditures for environmental protection in the year 2007 cost the European economy about EUR 220 billion[**].In Poland in the new financing period, the Rural Development Programme for the years 2007 – 2013 was implemented. The total amount of expenditures provided for the "new" programme is approximately EUR 17.2 billion, including about 34% allocated for environmental purposes. Most environment-friendly activities are a continuation of the tasks supported in the previous financing period[††].

The most recent reform of the Common Agricultural Policy still points to a tendency to support and finance projects in the field of environmental protection[‡‡]. It is also aimed at redistribution of payments from countries, in which the payments are currently higher, on behalf of those countries, which receive less support. The general assumption of the CAP reform of 2014 is to maintain the constant level of expenditures, and thus, to achieve a certain

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[*] Zeber-Dzikowska I., Buchcic E., 2004, Modelowe tendencje rozwojowe w wdrazaniu zagadnien z ochrony srodowiska i regionalizmu w dobie Unii Europejskiej [in:] M. Strzyz (ed.), Perspektywy rozwoju regionu w swietle badan krajobrazowych Problemy Ekologii Krajobrazu PAEK, Kielce, p. 245

[†] Brodzinska K., 2008, Program rolno-srodowiskowy i jego zakres realizacji w aspekcie rozwoju rolnictwa i ochrony srodowiska, Zeszyty Naukowe SGGW Problemy Rolnictwa Swiatowego, Volume 4 (19), p. 83-84

[‡] Broniewicz E, 2011, Environmental Protection Expenditure in European Union, Environmental Management in Practice, InTech, Chapters published July 05, p. 22

[§] Oleszko-Kurzyna B., 2008, Rozwoj zrownowazony rolnictwa wobec wymogow Unii Europejskiej w zakresie ochrony srodowiska, Zeszyty Naukowe SGGW Problemy Rolnictwa Swiatowego, Volume 4 (19), p. 330-331

[**] Broniewicz E., 2011, Environmental… p. 22

[††] Oleszko-Kurzyna B., 2008, Rozwoj … p. 335

[‡‡] Vapa Tankosic J., Stojsavljevic M., 2014, EU Common Agricultural Policy and pre-accession assistance measures for rural development, Economics of Agriculture 1/2014, p. 202

level of savings. Therefore, the expenditures for the years 2014-2020 have been planned to reach the level of EUR 423 billion[*].

Expenditures for environmental protection constitute the total of the investment capital and the running expenses for activities aimed at environmental protection[†]. Running expenses are expenditures associated with prevention, limiting, eliminating or managing pollution and other environmental losses due to day-to-day activity of business entities. These are internal costs (including costs of operation and maintenance of environmental protection installations and environmental charges), costs of services rendered by external entities, payments for sewage treatment and collection of waste, costs of control systems, monitoring, lab tests, management. Investment projects and running expenses for environmental protection depending on the ownership sector include[‡]:

- the public sector;
- the sector of enterprises;
- manufacturers specializing in environmental protection, for whom the main field of operation are environmental protection services, first of all, collection and treatment of sewage;
- the sector of households.

The mode of financing of activity in the field of environmental protection is subject to evolution processes. There are several sources of funds for environment-friendly investment projects. New foundations, banks and investment funds that provide support for environment-friendly activity keep emerging. The share of the private sector is increasing, including the internal funds of enterprises. It should be kept in mind that enterprises – through the obligatory payments and fines charged   – are the main source of funds for environmental protection and water management, which makes this share even more significant[§].

Analysis of expenditures for environmental protection is of strategic significance as it allows for assessment of the environmental protection policy, which has already been established. A low level of expenditures does not necessarily mean that a given country is not able to protect the natural environment effectively[**].

3. Expenditures for environmental protection in the EU-28

The funds used for environmental protection are of increasing significance in the European Union. Although most obligations with regard to environmental protection are imposed upon entities, which take direct advantage of the natural resources (the enterprises)

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[*] Vapa Tankosic J., Stojsavljevic M., 2014, EU Common Agricultural Policy and pre-accession assistance measures for rural development, Economics of Agriculture 1/2014, p. 203
[†] Environmental expenditure statistics 2007 edition General Government and Specialised Producers data collection handbook, http://ec.europa.eu/eurostat/documents/1798247/6191545/2-KS-RA-07-012-EN.pdf/bbeaa287-1b04-4f54-adb2-ddbd04409b8c [access date: 30.12.2014], p. 63
[‡] Broniewicz E., 2011, Environmental… , p. 22
[§] Fura B., 2010. Nakłady inwestycyjne w ochronie srodowiska a realizacja założeń rozwoju zrownowazonego, Zeszyty Naukowe Uniwersytetu Rzeszowskiego, Nierownosci społeczne a wzrost gospodarczy. Spojnosc społeczno-ekonomiczna a modernizacja gospodarki, Zeszyt 17, p. 309
[**] Broniewicz E., 2011, Environmental…, p. 35

in accordance with the polluter pays principle, it should be noted that such costs are borne by the state as well. The countries of the European Union (the public sector) bear the costs associated with protection of the natural resources. Since the very beginning of its existence until the present, many amendments have been made to the environmental policy of the European Union. These changes have been aimed at preservation of the natural environment and they have progressed, serving as a basis for the present community policy, which puts particular emphasis on environmental protection, treating it as a priority.

Figure 1.

Total expenditures for environmental protection in the public sector – EU 28
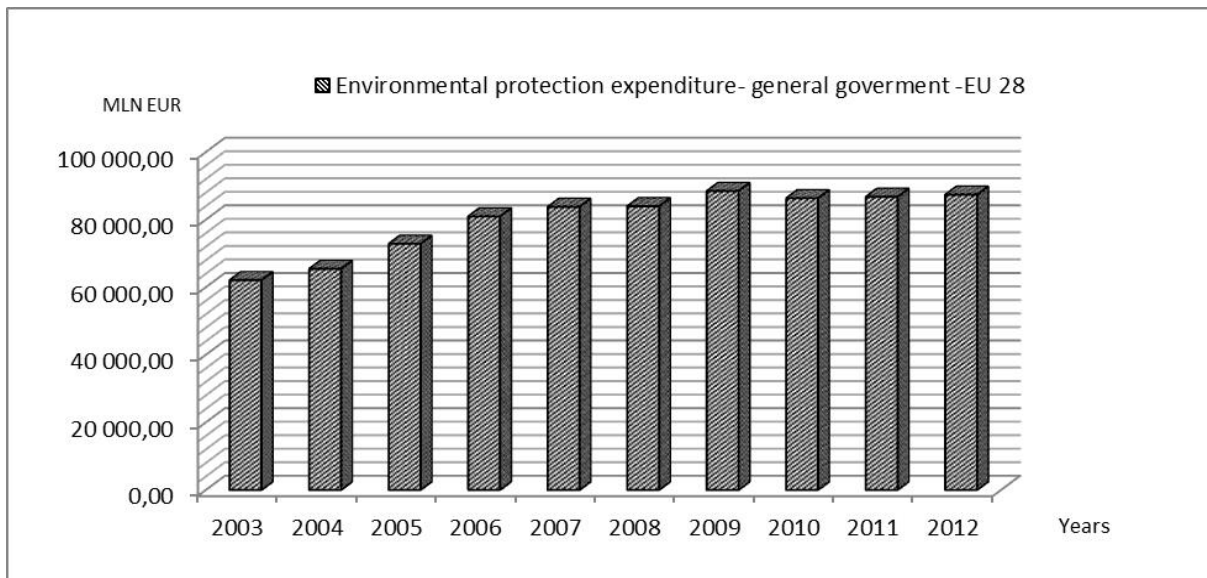
Source: own studies on the basis of Eurostat

Figure 1 presents the value of total expenditures for environmental protection in the European Union in the period 2003-2012. It should be underlined that in the years 2003-2006, there was an increase in the state expenditures for environmental protection from EUR 60 billion to approximately EUR 80 billion. These expenditures remained rather stable in the period of 2007-2012 at the level of more than EUR 85 billion annually. Worth noting are also the substantial differences in the level of these expenditures in individual countries. The highest average level of expenditures in the analyzed period was recorded in Great Britain, and the lowest - in Malta[*].

Governmental expenditures associated with environmental protection in the European Union have been presented in Figure 2 in the format of EUR 1 per person (*per capita*). In the years 2003-2012, the amount ranged between EUR 126-177 per capita. In this period, the highest average level of expenditures was recorded by Luxembourg – EUR 583.00 *per-capita*. The lowest amount per capita was recorded in Bulgaria – it was equivalent to EUR 21.58[†].

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[*] The average value for the UK amounted to EUR 15531.14 million, and for Malta - EUR 85.24 million. The database of Eurostat also contains data for countries, which achieve a result lower than Malta – these included Serbia, Estonia, Cyprus and Croatia – they were not quoted in the work due to lack of the value of expenditures for environmental protection for all years in the period between 2003 and 2012.

[†]Average values lower than the result of Bulgaria were recorded in Estonia, Croatia and Serbia; however, due to lack of data for all years in the period between 2003 and 2012, average amounts were not taken into account.

Figure 2.

**Total environmental protection expenditures in the public sector (EU-28) per capita**
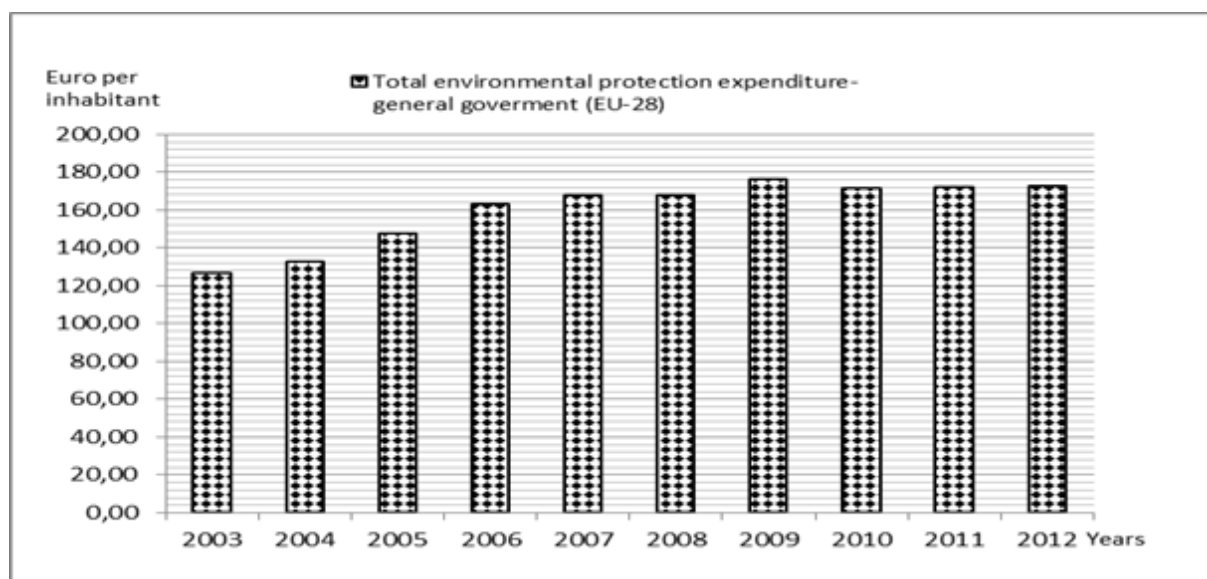
Source: own elaboration on the basis of Eurostat

Despite the growing interest in environmental protection in the European Union and the increasing emphasis of the community policy on environmental issues, it should be noted that the governmental expenditures for these purposes have remained rather low. This fact is illustrated by the share of this group of expenditures in the Gross Domestic Product (GDP) (Figure 3).

Figure 3.

Share of the public sector expenditures for environmental protection in the Gross Domestic Product (GDP) – EU-28.
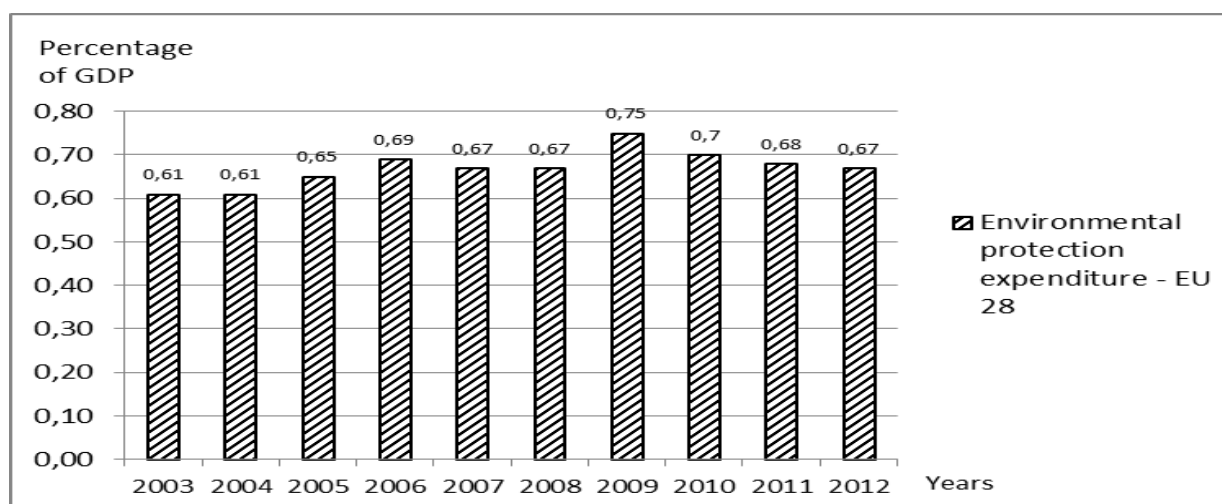
Source: own studies on the basis of Eurostat

In the years 2003-2012 , these expenditures constituted about 0.60 – 0.70% of GDP in the EU-28. Only the year 2009 was characterized by a substantial increase in these values;

however, in the subsequent years, expenditures for environmental protection were kept at the level of about 0.70% of GDP of the EU-28.

Conclusions

The growing concern for preservation of the natural environment results in increased expenditures for environmental protection. Activity in this regard is increasingly visible in the world. It is no longer associated only with fashionable slogans. At present, these activities are more and more often regulated by legislation. A particular case in this regard is the European Union, which imposes increasingly strict restrictions upon its Member States with regard to environmental issues, which is due to the priorities associated with the functioning of the Community that change over time.

Environmental protection depends on financial expenditures. Most charges associated with use of natural resources are imposed upon entrepreneurs directly responsible for such use. In the analyzed period between 2003 and 2012, expenditures of the European Union member states (EU-28) for environmental purposes did not exceed 1% of the Gross Domestic Product. These expenditures per capita ranged from EUR 120 to 170.

It should be noted, however, that the aggregated values of expenditures for environmental protection across the entire European Union do not reflect differences between individual countries. Information published by Eurostat indicate that such countries as Belgium, Germany, the Netherlands – that is, the so-called highly developed countries – designate higher amounts for environmental protection in comparison with less developed and developing countries, such as Malta, Croatia, Romania, Poland or Bulgaria. It can thus be stated that countries characterized by a higher level of economic development attach greater importance to environmental issues.

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INVESTMENT PLANNING IN THE CONTEXT OF VOLATILE BUSINESS CYCLES

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Abstract. The research "Investment planning in the context of volatile business cycles" describes stock market activity – related efficient decision making and portfolio structure optimisation methods, innovatively integrated into a single analytical framework, capable of providing applicable solutions for the topical economic challenges and capital flow generation issues. The newly developed forecasting and decision-making model, based on classic and time – proven methodologies, was created in order to simultaneously preserve and thrive on the existing expertise and acquired knowledge, while enhancing the existing paradigm capabilities with the main goal of creating a scientifically justified, risk – wise and reasonably easy to use equity management method, thus ensuring the appropriate financing of coherent and consistent economic development, based on sustainable long – term growth. The efficiency of the model had been quantitatively verified in terms of both empirical and applicable employability and the acquired results of the conducted experimental implementation were compared with the previously gained data form applying classic singular analytical approaches in the broader context of the proposed research hypothesis verification. The main research question had been provided with a scientifically rational answer, while solving the problem of making a choice over the preferred strategy of stock market behaviour, adapting to the existing investment environment and portfolio structure analysis and evaluation.

Keywords: technical analysis, fundamental analysis, stock analysis, decision-making models, forecasting models, investment portfolio.

JEL code: G11, G17.

Introduction

Investing has always been a risky business, but obtaining from investing may cause an even greater negative effect of financial asset liquidity and debt solvency, thus market actors seek alternative methods of investment management in order to insure their capital and financial reserve consistent, continuous and consequent growth. Stock markets provide significant earning and finance allocation opportunity, which is the main reason for considering

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the relevant activities an attractive concept of capital placing, despite the high risks involved and being caused by unpredicted stock quote fluctuations and high price volatility. In order to avoid the above mentioned risk of investment environment rapid changeability, investors use various methods of analysis, forecasting and strategic decision-making, the most common being fundamental and technical analysis.

Fundamental analysis provides an opportunity to analyse and forecast security price dynamics caused by objective reasons, such as conditions of the macroeconomic environment, sectors of the national economy or the intrinsic value of stock. The founders of the fundamental analysis are David Dodd and Benjamin Graham, who were first to describe principles of that methodology in their research called "Stock Analysis" in early 1934. But this method is still popular among the investors who prefer it to other forecasting and analysis methods.

Technical analysis – contrariwise, provides an opportunity to analyse and forecast security price dynamics caused by subjective, sometimes even logically inexplicable, reasons, such as mood and expectations of the market participants. The founder of Technical analysis was Charles Dow, who was first to describe the method of forecasting stock price fluctuations by using historical data and its graphical interpretation. Charles Dow described his method in the "Wall Street" journal in the beginning of the 18th century. Even though this method turns out to be even older, it still remains a topical issue and becomes more and more popular nowadays (CEAE, 2012). It is used by such successful traders as Larry Williams (Williams, 2012).

The research goal of the current study was to determine which of the described above methods turns out to be more precise and to find the way to combine them into one forecasting and decision-making model in order to get better (more precise) results.

1. Used research methods and analytical techniques

As it was previously mentioned, the current research is focused on the forecasting, analysis and decision-making models used in modern stock market. It means that it was necessary to collect information about the main methods of security evaluation and analysis, ways of constructing forecasting and decision-making models for investment projects and portfolio structure. It was planned to try already existing classical methods in order to compare the outputs with the results of the new offered model.

During the research the new stock quote forecasting combined stochastic model was created and tested on the example of selected stocks in order to determine the synergetic effect, caused by the merge of different instruments into one that is being an essence of the developed model. It has been chosen as the most effective and efficient variation of the offered model, in order to achieve better and more precise results in stock analysis, its future price forecasting, linked with the investment process decision-making and optimization of the investment portfolio. Taking into account the specifics of the conducted research, the following methods were acknowledged being the most relevant for sustainable and transparent result

acquisition: monographic method, primary data analysis, secondary data analysis, graphical analysis; mathematical analysis, econometric modelling, regression analysis and the case study method.

2. Summary of the existing theoretical basis and review of the conducted research

The main focus area of the current research is that combination method of both forecasting and analytical methodologies outperforms their parallel usage. The purpose of the treatise is the experimental research of relevant forecasting techniques related to both fundamental and technical analysis in order to work out the more optimal analysis and forecasting algorithm and to create a stock quote forecasting combined stochastic model, achieving a positive synergetic effect by simultaneous usage of the both approaches, quite different in their nature.

The creation of such a methodology will lead to the minimization of the risk that turns out to be more and more significant nowadays (Cumov, 2005) of the forecasting error, easement of the decision-making process, minimization of the role of subjectivity in a decision-making process, more versatile analysis, more precise forecast, more effective investment portfolio structure and maximization of income. A lot of various researches of the stock market mechanisms and its forecasting instruments have been held, but since already 1934 experts argue about which of the two forecasting and analysis methodologies is better: fundamental or technical analysis.

Fundamental analysis is used to examine and evaluate the situation on the stock market through the prism of political decisions, economic processes, financial and credit policy, to analyse such events and processes as capital flows, production and trade dynamics, level of inflation. Fundamental analysis school was funded by the Americans David Dodd and Benjamin Graham in the scientific research "Securities Analysis", which was published in the 1934.

The second method is technical analysis, which is based on graphical techniques and its mathematical interpretation methods. The first person who discovered the method of forecasting of stock price future volatility based on historical price dynamics and fluctuations was Charles Dow – describing this idea in the "Wall Street" magazine already in the 1790s.

Many researches, dedicated to the possibilities of parallel use of fundamental and technical analysis instruments in a single decision-making model, were conducted and are being considered quite efficient and applicably effective, for example, Tony Coopers' research "Optimal Rotational Strategies, using Combined Technical and Fundamental Analysis" (Cooper, 2011). Despite all known and discovered methods of forecasting and decision-making in the stock market, economists, investors, traders and other experts continue searching some new, more advanced techniques and methodologies.

The research "Investment planning in the context of volatile business cycles" provides solutions for making the stock quote dynamics analysis, forecasting and linked with it decision-making process much easier and precise and offers the ways of optimization of the process of calculation of investment portfolio structure as well. The described research provides an

absolutely new way of forecasting and decision-making, by creating a generalizing complex-weighted forecasting model that aids the application of a unified forecasting and decision making system.

The efficiency of the model was applicably verified with the use of experimental modelling approach and the results of the new model were compared with previous ones, using classical models, in order to check the hypothesis. The research subject is classical analysis and widely used decision-making models. During the research, new stock quote forecasting model was created and tested on the example of selected stocks "Johnson & Johnson" USA (JNJ), "Grindex" Latvian (GRD) and "Hoffmann La Roche" Swiss (ROC) enterprise stock price and other financial ratio fluctuation statistics in a period of 10 years) in order to determine the synergetic effect, caused by the merge of different instruments into one, that is being an essence of the developed model.

Consequentially, the most effective and efficient variation of the offered model das been chosen in order to achieve better and more precise results in stock analysis, its future price forecasting, linked with the investment process decision-making and optimization of the investment portfolio.

3. Analytical summary of the conducted research's results

After studying the theoretical aspects of creation of forecasting, decision-making and investment portfolios structures determining models, described in the theoretical part instruments and methodologies were implemented in practice. The two following types of analysis (fundamental and technical) had been used to analyse the available data, while providing alternative price forecasts.

During the performance of the fundamental analysis the following steps had been made (Forex Educational Portal, 2012): investment spheres' and environments' evaluation (PwC, 2013), (PwC: Russia, 2013); analysis of enterprise activity and ratios (BeInTrend, 2012), (EF, 2012); correlation analysis of macroeconomic factors and stock quote dynamics (WB, 2012), (Latvian Central Statistical Bureau, 2012); regression analysis of macroeconomic factors and stock quote dynamics (Freinats, 2008); single factor forecasting models' implementation.

During conduction of the technical analysis the following steps had been made (Investment Portal: Technical Analysis, 2013): implementation of the instruments of technical analysis: analysis of the classical graphical shapes; analysis of the moving average dynamics and performance of complex trading rules based on moving averages over longer horizons than those usually considered (Isakov, Marti, 2011); analysis of the Bollinger Bounds (Naiman, 2009); analysis of the CCI oscillator (Kann, 2005), (Investment Portal „Bull&Bear", 2012) was used in order to analyse less volatile markets, because it is known that technical trading rules are most (least) profitable during the period with the highest (lowest) volatility levels (Kazyra, Lento, 2011); fractal analysis: Hurst coefficient and its interpretation (CTWM, 2012).

After the analysis of the selected stocks and their respected dynamics the structure of the investment portfolio was determined, using various quantitatively – econometrical methods, such as the implementation of the Harry Markowitz model (Markowitz, 1952), which the acquired results being as follows: it has been offered to buy (so called "Bull" strategy) USA enterprise "Johnson & Johnson" stocks that weight in the portfolio would be 63%; it has been offered to buy (so called "Bull" strategy) Swiss enterprise „Hoffmann La Roche" stocks that weight in the portfolio would be 29%; it has been offered to sell (so called "Bear" strategy) Latvian enterprise „Grindex" stocks weight in the portfolio would be 8%.

All the forecasts were made for a yearlong period (12.2011 – 12.2012) and each of instruments provided its own forecast.

The real (actual) prices in the twelfth month of 2012 were retrieved, analysed and found to be accurately reflected in the following manner: "Johnson & Johnson" (JNJ) stock price was USD 70.10 (Yahoo, 2012), (NASDAQ, 2012), (Johnson&Jonhson, 2013); „Grindex" (GRD) stock price was USD 6.55; (Grindeks, 2013), (NASDAQ.OMX Baltics, 2012); „Hoffmann La Roche" (ROC) stock price was USD 186.90. (Swiss Stock Exchange, 2012), (Hoffmann-La-Roche, 2013). The cumulative results of the analysed company price forecasting, using various analytical approaches, are summarised in Table 1.

Table 1

Stock Future Value Forecasts

Stocks	Forecast [USD]		
	JNJ	GRD	ROC
Fundamental analysis instruments			
Trend determination by using correlative macroeconomic ratio methodology	74.45	6.59	169.30
Single factor regression forecasting model	67.11	6.55	173.79
Technical analysis instruments			
Analysis of the classical graphical shapes	74.88	7.30	179.19
Analysis of the moving average dynamics	72.56	6.31	179.19
Analysis of the Bollinger Bounds	72.56	6.31	168.78
Fractal analysis: Hurst coefficient	75.15	7.90	194.64

Source: author's construction based on official statistical data (Johnson$Jonhson, 2013), (Grindeks, 2013), (Hoffmann-La-Roche, 2013), (NASDAQ.OMX Baltics, 2012), (Swiss Stock Exchange, 2012)

The next step after finishing the analytical part was the creation of the generalizing table, which contributed to the evaluation of the preciseness of the forecasts by comparing dispersion – forecasted price deviation from the actual one.

4. The layout and the result of the conducted empirical modelling experiment

The main research goal of the current research was the creation of unified forecasting and decision-making combined stochastic model in order to achieve the positive synergetic effect,

which would provide an opportunity of making more precise forecasts, calculating more optimal investment portfolio structure and facilitating the decision-making process by minimizing the influence of the subjective judgments thereby levelling the risk.

The draft of the models' graphical interpretation can be seen in Figure 1, where P stands for "Price" and R is "Forecasting instrument rang". The left part of the model combines different forecasting instruments of the fundamental analysis but the right side - different forecasting instruments of the technical analysis.

$$\bar{P}_M = 0{,}5 \cdot \left[\sum \left(P_{F_n} \cdot \frac{R_{F_i}}{\sum\limits_i^n R_{F_n}} \right) + \sum \left(P_{T_n} \cdot \frac{R_{T_i}}{\sum\limits_i^n R_{T_n}} \right) \right]$$
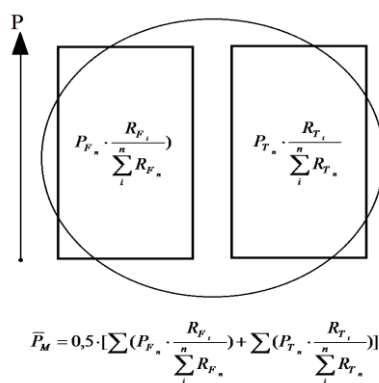
Fig. 1. **The Empirically – functional framework of the developed model**

The model in general enables the calculation of single forecasted value, which is being more precise than the result of the classical model because of the positive synergetic effect caused by the specific calculated combination of different methodologies. All the formulas are simultaneously reflected in Figure1.

In order to create the mentioned above model, it was crucial to fulfil all of the below listed steps: ranging of the used forecasting instruments within each of the analysis groups; calculation of scales; creation of the forecasting model and its different variations; model implementation - forecasting; defining the models' optimal variant; calculation of the investment portfolios' structure; comparison and interpretation of the results; defining   the applicably – effective and generated result – efficient methodology; developing a conclusive summary.

As it was mentioned previously, the first step was to rank all used forecasting and analysis instruments from 1 to n (n being number of instruments and maximal rank). The most precise instrument was ranked with the highest rank n, and the less precise with the lowest rank 1. The results are as following.

Within the group of fundamental analysis instruments rank 1 was assigned to correlation analysis of macroeconomic factors and stock quote dynamics (average forecasting error 5%) and rang 2 - regression analysis of macroeconomic factors and stock quote dynamics (average forecasting error 4%).

Within the group of technical analysis instruments maximal rang 4 was assigned to analysis of the moving average dynamics (average forecasting error 6%); rang 3 - analysis of the

classical graphical shapes (average forecasting error 7%); rang 2 - analysis of the Bollinger Bounds (average forecasting error 11% with minimal deviation) and minimal rang 1 - fractal analysis: Hurst coefficient and its interpretation (average forecasting error 11% with high deviation).

It means that both analysis and forecasting techniques will be equally represented in a model but fundamental analysis may be represented, using two instruments (correlation analysis of macroeconomic factors and stock quote dynamics with weights 33% and regression analysis of macroeconomic factors and stock quote dynamics with weights 67%) and technical – with four instruments (analysis of the moving average dynamics with weights 40%, analysis of the classical graphical shapes 30%, analysis of the Bollinger Bounds 20% and fractal analysis: Hurst coefficient and its interpretation 10%).

However, in order to minimize an average forecasting error among the instruments used in the model it was qualitatively proved that exist more effective complex-weighted forecasting models' variation incorporated the above mentioned instruments within a single sliding – weight framework or a broader econometrical calculation system of simultaneous indicator analysis and generalizing current experimental modelling results may be summarised in the following manner:

• complex-weighted forecasting model consists of two equal parts. Each element's weight is 50%, i.e. final forecast will be calculated by using the average method;

• the first part of the model represents fundamental analysis as a technique which allows predicting the future prices by analysing quotation fluctuations caused by objective factors (for example changes in economic or political environment) and the second part of the model represents technical analysis as a technique which allows predicting the future prices by analysing quotation fluctuations caused by subjective factors (for example traders' expectations, mood, etc.);

• the first part includes two fundamental analysis forecasting instruments: correlation analysis of macroeconomic factors and stock quote dynamics with weights 33% and regression analysis of macroeconomic factors and stock quote dynamics with weights 67% and the second part includes two technical analysis forecasting instruments: analysis of the moving average dynamics with weights 55% and analysis of the classical graphical shapes 45%;

• nevertheless both fundamental and technical analysis are considered as equal, technical analysis results turned out to be less precise, that is why the difference of weights is more "smoothed".

After getting the forecasted values for each stock, the structure of the investment portfolio was determined by using special calculating table.

Mentioned investment portfolio structures' determination instrument can be considered more precise than classical ones, because it is based on the results of all previous analysis and forecasting activities. Consequentially, it is worth mentioning that: "Johnson & Johnson" USA enterprise forecasted future price is USD 71.46; "Hoffmann La Roche" Swiss enterprise

forecasted future price is USD 172.59; "Grindex" Latvian enterprise forecasted future price is USD 6.71.

While comparing the acquired results, it can be verified that the newly developed methodology had created a more efficient analytical system, which provided a more favourable outcome of USD 96 570.33 total profit against the USD 10 445.99, generated by the classically used singularized, mutually non – compliant methods, thus creating a scientifically rationalized model of simultaneous precise forecasting and risk evasion investment portfolio structuring.

Conclusions and proposals

Summarizing the structural layout of the conducted research, the acquired results and their applicable feasibility, the following **conclusions** can be made:

1. The research hypothesis had been positively verified via conduction of the described research. The results of the carried out experimental modelling turned out to be positive, thus confirming the research hypothesis and in addition demonstrating the logics of regional diversification presumption, even despite the fact that the basic objective of the outlined research was not the creation of an ideal investment portfolio;

2. The conducted analysis confirmed the adequacy of the forecasted growth of the selected stock quotes (period: end of 2011 – end of 2012).

3. The conducted research had determinedly confirmed the general noting that the Markowitz model is much more suitable for the existing situation than for example mentioned Sharp's or Tobin's models, due to the fact that Markowitz model can be used for composing structuring of an investment portfolio consisting of regionally different enterprise stocks (JNJ – USA, GRD – Latvia and ROC - Swiss).

4. It had been proven that parallel use of various analytical methods in practice turns out to be less efficient and precise than it's combining technique.

5. The developed methodology in a functioning analytical algorithm that enables a more precise forecasting instrument implementation, consequentially enhancing applicability of the relevant decision-making process.

6. The use of both the complex-weighted forecasting model and the investment portfolio calculation instrument, based on the developed model's empirical derivative enables the possibility of making a more lucrative decision.

7. The newly created model and its deriving working algorithm were implemented in a practical experiment and proven the newly created methodology's efficiency, thus raising the maximum earning potential of the initially available financial basis, while simultaneously meeting the crucial requirements of risk minimization and profit maximization.

Summarizing the conducted research, the acquired qualitative and quantitative analytical results, the following **proposals** can be made:

1. It is offered to use the new complex-weighted stochastic forecasting model as well as investment portfolio structures' calculation table and offered working step-by-step algorithm.
2. It is offered to use in a model following components: fundamental and technical analysis techniques.
3. Fundamental analysis techniques, enabling the prediction the future prices by analysing quotation fluctuations caused by objective factors will be presented in the developed model with 33% and 67% weights.
4. Technical analysis enabling the prediction the future prices by analysing quotation fluctuations caused by objective factors will be presented in the developed model with 45% and 55% weights.
5. After the implementation of the developed investment portfolio structure determining instrument, it had proven optimal to propose the following financial resource allocation structure: 47% "Johnson & Johnson" USA enterprise stocks, 5% "Grindex" Latvian enterprise stocks and 48% "Hoffmann La Roche" Swiss enterprise stocks.

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DEVELOPMENT OF SYSTEM OF STATE REVENUE SERVICE PERFORMANCE INDICATORS

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Abstract. In the public sector, performance-oriented reforms have become topical over the last twenty years. The performance management documents such as Business Plan, Annual Report, Service Delivery Standards and Surveys of Taxpayers as a good practice have been adopted and are used in almost all of the countries considered; there are slight variations as to which of these documents are publicly available. State Revenue Service (SRS) is no exception. Latvian laws and regulations related to the development of performance include appropriate well-known practices adopted in the world that ensure quality of the content of adequate effectiveness measurement, however mentioned measurement indicators mainly used for state budget planning purposes not for performance management. This study aims to investigate the performance measurement system of the SRS as a tool to achieve the institution's strategic goals. In the paper possibility if introduction of integrated outcome-output indicator's matrix is proposed to ensure process management system and performance management system integration. The research object is SRS performance measurement system. The research is mainly based on the literature analysis, monographic descriptive method as well as the methods of analysis and synthesis and content analysis.

Keywords: performance, public administration, performance indicators, process management.

JEL code: H110

Introduction

In the public sector, performance-oriented reforms have become topical over the last twenty years. The public sector has a limited opportunity to use efficient and targeted performance evaluation elements characteristic of the private sector; therefore most developed countries have gradually developed and implemented the system of performance indicators characteristic only of the public sector for the evaluation of administration activities. As Raj (2012) points out in his study the advent of the 21st century has altered the landscape of the government structure and culture wherein the focus is on quicker delivery of the goods and

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services on the one hand and also become accountable and responsible for the omissions and commissions towards the people on the other (Raj, A. S., 2012).

Countries that have adopted a new public management approach determine its efficiency by the compliance of state administration activities with the needs of society. National governments, following the New Public Management (NPM) guidelines, introduced private principles and instruments in the public field to improve the efficiency, effectiveness and financial stability of state enterprise (Calogero, M.,2010). The way the performance management systems are used affects organisational activities; in turn, the impact of these activities depends on contractibility. Contractibility implies a clear understanding of the objective, the ability to choose real performance indicators and the manager's ability to manage and control performance transformation processes. Authors concur to Speklea, R.F., Verbeetenb, F., H., M., 2014 pointed that the way in which these systems are being used affects organizational performance, and that these performance effects depend on contractibility.

Strengthening the performance approach to public service agencies has proved its merits, so that in future it is of importance for public authorities to further develop the performance measurement and other activities to improve the organisation's performance. The economic crisis provides some insights on the role of measurement systems. As shown by the ongoing discussion of credit rating agencies by political actors and in the news media, measurement is not a neutral device but an active agent in societal processes (Van Dooren, W., De Caluwe, C., Lonti, Z., 2012). Therefore, special attention should be devoted directly to the strategic choices behind the selection and implementation of performance measurement practices in public sector entities (Jaaskelainen, A., Laihonen, H., 2014).

Despite the fact that the performance management practices in public administration have established some traditions, where countries try to take over the most appropriate expertise from one another, public administration institutions often experience the situation when they have to justify their performance as well as the use of financial resources to the society. It is important for the society to know whether the use of financial resources in the public sector is justified, as one of the factors that hinders business development and reduces the competitiveness of enterprises is the existing administrative burden (Pilvere, I., Nipers, A., Upite, I., Bulderberga, Z., Popluga, D., Dobele, A., Dobele, L., 2012).

This study aims to investigate the performance measurement system of the State Revenue Service (SRS) as a tool to achieve the institution's strategic goals. The main task is to evaluate the possibility of integrating the process management systems to improve the quality of performance indicators. The research object is SRS performance measurement system. The research is mainly based on the monographic descriptive method as well as the methods of analysis and synthesis.

1. PERFORMANCE MEASUREMENT STRATEGIC GOAL

At present, in the tax and customs administrations of many countries, there is a tendency to improve both financial planning performance and performance implementation management. Although financial planning performance and performance implementation management are considered to be distinct concepts, in practice many national governments have tried to introduce a results-based approach in both management and financial planning contexts, in which organisations are given some flexibility in the way, in which performance improvements are achieved. Performance measurement in the public administration has two main functions: to measure financial planning performance and to evaluate performance in order to modernise management techniques in an organisation. However, there are countries, where the organisations representing the public sector have to comply not only with uniform laws and regulations that govern the scope of performance but also should establish their performance management system in such a way to be able to perform the whole system target mandated.

Table 1

Revenue bodies' mandated business performance targets

Country	Business performance targets mandated for 2012 (and beyond)					
	Budgeted revenue	Tax debt reduction	Tax gap reduction	Improvement in taxpayer satisfaction	Compliance with burden reduction	Operating costs/staff reduction
Austria	√	X	X	X	X	X
Denmark	√	√	√	√	√	√
Estonia	√	X	X	X	X	X
Greece	√	√	√	√	√	√
Hungary	√	X	X	√	X	√
Ireland	√	√	X	X	√	√
The Netherlands	√	√	X	X	√	√
Portugal	√	X	X	√	X	√
Slovak Republic	√	X	X	X	X	X
Spain	√	√	√	√	√	√
Latvia	√	X	X	√	X	X
Romania	√	√	X	√	√	√

Source: OECD, 2013

The authors have considered revenue bodies' mandated business performance targets of the EU Member States, such as Austria, Denmark, Estonia, Greece, Hungary, Ireland, the Netherlands, Portugal, the Slovak Republic, Spain, Romania and Latvia, which are the OECD (Organisation for Economic Co-operation and Development) countries or candidate countries of the OECD, and which have integrated their tax and customs administrations into one organisation (Table 1). The degree of integration of tax and customs administrations can vary considerably in various countries, for example, in Latvia tax and customs basic processes are separated from each other, while in Estonia tax and customs basic processes are fully integrated. Moreover, according to the model topology of customs authorities, by combining

the tax and customs administrations there are differences in the degree of their autonomy, for example, a Revenue Department – the structural unit that performs tax and customs functions at the national level as a single entity in the relevant ministry, usually the Ministry of Finance, and a Revenue Service – a partially independent organisation, where tax and customs administrations are integrated at the national level, the structure of which could be similar to a Revenue Department; however, it is partially independent of the ministry to which it is subordinated.

In Latvia, it is often emphasised that the merging of tax and customs administrations happened based on Denmark's experience; however, analysing the performance of the State Revenue Service it can be concluded that the main incentive for the creation of SRS has been the improvement of efficiency – budgeted revenue, improvement in taxpayer satisfaction and compliance with the law in contrast to Denmark, where a productivity incentive was set as a priority (Pētersone, M., Ketners, K., 2013).

2. SRS PERFORMANCE INDICATORS

In view of the new performance management trends in tax and customs administrations, other countries' best practices are gradually being taken over. The performance management documents such as Business Plan, Annual Report, Service Delivery Standards and Surveys of Taxpayers as a good practice have been adopted and are used in almost all of the countries considered; there are slight variations as to which of these documents are publicly available.

Latvian laws and regulations related to the development of performance (Cabinet of Ministers, 2009a) include appropriate well-known practices adopted in the world that ensure quality of the content of adequate effectiveness measurement. Since Latvia is one of those countries, where the public administration has to comply with uniform laws and regulations governing the scope of performance, the mutual policy cycle of outcomes and their performance indicators is regulated, which also envisages the classification of performance indicators (Cabinet of Ministers, 2009b):

1. input indicators (indicators of resources) **-** reflect the amount of investment and resources required to achieve the objective or outcome;

   – indicators of resources – characterise the planned amount of financial resources of direct administration institution, the administrative capacity, infrastructure required to perform the functions of direct administration institution and ensure its operation;

   – direct performance indicators – reflect the institution's internal activities that are oriented to internal customers;

2. benefit indicators:

- policy outcome indicators – priority monitoring indicators – changes in the society (in the relevant policy) that are affected by a number of performance outcomes achieved and partly by external factors;

- performance indicators – task / event monitoring indicators – the end product – the achievement level is fully dependent on the policy implementer;

3. macro-impact performance indicators – basic indicators for development assessment – changes in the society that is affected by a number of policy outcomes and external environmental factors;

4. analytical indicators reflect the relationship between inputs and outputs or the compliance of intended benefits with the outcome or objective achieved:

- economic performance indicators (efficiency) – the degree at which a system or its component reaches the desired outcome (performs its functions) compared to consumption of resources;

  ✓ economic indicators characterise performers' economy and the ability to efficiently use the available resources. Economic indicators are only applicable to the investment;

  ✓ productivity indicators characterise the intensity of operation and the ability to use time efficiently;

- functional performance indicators (effectiveness) – describe the extent to which the resources invested and the performance outcomes obtained have ensured the achievement of intended policy outcomes;

- quality indicators – characterise the compliance of services and products provided to the society and public administration institutions with quality requirements and standards set as well as reflect the satisfaction level of needs and desires of the society and public administration institutions (The Guidelines on Outcomes and Performance System for the Period of 2008–2013).

Traditionally, system performance management process takes place at three levels – strategic, tactical, and operational. For example, in the Russian Customs Service the performance system is divided into three levels – federal, regional and local customs authorities (Gubin, A., 2011) each outcome level has its own strategic goals, objectives and performance indicators. The SRS has a single-tier organisational structure, where each performance indicator level performs only the functions assigned to its level. At present, the performance indicators of SRS operation strategic management levels operate as a separate assessment tool without direct interaction with the performance indicators of other SRS structural unit levels; namely, there is no clear subordination, traceability and interaction of strategic level performance indicators, tactical level performance indicators (structural unit (process) framework) and operational

level performance indicators (particular sphere of operation, persons (employees, service users) and groups of persons involved) with the achievement of the SRS strategic goals and objectives.

The system of strategic management level performance indicators or political outcomes (according to the Cabinet of Ministers, 2009a) have been identified relatively recently (for the first time available in the State Revenue Service Operations Strategy for the period of 2014–2016). Therefore, it is difficult to assess whether the defined performance indicators fully reflect the achievement of the SRS goals.

The tactical management level or performance outcomes (according to the Cabinet of Ministers, 2009a) are characterised by the fact that there is a strict subordination of operational results and performance indicators to strategic goals and objectives but there is neither strict traceability with strategic level performance indicators nor subordination to the performance indicators of operational management level.

At the operational management level for the purpose of performance outcome aggregation, the SRS has recently developed the SRS performance aggregation matrix, which compiles information on the SRS structural unit performance outcomes, which cannot be regarded as performance indicators for measuring the implementation of the strategy. The SRS performance aggregation matrix serves as a tool that exists in parallel to the calculation of performance indicators and summarises the SRS structural unit operations results but there is no clear link with other level performance indicators (Figure 1).

Operational level			
Fiscal performance indicators	Decision-making indicators	Control process indicators	Customs and tax customer service indicators

Fig. 1. **The SRS performance aggregation matrix**

In the SRS performance matrix, the operations objective, process and the responsible structural unit are specified for each indicator. However, to accurately characterise the SRS performance outcomes, the aggregation matrix should include a performance indicator determined for each process operation.

3. INTEGRATED OUTCOME AGGREGATION MATRIX

Evaluating internal laws and regulations of the SRS performance management process, it should be concluded that, although there is formally a sequential relationship among the SRS operations strategy (the medium-term planning document), the SRS action plan (the short-term planning document) and the SRS structural unit action plans, specific tasks for structural units are not identified but exactly the execution of the tasks would affect the achievement of all the strategy objectives in the short and medium terms. Within the framework of the SRS structural units, there is no operation planning that focuses on the activities identified in the

SRS annual operation plan to achieve strategic goals. The authors believe that within the framework of performance planning, it would also be useful to draw up a plan for each employee, setting up individual tasks, the fulfilment of which would affect the achievement of strategy's goals. Setting of such annual tasks for employees would be related to annual performance evaluation (Petersone, M., 2013a).

To make all performance planning documents interrelated, it is necessary to know the origin of each performance indicator at all three levels; however, at present the procedure for the calculation of a particular performance indicator is not developed and described in the SRS operations strategy as well as the data sources are not listed. In the SRS basic structural units, a variety of tools are used for the calculation of performance indicators. For example, the SRS responsible Tax Administration Unit obtains data from the SRS data warehouse system, tax information system (TIS) and other databases. Performance indicators are obtained through standard data filtering; however, there are certain indicators that require manual accounting and calculation. The responsible employee of the Planning and Coordination Department of Customs Modernisation Unit of Customs Administration summarises the data sent by the SRS structural units and performs repetitive manual data entry using MS Excel tables with built-in formulas for the calculation of indicators. Performance indicators are not analysed in detail with the aim to understand their sphere of influence and make adjustments to the operation of structural units.

The SRS has ensured the quality of content of performance measurement, by linking it to the process management system creating the SRS outcome matrix (On the State Revenue Service's Performance Outcome), where each indicator is linked to one process and process activities. In the SRS performance aggregation matrix, 1,028 performance indicators are identified. The SRS performance aggregation matrix is based on a process management system (Petersone, M., 2013b), where the process and the responsible department are specified for each performance indicator, so the matrix serves only as an overview of obtained indicator group performance.

In an attempt to improve the financial planning performance and performance management process, the authors propose complementing the existing SRS performance matrix with analytical performance indicators as well as positioning a more appropriate level of management to each performance outcome (Figure 2).

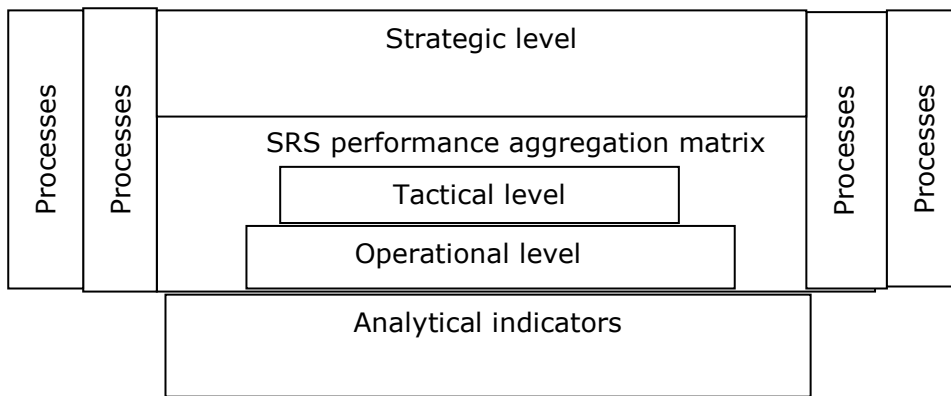| Processes	Processes	Strategic level		Processes	Processes
		SRS performance aggregation matrix			
		Tactical level			
		Operational level			
		Analytical indicators			

Fig. 2. **The SRS integrated outcome aggregation matrix**

In the SRS performance aggregation matrix the performance indicators of tactical and operational management levels are integrate, provided matrix is stipulating the compliance of indicators with each management level and their potential impact on the strategic level. The traceability and interrelation of performance outcomes at all levels would help manage the SRS performance process. Thus by interconnecting performance indicators at all levels, it is possible to establish the subordination of certain indicators and to relate them to the achievement of strategic goals. At present, the group of analytical indicators of performance measurement system by its functions is rather focused on disclosing organisation's performance to the society. The authors believe that introducing analytical indicators to the performance aggregation matrix, the latter could be used more successfully for the purpose of performance management.

The integrated outcome aggregation matrix based on the process management system through the same operating principle affects other organisations in human resource management areas (Petersone, M., Ketners, K., Krastins, A., 2013), such as talent management (Petersone, M., Ketners, K., Krastins, A., 2014) or risk management (Petersone, M., 2014), which implies a considerable opportunity to influence the achievement of strategic goals and objectives. The regulatory documents of strategic management and the hierarchy of performance indicators, respectively, are of importance.

Conclusions and recommendations

1. Performance management system implementation in the public administration institutions has proved its merits in the world. Improving the performance management system in the public administration, it is expected to enhance the employees' understanding of their role in the achievement of institution's strategic goals; thus, it will be possible to continuously monitor and control the strategic development.
2. In the tax and customs administrations of many countries, there is a tendency to improve both financial planning performance and performance implementation management.

3. The performance indicators of SRS operation strategic management levels operate as a separate assessment tool without direct interaction with the performance indicators of other SRS structural unit levels; namely, there is no clear subordination, traceability and interaction of strategic level performance indicators, tactical level performance indicators and operational level performance indicators with the achievement of the SRS strategic goals and objectives.

4. Performance measurement is one of the decisive stages of the performance management process. Improving the performance measurement system, it is necessary:

  - to clearly define a hierarchy of performance system indicators and the principles of interaction and subordination of performance indicators at all levels;

  - to describe the process of developing performance indicators;

  - to assign employees responsible for the process implementation;

  - to identify the selection principles of performance indicator types, the selection principles of performance indicator values;

  - to determine the evaluation criteria of efficiency and adequacy of performance indicators;

  - to define updating and valuation principles of performance indicators as well as identification and accumulation principles of the necessary data for measuring performance indicators;

  - to determine the regularity for measuring performance indicators and the application principles of performance indicators in the process of decision-making.

5. The issue of modernisation of the performance management process is becoming ever more urgent for the SRS; therefore, by integrating in the SRS performance aggregation matrix the performance indicators of tactical and operational management levels, at the same time stipulating the compliance of indicators with each management level and their potential impact on the strategic level, the content quality of performance measurement system would be improved.

6. Improving the performance management process, it is expected that one of the improvement indicators will be the elaboration of internal laws and regulations, which will describe the performance management process, including strategy development and updating cycle as well as the subordination of performance indicators in all performance management documents.

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ASSESSMENT OF CORPORATE INCOME TAX IN THE BALTIC STATES

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Abstract. A favourable and stable tax policy, predictability of taxes and well-structured taxes are the key drivers for the development of new enterprises and the attraction of investment as well as a significant driver for the sustainability of existing enterprises and economic growth in the country. The aim of the research paper is to identify how some elements of the corporate income tax of Lithuania and Estonia might be applied in Latvia. Both in Latvia and in Lithuania, taxable income is adjusted for the depreciation of fixed assets. In Latvia and in Lithuania, the taxable income is also adjusted for fines and penalties paid in the reporting year. Lithuania's enterprises are entitled to more favourable tax adjustments for costs unrelated to economic activity, as theses costs do not have to be added to their pre-tax profit. In Latvia, undistributed profit has to be taxed as in Estonia, setting a 0% enterprise income tax rate on undistributed profit.

Key words: corporate income tax, tax calculations, tax adjustments

JEL code: H2

Introduction

Stabile, predictable and well-structured tax policies not only in Latvia but also in a greater region, like in the Baltics, are one of the factors for sustainable economic growth in the country. Every country's sustainable development depends on planning the country's development, the government's revenues and expenditures, developing priority industries as well as efficient government budget management. Every country can plan its development only based on its government budget revenues, most of which are composed of taxes collected in the country.

Presently Latvia, Lithuania and Estonia have stabilised their government budget revenues from taxes. In each country, the corporate income tax (CIT) rate is different; yet, given that any state's key purpose is to ensure preconditions for its economy's sustainable development, the elements and rates of the corporate income tax and its payments to their Treasury are very important.

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Hypothesis: the elements of Lithuania's and Estonia's corporate income tax systems may be applied in Latvia as well.

Research aim: to identify how some elements of the corporate income tax of Lithuania and Estonia might be applied in Latvia.

To achieve the aim, the following tasks are set:

1) to examine the theoretical aspects of corporate income tax;

2) to perform a comparative analysis of corporate income taxes in the Baltic States;

3) to perform a comparative analysis of corporate income tax calculations in the Baltic States.

The following **research methods** were employed in the paper: abstract and logical analysis; the monographic and descriptive methods; the graphic method; and statistical analysis methods.

Materials used

The theoretical part was based on findings and perspectives of various authors, information available in statistical databases as well as documents produced by the Cabinet of Ministers on the tax system.

Research results and discussion

### Theoretical aspects of corporate income tax

When doing accounting, any enterprise, in line with its field of economic activity, has to calculate its estimated tax payments. Any enterprise has to make all tax payments in accordance with the laws and rules being in effect in the country, for instance, excise, customs, value added tax payments.

Corporate income tax is one of the taxes that, in accordance with a country's legislation, has to be calculated and paid into the government budget.

The government policy document Guidelines for the Development of the System of Taxes and Duties stipulates that the problems to be tackled with regard to the enterprise income tax are as follows: optimisation of the tax reliefs and strengthening of the tax base (Guidelines for the Development…, 2003).

Any enterprise, when calculating its corporate income tax, has to take into consideration the terms of the law passed in a country – criteria, tax reliefs and other important factors. The way how genuinely enterprises keep records of all their revenues and expenses and calculate their payable taxes as well as make tax payments cannot be traced by any institution. Accordingly, it is very important that owners of an enterprise understand the need to keep correctly records of all the enterprise's assets, revenues and expenses and would not perceive the corporate income tax as a penalty.

Stable corporate income tax rates are important both for businessmen to be able to budget the costs of future periods and for the government to budget tax revenues.
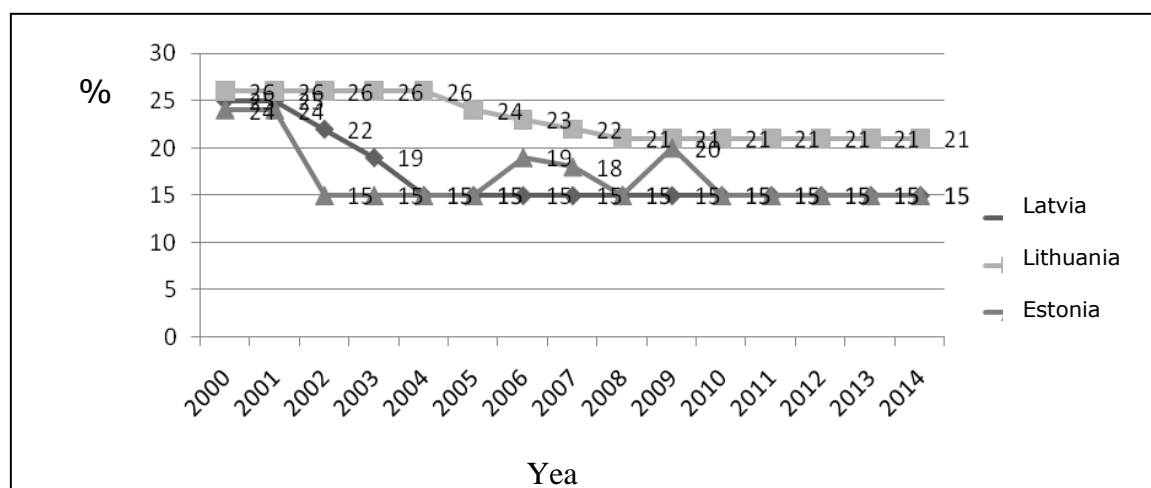
Fig.1. Corporate income tax rates in the Baltic States in the period 2000-2014, %

Since the year 2000, the corporate income tax rates have changed many times in the Baltic States – in Latvia and Estonia the rates only decreased, while in Lithuania, after the rate was reduced to 15% in 2002, it was raised and reduced again until 2010 when it stabilised at 15% (Fig.1).

Overall analysis of business activity

The purpose of reforming the corporate income tax in the Baltic States is to foster the development of enterprises and to attract investors.

As shown in Figure 2, among the Baltic States, the greatest number of active enterprises was observed in Lithuania in the period 2005-2012; according to the Statistics Lithuania, the greatest number of enterprises was registered in 2008, reaching 169159 units.
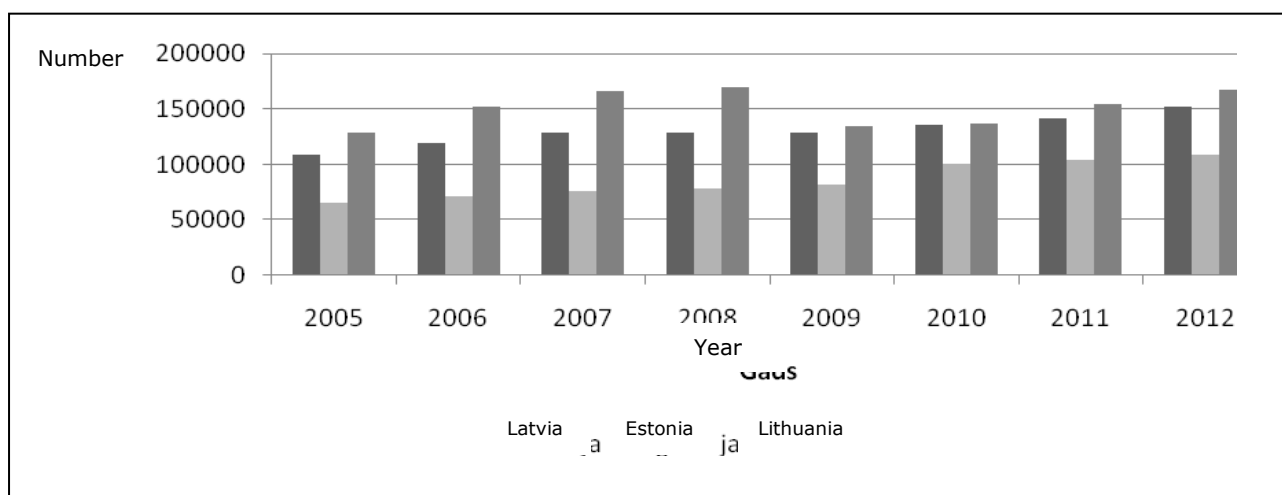
Fig.2. Number of active enterprises in the Baltic States in the period 2005-2012

The trends in the Baltic States are similar; there are just a few exceptions. Increases in the numbers of active enterprises were observed in the period of analysis in all the Baltic States.

Efficient attraction of investment is the determinant factor that creates favourable conditions for overcoming an economic crisis, for structural changes in the national economy and for fostering regional development and technological progress, which, in its turn, is a basis for stable economic growth (Titarenko D., 2006).

Until 2008, a strong inflow of foreign investment was observed in Latvia. In 2008, compared with the previous year, the weakest increase in the inflow of foreign investment was recorded, only 11.69%. In 2005, too, an increase was insignificant, 10.01%, which may be explained by the fact that on 1 May 2004 Latvia, just like the other Baltic States, was not a member of the European Union.

Table 1

Foreign investment in Latvia in the period 2004-2010, mln EUR

Year	2004	2005	2006	2007	2008	2009	2010
Investment	1679.1	1847.3	2362.3	3142.3	3509.8	4687.7	5284.4
Annual increase, %	-	10.01	27.87	33.01	11.69	33.56	12.72
Increase from 2004, %	-	10.01	40.69	87.14	109.02	179.17	214.72

Source: authors' calculations based on CSB data

According to the Central Statistical Bureau of the Republic of Latvia, most of the foreign investment in Latvia originated in the European Union countries. Of the total foreign investment in 2010, 73.68% was from the European Union. In Latvia, least foreign investment came from the CIS countries.

Table 2

Foreign investment in Lithuania in the period 2004-2010, mln EUR

Year	2004	2005	2006	2007	2008	2009	2010
Investment	4698.69	6920.69	8377.14	10282.65	9190.6	9206.19	10030.97
Annual increase, %	-	47.29	21.04	22.75	-10.62	0.17	8.96
Increase from 2004, %	-	47.29	78.29	118.84	95.60	95.93	113.48

Source: authors' calculations based on the Statistics Lithuania

In Lithuania, an annual increase in foreign investments ranged from 10.62 to 47.29% in the period 2004-2010. The fastest increase in foreign investments was observed in 2005 when, compared with the previous year, they grew by 47.29%. In 2008 and 2009, the amount of foreign investment, measured from the base year of 2004, was the same, with a slight increase of 0.17% in 2009. The number of registered enterprises also declined in Lithuania in these years.

As shown in Table 3, the situation with foreign investments in Estonia is similar to that in Lithuania. In the period of analysis, an increase in foreign investments, on an annualised basis, ranged from 0.89 to 29.65%. Just like in Lithuania, in Estonia, too, the fastest annual increase was observed in 2005, reaching 29.65%. The next fastest increase was recorded in 2007, which was 18.07% in comparison with the previous year. During the period 2007-2009, the amount of accumulated foreign investment in Estonia was steady. At the end of the period of

analysis, compared with the base year, the amount of investment had increased by 69.45%, which was the lowest growth rate among the Baltic States.

Table 3

**Foreign investment in Estonia in the period 2004-2010, mln EUR**

Year	2004	2005	2006	2007	2008	2009	2010
Investment	7374.30	9560.50	9643.80	11386.40	11774.60	11670.20	12495.40
Annual increase, %	-	29.65	0.87	18.07	3.41	-0.89	7.07
Increase from 2004, %	-	29.65	30.78	54.41	59.67	58.26	69.45

Source: authors' calculations based on Eesti Pank data

Even though the fastest increase in foreign investments was registered in Latvia in the period of analysis, compared with the base year, the total amount of foreign investments in Latvia in 2010 was smaller than in Lithuania in 2005 and Estonia in 2004. The greatest amount of foreign investments was in Estonia regardless of the facts that in Estonia the number of enterprises was smaller and the number of non-resident enterprises was considerably smaller than in Latvia and in Lithuania. Estonia is attractive to investors due to the 0% corporate income tax rate for undistributed profit, while Lithuania's enterprises are entitled to more favourable tax adjustments for costs unrelated to economic activity, as theses costs do not have to be added to their pre-tax profit.

Corporate income tax burdens in the Baltic States

The key tax policy indicator is usually a tax burden expressed as a percentage of gross domestic product (GDP), which shows the share of GDP to be redistributed by means of the country's tax policy (Ketners K., Lukasina O., 1993).
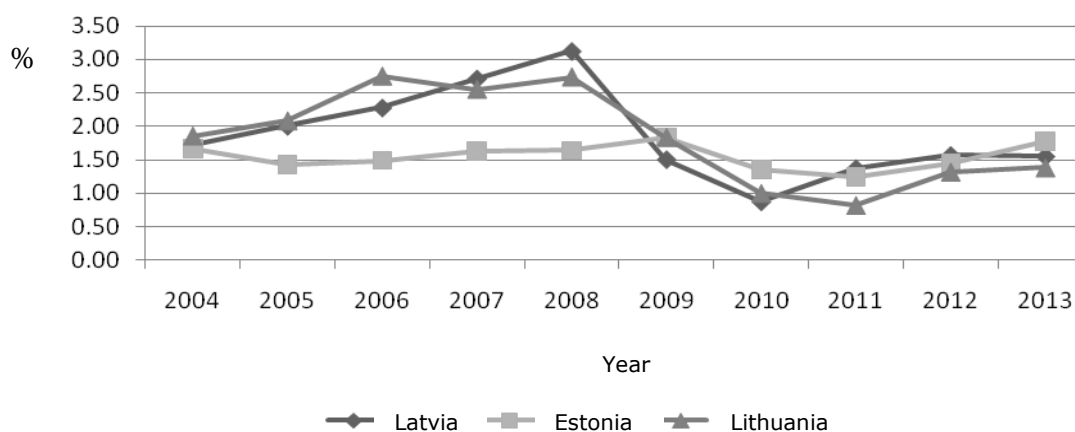
Source: authors' construction based on Eurostat data

Fig.3. CIT revenues as a percentage of GDP in the Baltic States in the period 2004-2013

The CIT revenues paid into the government consolidated budget, expressed as a percentage of GDP, characterise a tax burden in a particular country. As shown in Figure 3, until 2009 the lowest CIT burden among the Baltic States was observed in Estonia, being quite steady within a range from 1.43 to 1.66% of GDP. In 2010, CIT revenues in the consolidated budget of Estonian's government decreased by 24.41%, compared with the previous year; this was the

reason why CIT revenues declined in terms of percentage of GDP. Over the entire period of analysis in Estonia, the CIT burden was quite steady, varying between 1.24 and 1.88%.

The trends in CIT burdens in Latvia and Lithuania were similar. The highest CIT burden among the Baltic States was observed in Latvia in 2008, accounting for 3.13% of GDP, followed by a sharp decline up to 1.51% of GDP in 2009 and 0.88% of GDP in 2010. Over this period, in Latvia, too, just like in Estonia, CIT revenues in the government consolidated budget declined, which might be explained by the global economic crisis and decreases in the profits of enterprises, as the number of enterprises did not grow in the period concerned. In 2009 in Lithuania, the number of active enterprises sharply declined; consequently, CIT revenues, in terms of percentage of GDP, also decreased. However, despite the fact that the number of active enterprises rose in Lithuania over the next years, the CIT burden fell to 1.00% of GDP in 2010 and to 0.82% of GDP in 2011. This is explained by decreases in profits made by enterprises and a CIT rate cut from 20% to 15% in 2009.

Comparison of corporate income tax calculations in the Baltic States

To illustratively show the key differences in corporate income tax among the Baltic States, the paper shows the corporate income tax calculated in accordance with each country's legislation and tax declarations, taking into consideration taxable income adjustments – increases or decreases in the tax – as well as applicable tax deductions (Table 4).

Both in Latvia and in Lithuania, taxable income is adjusted by adding the depreciation of fixed assets. As regards depreciation, in both countries it is calculated in the same way – by means of the straight-line method – the purchase value of fixed assets is spread over three years, thus, obtaining a depreciation value of EUR 300 per year.

In Latvia and in Lithuania, penalties and fines paid in the reporting period have to be added to taxable income.

As regards representation costs, Latvia's Law on Enterprise Income Tax states that in calculating the enterprise income tax, 60% of the representation costs have to be added to the taxable income. It turns out in this case that if an enterprise has spent EUR 500 for representation in the reporting period, EUR 300 have to be added to its taxable income. In Lithuania, enterprises are allowed to incorporate in their costs up to 75% of their representation cost, meaning that enterprises have to adjust their taxable income by adding 25% of their representation cost, which, in this example, amounts to EUR 125.

In both countries, the taxable income has to be also adjusted by adding the increase in the allowance for doubtful receivables, which, in this case, is assumed to be EUR 200.

In total, given all the mentioned tax adjustments, the taxable income in Latvia increases by EUR 830, while in Lithuania this amount is only EUR 655, which is EUR 175 less than in Latvia.

Table 4

Calculation of the corporate income tax in Latvia and Lithuania, EUR

	Latvia	Lithuania
Taxation period profit before the tax	10000	10000
Expenses unrelated to economic activity	650	-
Taxable income	**10650**	**10000**
Additions to taxable income		
Sum of the depreciation of fixed assets and the write-off of intangible investment reported in an annual report	300	300
Sum of penalties and fines	30	30
Representation costs	300	125
Increase in the allowance for doubtful receivables	200	200
Total increase in taxable income	**830**	**655**
Deductions from taxable income		
Sum of the depreciation of fixed assets and the write-off of intangible investment	(630)	(600)
Cost for providing a new special job for physically or mentally disabled individuals	(350)	-
Total deduction from taxable income	**(980)**	**(600)**
Taxable income	**10500**	**10055**
Total loss reducing the taxable income	1500	1500
Adjusted taxable income	**9000**	**8555**
Tax on adjusted taxable income	**1350**	**1283,25**
Tax deductions	(270)	(513,3)
Estimated CIT	**1080**	**769,95**

Source: authors' calculations based on each country's legal acts

The next adjustment of taxable income, according to any enterprise profit and loss statement, refers to deductions from taxable income.

Just like there are additions to taxable income, there are also deductions from taxable income; taxable income is adjusted for depreciation. In Latvia, Section 13 of the Law on Enterprise Income Tax stipulates five depreciation categories; computer equipment and programs are included in Category 3 with a depreciation rate of 35% which is multiplied by a coefficient of 2.

In Lithuania, no certain depreciation categories with certain depreciation rates are set for enterprises; however, the law states that depreciation has to be calculated using the straight-line method and spread over 3 years (for computer equipment) applying a coefficient of 2.

Latvia's Law on Enterprise Income Tax also provides that an enterprise which has created a new special job for a physically or mentally disabled individual and employs such an individual for at least two years may deduct from its taxable income the cost of creating this job. The authors assume that if an enterprise incurs such costs, they are deducted from its taxable income at a full extent.

After the taxation period, given the additions to and deductions from taxable income, an enterprise's taxable income in Latvia would be equal to EUR 10500, while in Lithuania it would be EUR 10055, which is significantly less than in Latvia.

In both countries, the legislation allows transferring losses of previous periods to the next taxation period.

The corporate income tax is calculated from the adjusted taxable income, applying a 15% rate both in Latvia and in Lithuania. The tax from the adjusted taxable income in Latvia would be EUR 1353 and EUR 1283.25 in Lithuania, which is EUR 66.75 less than in Latvia.

In accordance with the legislation, tax reliefs may be applied to taxable income. Both in Latvia and in Lithuania, there are tax deductions for charitable contributions. In Latvia, its legislation strictly stipulates what charitable contributions may be made and whom they may be given, thus, restricting potential abusive tax avoidance instances. In Latvia, enterprises may be granted a tax relief of 85% for charitable contributions to governmental institutions and government capital companies fulfilling national cultural functions delegated by the Ministry of Culture as well as to associations, foundations and religious organisations registered in the Republic of Latvia; however, the total amount of this relief may not be more than 20% of the estimated corporate income tax. So, one can assume that if an enterprise, in a reporting period, has donated EUR 500 to a governmental institution or a religious organisation, 85% of this amount is equal to EUR 425 but this is more than 20% of the estimated corporate income tax. Since the tax relief may not exceed 20% of the estimated corporate income tax, the enterprise may be granted a tax relief of EUR 270 for its charitable contribution.

In Lithuania, enterprises may deduct from their taxable income a double amount of their donation but it may not exceed 40% of the estimated corporate income tax. This tax relief in Lithuania significantly affects the size of the corporate income tax calculated and presented in the example, as this tax relief reduces the corporate income tax in Lithuania by 40%, which is quite a lot, given the fact that in Latvia such a tax relief reduces the corporate income tax by only 20%.

After deducting the tax relief from the estimated corporate income tax, the authors conclude that in Lithuania, based on this example, EUR 769.95 have to be transferred to the government consolidated budget, which is EUR 301.05 or 28.7% more than in Latvia. The greatest difference between the sizes of corporate income tax calculated for both countries is made up of tax relief deductions. Enterprises in Lithuania may deduct 20% more tax relief related to charitable contributions than in Latvia, whereas in Latvia enterprises may deduct only 85% of their donations; however, in Lithuania, the amount donated have to be multiplied by 2 for the purpose of tax deductions.

To calculate the size of corporate income tax to be paid by an enterprise in Estonia, the amounts of profit distributed in a reporting period in the Baltic States have to be identified, as shown in Table 5.

In Estonia, the corporate income tax is paid only if profit is distributed. The tax rate on dividends paid is 21% of the gross dividends, which is equal to EUR 10000, as shown in the example in Table 5, or a 21/79 tax rate is applied to net dividends, which totals in this case EUR 7900.

Table 5

Distributed profit of an enterprise in the Baltic States in the period of analysis, EUR

	Latvia	Lithuania	Estonia
Pre-tax profit in a taxation period	**10000**	**10000**	**10000**
Estimated CIT on profit	1080	769.95	-
Undistributed profit in a reporting year	8920	9230.05	10000
Estimated IIT on dividends paid	892	1846.01	-
Estimated CIT dividends paid	-	-	2100
Total estimated taxes	**1972**	**2615.96**	**2100**
Net dividends paid	**8028**	**7384.04**	**7900**

Source: authors' calculations

Given the fact that when distributing a profit in dividends in Estonia, the profit is taxed by only one tax – corporate income tax – and individual income tax is not applied to the profit; the tax paid in Estonia is higher than in Latvia because the tax rate in Estonia is comparatively higher, yet, it is lower than in Lithuania, as dividends paid in Lithuania are taxed also by individual income tax, the rate of which for dividends is 20%. However, enterprises very often choose not to distribute all their profit made during a reporting period; in this case, Estonia's tax system has some advantages, as the estimated tax is smaller.

The dividend systems in Latvia and Lithuania are similar: an estimated corporate income tax of a reporting period is calculated from the pre-tax profit after the taxable income has been adjusted, thus, obtaining an undistributed profit of the reporting period. When distributing this profit to the owners or shareholders of an enterprise, it is taxed by the individual income tax. In Latvia, the individual income tax rate on dividends is 10%, while in Lithuania this tax rate is twice as high at 20%.

Conclusions, proposals, recommendations

1. Latvia, Estonia and Lithuania offer a favourable tax system as well as low tax rates for foreign investors. Estonia is attractive to investors due to the 0% corporate income tax rate for undistributed profit.

2. In the period 2005-2009, the number of active enterprises in Latvia rose 18.12% or by 19791 units, while in the period 2009-2012 their number grew at a slightly slower rate, 17.83%; however, this number rose by 22934 units, which indicated that conditions for business were favourable in Latvia.

3. Despite the low tax burdens in all the Baltic States, foreign investments in Lithuania and Estonia are considerably greater than in Latvia, which indicates more beneficial and better-structured CIT systems there.

4. Lithuania's enterprises are entitled to more favourable tax adjustments for costs unrelated to economic activity (as these costs do not have to be added to their pre-tax profit, representation costs increase the taxable income by only 25%, while in Latvia it is 60% as well as tax reliefs for charity donors are greater in Lithuania).

5. Latvia's enterprises, unlike those in Lithuania, are entitled to more favourable taxable income adjustments. First, a taxable income is adjusted for the depreciation of fixed assets (because depreciation categories with certain depreciation rates are set for enterprises in Latvia, which are higher than if calculating using the straight-line method, as it is practised in Lithuania. Tax adjustments for costs of providing a new special job for physically or mentally disabled individuals in Latvia may be positively viewed).

6. Adjustments of taxable income and tax reliefs affect CIT revenues paid into the government budget only in Latvia and Lithuania, while in Estonia revenues paid into the government budget are influenced by the amount of profit distributed in a reporting period, as adjustments of taxable income and tax reliefs are not available in Estonia.

7. The government should perfect the PIT policy in Latvia by amending the Law on Enterprise Income Tax and introducing significant PIT reliefs for businessmen, thus, contributing to business development and competitiveness in Latvia.

8. To maintain the competitiveness of enterprises, Latvia's legislators have to retain the PIT rate at 15%; this rate in Estonia is 21% and 15%, too, in Lithuania.

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POSSIBILITY FOR PERSONAL WEALTH TAXATION SYSTEM IN LATVIA

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Abstract. Taxation policy is one of the possible solutions to ensure development of the economy and can affect possible regional and social disparities and market distortions. One of the possible discussions in the field of the current Latvian tax policy is mainly based on reduction of income inequality by some elements of tax policy. Research of the current status of taxation policy and quality of the state budget revenue sources enabled to suggest some solutions instead of personal income taxation to tax personal wealth with separate wealth tax. As the main result this paper offers proposals on the personal wealth taxation system. The research is based on traditional economic science methods, including monographic method, analysis and synthesis, statistical analysis, and also comparative analysis and practical experience of tax policy implementation. Implementation of prepared recommendations provides an opportunity to ensure development of Latvian tax system.

Key words: wealth taxation, tax policy, Latvian tax system.

JEL code: H24, K34, D31

Introduction

One of the main ideas for improvement of tax policy in Latvia is introduction of progressive rates within personal income tax. Argument for such solution is income inequality and income distribution distortions. Equity and efficiency objectives have always been at the centre of the analysis and search for improvement of taxation systems. In the context of the common European policy and in the political discussions following the financial and economic crisis, there is a specific interest in the fairness and redistribution aspects of the tax system. These issues have traditionally been linked to the balance of the taxation system in relation to its various components and, more specifically, to the analysis of the progressivity of personal income tax provisions (European Commission, 2014; European Commission, 2013). Many professionals study the impact of personal income tax on the income distribution. Common complaints are that the tax system is unfair and wealthy taxpayers should be taxed at higher rates. According to the author's evaluation despite the considerable resources that will be

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expended on compliance, the progressive tax within current income structure could raise only a small portion of revenue. Another possible solution for reduction of inequality is introduction of a regular wealth tax. It has been argued in the past that individuals benefit directly from holding wealth and that the status and power it brings mean that additional taxation of wealth is appropriate. However, wealth taxation is costly to administer, might raise little revenue and could operate inefficiently. The aim of the research is to explore net-wealth tax systems in Europe and to evaluate the possible proposals for the improvement of Latvian tax system. The tasks of the research were set to achieve the aim of the paper – to analyse the development of wealth tax reforms, to evaluate the impact on taxpayers and efficiency of the tax system. The research is based on traditional economic science methods, including the monographic method, analysis and synthesis, statistical analysis, and the graphic method, comparative analysis of literature and practical experience of tax policy implementation. Although the global economic crisis has posed hard questions, it also offers an opportunity to accelerate structural tax reforms and to restart the discussion on the design of Latvian tax system beyond short-term policy responses. Therefore, at the end of the paper there are outlined proposals to reform personal wealth taxation.

Current wealth taxation situation in Europe

Fair tax system is one of topical issues in current tax policy researches. Inequality problems and respective implications in tax policy strategy were discussed in Sproge (2011), Skapars, Sumilo and Dunska (2010). According to recent researches, as Dubra, Vilcina (2014), reduction of high poverty rate in Latvia is challenged by such factors as income inequality, including low income of the employed and rather high tax burden on low income employees ('working poor' problem), and limited budget resources in the upcoming years. Both problems could be solved by tax policy decisions and possible reforms in taxation field. In theory as noted by Ketners, Titova (2013) the main concepts of the fairness of tax system are - horizontal and vertical equity. Horizontal equity is assumed to be if persons are treated equally in terms of tax burden (flat tax example). Vertical equity is characterised by the situation when taxpayers with a higher income should pay higher taxes, i.e. that the tax liability should depend on the ability to pay. As to the author's opinion equity concept could be achieved by household taxation. Common view of different researches (Skapars, Sumilo and Dunska (2010)) is that the tax system is unfair and wealthy taxpayers should be taxed at higher rates. According to the author's evaluation despite the considerable resources that will be expended on compliance, the progressive personal income tax within the current income structure could raise only a small portion of budget revenues. Another solution to be considered for reduction of inequality is introduction of a regular wealth tax. It has been argued in the past that individuals benefit directly from holding wealth and that the status and power it brings mean that additional taxation of wealth is appropriate. However, wealth taxation is costly to administer, might raise little revenue and could operate inefficiently.

In the field of the research of wealth taxation there are many publications in the world scientific literature. As recent remarkable examples Profeta et.al. (2014), presented an empirical model of wealth transfer taxation in the revenue systems of the G7 countries – Canada, France, Germany, Italy, Japan, the UK, and the US – over the period from 1965 to 2009. Also the author agrees with Tamai (2014), who examined the relationship between wealth distribution and economic growth in an endogenous growth model with heterogeneous households and redistributive taxation. Some solutions for progressive taxation in Latvia were provided by Repsa (2010) and general fairness of tax system was described in Vanags (2010). Despite the popularity of tax policy research some aspects of specific wealth taxes – real estate taxes are covered by Latvian scientists (Stucere, Mazure (2013)). As argued by Stucere, Mazure (2012) in the future tax burden in Latvia, Lithuania, Estonia, and Poland should be shifted from personal income to immovable property, since it is difficult to avoid paying of immovable property tax and it leaves a less impact on the economic growth of the country.

Taxes on personal wealth and transfer of wealth trigger intense debate at all levels among policy-makers, economists and the general public. According to Ketners, Titova (2013) wealth taxes are commonly identified as taxes on the possession of net-wealth and group of wealth taxes consists of taxes on property (including vehicles), inheritance and gift taxes, real estate and land taxes and annual recurring taxes on the possession of wealth.

The author agrees with Boadway, Chamberlain, Emmerson (2010) conclusion that wealth taxation is as an alternative to income taxes, at least for income generating wealth, because an annual tax on wealth is roughly analogous to a tax on capital income from that wealth. To the extent that one wants to include capital income in the tax base, wealth taxation may be convenient for some types of assets, particularly those for which measures of asset income are not readily observable. For example, taxes on the value of owner-occupied housing (net of mortgage debt) are a way of taxing its imputed return, given that there is no tax paid on the imputed rental income from owner-occupied housing. In an open economy setting where capital income from abroad is not easily verifiable, a tax on wealth might be a rough-and-ready way of taxing presumed income. Of course, it may be even more practically difficult to measure the value of such wealth than to monitor the income it produces. Wealth taxation may be a supplement to capital income taxation where the latter is constrained by policy design. In a dual income tax system where capital income is taxed at a uniform rate, wealth taxation may be used as an additional policy instrument to achieve redistributive objectives.

According to the European Commission (2014b) inheritances and gifts are taxed widely in the EU-20 and EU-21 Member States respectively. For inheritances a separate tax is commonly used. Gift taxation is more often part of a general tax but a separate tax is still the most common approach. Most EU Member States using a separate tax for both inheritances and gifts use the same tax law to regulate both. It must be noted at this stage that the in last decade the number of Member States which tax inheritances and gifts has decreased. Since the year 2000, five countries – Austria, Cyprus, the Czech Republic, Italy and Slovakia – have

abolished their inheritance and gift tax. Two countries - Greece and Portugal – have replaced their inheritance tax with a new tax (Greece) or provision (Portugal). Lithuania has reformed the system and abandoned the use of both a tax and provision for inheritances and gift in favour of only a tax (inheritances) or only a provision (gifts). Only Italy has truly re-introduced an inheritance and gift tax, while Latvia has introduced a gift tax provision in the income tax.

Real estate is taxed in every EU Member State. Possession of real estate is taxed the most (27 Member States), closely followed by real estate transfers (26 Member States). Most countries tax both real estate possession and real estate transfer. Malta, however, only taxes real estate transfers, while Lithuania and Slovenia only tax real estate possession. Again a separate tax is the most common way to tax real estate. Eight EU Member States tax the possession of certain assets. Most of these, however, tax vehicles and the aim is more for environmental purposes than to tax wealth. Only the Italian tax on bank accounts and financial assets is clearly aimed at taxing wealth. Apart from these specific taxes, only some EU Member States use general net-wealth as a taxable base. As shown in Figure 1 tax burden is comparably low. The author agrees with the European Commission (2014a) analysis that there is a clear trend of abolishing wealth taxes due to low tax revenues. However, Spain tax policy shows an example of temporarily introduction of general wealth tax on net-wealth motivated by revenue considerations.

	NL	DK	IT	HU	BG	FR	ES	PL	HR	SI
■ Percentage to GDP	0.57	0.55	0.45	0.25	0.23	0.22	0.08	0.06	0.00	0.00
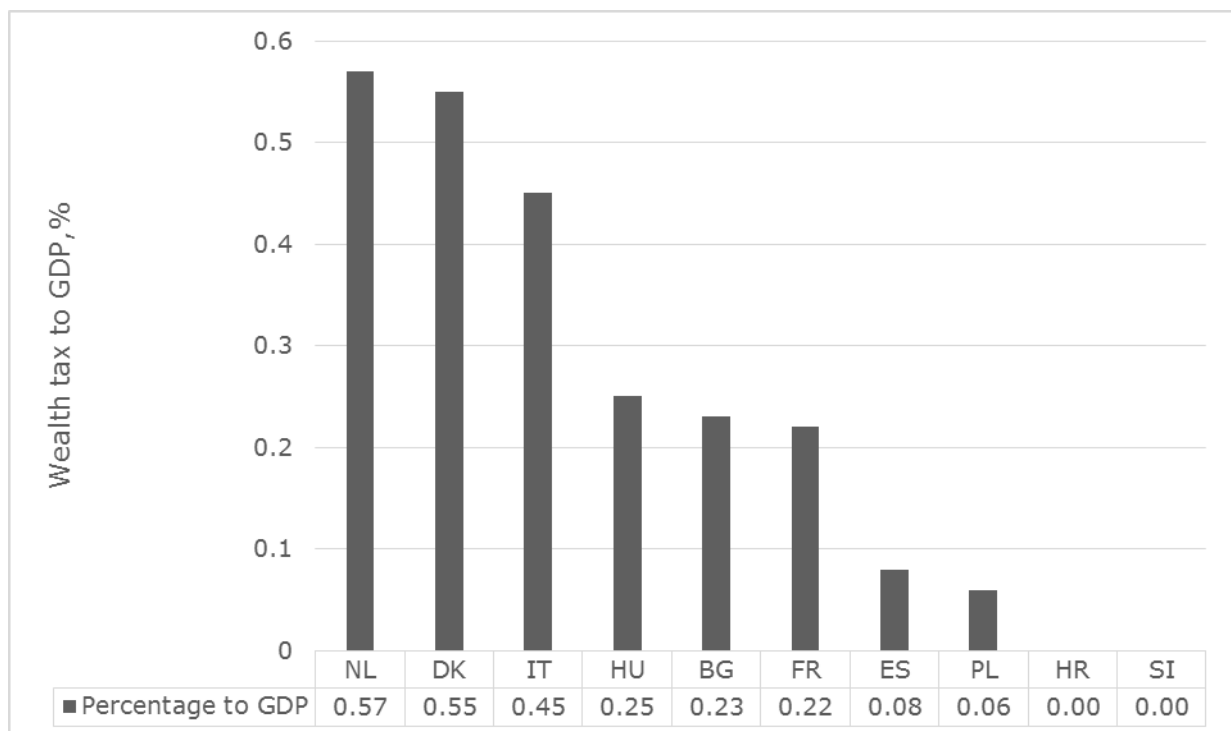
Source: European Commission, 2014 a

Fig.1 Net-wealth tax and non-tax payment burden in Europe, % to GDP

Comparative analysis of net wealth taxes shows that the French and Spanish wealth taxes are progressive, have top rates. Italy and the Netherlands have specific wealth taxes on financial assets and as a part of income taxation.

Table 1

Main elements of wealth taxes in the EU

Member State	Number of rate scales	Tax rate range	Threshold, EUR
Spain	8	0.2% - 2.5%	700,000
France	6	0% - 1.5%	1,300,000
Italy	0	Lump sum of EUR 34.20 for bank account + 0.2% over the value of other assets.	5,000
	0	0.2%	None
Netherlands	0	1.2% (30% over a fictitious 4% income).	21,140

Source: European Commission (2014 a)

General taxes on wealth raise less budget revenues as specific taxes since the rates normally apply to the part of taxpayers, taking into consideration tax free thresholds (Table 1).

Spain and France provide large tax free thresholds. The Netherlands income tax provision has lower exempt amount. In France, according to France statistic data (2014), about 160 thousand individuals were subject to wealth tax, which is about 0.5% of all respective income tax payers. The comparative analysis shows also that considering the principle of equity some countries are keeping wealth tax in the tax system. Also it should be remarked that abolition of wealth tax in Finland was substantiated by unfair impact on enterprises and motivated by many possibilities to evade tax. Luxembourg and Sweden abolished wealth taxes to create a more attractive environment for high net worth individuals. According to comparative analysis the annual taxes on net wealth could be characterized as taxes with tax base - assets less the related liabilities of the taxpayer, with relatively low threshold. Also exemption from the tax base on business assets is applicable. Taxes are progressive with rates between 0% and 3%. (For country specific wealth taxation issues see also European Commission, 2014 b).

Possible wealth taxation reform for Latvia

Whereas EU Member States had significant development in the field of wealth taxation, for Latvia it is different. As shown in Mazure, Viksne (2014), the current tax policy in Latvia is mainly based on the continuation of the tax policy followed since the tax reform of 1995. The recent developments in the tax system have been mainly targeted at abolishing discriminatory and restrictive provisions by extending the relevant exemptions. Essential opportunity to increase revenues from capital taxes is provided by differentiation of corporate income tax and revision of corporate tax base. According to the legal acts that are in force in the EU, Member

States are not subject to any restrictions regarding corporate income tax. The EU Member States are competent to apply different tax rates for different taxpayers, of course, taking into account the EU regulations (Jakusonoka (2013)). In the field of personal income taxation, Latvian approach seems to be simple and close to classical flat taxation system with some semi-dual tax elements. However, recent statistics (Table 2) shows increase in implicit tax rates.

Table 2

Development in tax burden and implicit tax rates in Latvia

	2000	2005	2008	2009	2010	2011	2012
Total tax burden in percentage of GDP	**29.7**	**29.2**	**29.2**	**26.6**	**27.2**	**27.6**	**27.9**
Consumption	**18.4**	**19.9**	**17.4**	**16.9**	**16.9**	**17.2**	**17.4**
Labour employed	**36.7**	**33.2**	**28.4**	**29.2**	**33.1**	**33.3**	**33.0**
Capital	**12.3**	**10.6**	**17.7**	**10.2**	**7.9**	**9.5**	**9.9**
Capital and business income	**6.9**	**7.4**	**14.0**	**6.6**	**3.9**	**5.3**	**5.8**
Households	**1.1**	**1.0**	**1.0**	**0.9**	**1.5**	**2.5**	**3.0**

Source: European Commission, 2014 b

An international comparison of Latvian tax burden shows differences compared to developed countries. As in 2013 Latvian tax-to-GDP ratio continued to fall, but OECD revenue statistics shows (OECD (2014)) that tax burdens and revenue collection in advanced economies are reaching record levels not seen since pre-crisis period, however, the tax mix continues to vary widely across countries. OECD (2014) shows that the average tax burden in the OECD countries increased by 0.4 percentage points in 2013 to 34.1% compared with 33.7% in 2012 and 33.3% in 2011. Historically, tax-to-GDP ratios rose through the 1990s, to a peak OECD average of 34.3% in 2000. Tax burden fell back slightly between 2001 and 2004 but then rose again between 2005 and 2007 before falling back following the crisis. In 2013, the tax burden rose in 21 of 30 countries for which data is available, and fell in the remaining 9 OECD Member States. A number of factors are behind the rise in tax ratios between 2012 and 2013. About half of the increase is attributed to personal and corporate income taxes, which are typically designed so that revenues rise faster than GDP during periods of economic recovery. Discretionary tax changes have also played a role, as many countries raised tax rates and/or broadened tax bases. Revenue considerations and necessity for additional fiscal policy resources leads to possible tax revenue generating reforms. Since labour employed taxes are comparable with the average EU Member State implicit tax rates and there is low possibility to increase consumption taxes the only solution remains capital taxation. Despite trend to increase capital taxation (OECD (2014), European Commission (2014b)) for Latvia additional

taxation of capital is still unused possibility. However, it must be remarked that to ensure competitiveness of Latvian tax system for new businesses additional capital taxation should not affect business assets. For wealth taxes as a part of household taxation it should be mentioned that in case of Latvia there are no taxes regarding inheritances or gifts. As described by Ketners, Titova (2013) taxation of gifts is represented by personal income taxation. Gifts in amount exceeding EUR 1,425 annually, which are received from non-relatives (the gift-giver is not related to the taxpayer by marriage or kinship to the third degree), are subject to personal income tax. Gifts received from legal entities are wholly taxable. Gifts used for medic treatment or higher education are, under certain conditions, exempt regardless of the relation between the beneficiary and the donor. In wealth taxation field only real estate taxation is relatively important. A real estate tax is applicable to land, buildings and engineering constructions based on the cadastral value of land and buildings. Starting from 2013 local municipalities are delegated to determine the tax rate within the scope of the tax rate corridor (0.2– 3%) provided by law: as a general rule tax rates should be set within the 0.2–1.5 % limits, and where real estate is not maintained according to the procedure provided by law — within 1.5–3.0 % limits. Relative importance of the tax is 0.66% of GDP or 1.67% of total tax revenues (European Commission, 2014b). Also in the real estate sector there is a duty (state fee) on the registration of the title to immovable property. The person requesting registration of ownership after the purchase of an immovable property is liable to a stamp duty on registration of real estate with the Land Register. According to European Commission (2014b) this "quasi tax" generates 0.28% of total tax revenues or 0.08% of GDP.

On December 15, 2011 the law on initial property declarations for private individuals, or so-called "zero declarations" law, came in force in Latvia. It was obligatory for property condition declarations to be submitted by people who, as at December 31, 2011, were Latvian citizens, aliens or foreigners (who have received a permanent accommodation permit or permanent stay certificate in Latvia) and who are also Latvian residents whose property condition on December 31, 2011 corresponded to one or some of the criteria stated by law and including cash, loans and property which exceeds given threshold. The State Revenue Service, 2013 initial property status declarations' statistics shows the possibilities of introducing of net-wealth taxation in case of Latvia. In total there are 131 992 declaration submitted to the State Revenue Service, including 130,995 declarations of persons who were obliged to submit declarations, 278 declarations for a minor or incapacitated person, 719 voluntary declarations, which is covering around 17% of individual taxpayers. Instead of comprehensive personal income taxation wealth taxation will affect smaller number of taxpayers and this will reduce tax compliance costs. In total, 4,193 individuals indicated their ownership or co-ownership of 5526 real estates in foreign countries. In total, 1,019 individuals indicated that they owned 1,306 vehicles in foreign countries, including 1,122 cars, 47 motorcycles, 31 truck, 15 tractors, 11 auto trailers, 10 yachts. In total, 2,825 persons have indicated that they have foreign companies' shares (for example, equity share capital, investment shares) with a total

acquisition value of EUR 387 million. In total, 2,629 individuals indicated that they owned Latvian financial instruments with a total acquisition value of EUR 206 million. The top 3 declared Latvian financial instruments owned by one person are with acquisition cost EUR 9.12 million, EUR 6.64 million, EUR 6.39 million. In total, 679 persons have indicated that they have foreign-owned financial instruments whose value is EUR 79 million. Also 46,336 persons have indicated that they have savings amounting total to EUR 3.26 billion. Based on evaluation of property declarations and possible wealth tax rate of 0.05% the revenues from wealth taxation could be estimated to EUR 99.45 million. On one hand, application of net wealth tax would contribute to reduction of income inequality, but on the other hand would not affect labour market, employees' incomes and, thus, competitiveness and attractiveness of the national economy.

Conclusions, proposals, recommendations

1**.** The annual taxes on net wealth could be characterized as taxes with tax base - assets less the related liabilities of the taxpayer, with relatively low threshold. Also exemption from the tax base on business assets is applicable. Taxes are progressive with rates between 0% and 3%.

2. The number of net wealth taxes has declined over the last decade. Most OECD countries have abolished wealth taxes.

3. In case of Latvia there are no taxes regarding inheritances or gifts in Latvia. Taxation of gifts is represented by personal income taxation. Taxation of wealth is represented by real estate tax.

4. Wealth taxation may be used as an additional tax policy instrument to achieve redistributive objectives. This would preserve labour market, employees' income, and, thus, would not harm competitiveness and attractiveness of the national economy.

5. Another option that could be explored further is an annual tax targeted at a very high value residential property with no reduction for debt. Perhaps the easiest way this could be implemented would be through the imposition of an additional real estate tax which would only affect occupiers of a residential property with a gross value above a large limit and would be paid wherever the occupier was resident or domiciled.

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CONTOURS OF THE BANKING UNION WITHIN THE INTEGRATED EUROPE: THE LITHUANIAN CASE

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Abstract. The recent financial crisis has shown that certain institutions of the European Union (EU) and its Member States are poorly prepared for solving the issues created by difficulties experiencing banks in European markets. In order to be able to further provide services for citizens and companies, the governments of EU Member States had to support their banks with public finances and provide guarantees on an unprecedented scale. This averted the collapse of some banks and disturbance of the economy but put the burden on taxpayers. As a result, there was deterioration in public finances. The major responsibility for avoiding further deterioration should be assumed by the European Banking Union (EBU), also called as the Integrated Financial System (whose foundation occurred while Lithuania held the presidency of the Council of the EU in the second half of 2013). Taking into account this fact, there are several problematic aspects, connected to Lithuanian membership in the Banking Union, which are discussed in this paper.

Key words: eurozone, banking union, single supervisory mechanism, single resolution mechanism, single bank resolution fund

JEL code: H3, H7, F6, F5

Introduction

The euro crisis, which was caused by issues on global financial markets, made the EU institutions and Member States to implement reforms of their finance sector. The European Commission entrusted a group of high level experts, which was led by a former EC member, the head of Finnish bank and board member of the European Central Bank (ECB) E. Liikanen, to execute the report on demand assessment of structural reforms in the EU banking sector. The experts group presented their report (Liikanen-report, 2012) in September, 2012. The means proposed in E. Liikanen (2012) report were later implemented in many initiatives of the European Commission.

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Issues surrounding the creation of the EBU have not been widely analysed in Lithuanian scientific literature so far. In 2013, the Central Bank of Lithuania carried out a study on the Euro introduction in Lithuania in 2015. The study analyses and makes the quantitative impact assessment of Euro introduction for the national economy (Euro ivedimo Lietuvoje...., 2013). However, this study is not directly associated with the creation of Banking Union. This subject is seldom analysed in Lithuanian academic research literature. Some aspects of soon-to-be-created EBU and public policy tendencies in the banking sector were analysed by V. Senavicius (2012). The author aspired to evaluate the impact of centralization of bank risk supervision and creation of the Single Resolution Mechanism (SRM) on the national public administration systems of EU Member States. T. Ambrazas (2014) research object is the regulation of bank (single) resolution mechanism and its application in the Republic of Lithuania. There are certain mechanisms in Lithuania which help defeat bank solvency problems: bank nationalisation, the transfer of the bank's assets, rights, transactions and liabilities to another bank. A. Aslund (2013) analyses the lessons of East European financial crisis in the period of 2008-2010. This financial crisis was an ordinary credit boom and bust cycle, leading to a current account crisis. A. Miskinis, E. Cipkute (2012) discuss some aspects of the inefficiency of the supervision system of credit institutions. This was influenced by the securitization process.

The aim of this paper – to identify the major elements of single resolution mechanism for the European Banking Union and to reveal the possible consequences of Lithuania's membership in the Banking Union.

The object of this paper - single resolution mechanism for European banks. This paper will analyse only concisely the Single Supervisory Mechanism (SSM), because it constitutes a very broad topic. Though the analysis has a special focus on 2 major pillars of the Integrated financial system: the SSM and the SRM.

The research tasks:

1) define the key issues of eurozone;

2) identify the tools of the European Union for resolution of the financial sector;

3) determine and assess the measures applied for reforming of Lithuanian banking sector.

Research methods. The logical method is used for making substantiated generalization of collected facts and formulating transitional and final research conclusions. The method of systematic analysis is applied seeking to evaluate the existing banking regulation in Lithuania and the EU. The generalization method, together with the logical, will help identify the general and major features and characteristics of the mechanisms, which were analysed in this paper.

Research results and discussion

State intervention to rescue the banking sector began in the period of 2008-2009 together with the global financial crisis. According to the latest Eurostat data, it certainly has reached

dramatic proportions (Baciulis M., 2013; Eurostat, 2013). Support for national states was provided in various forms: by buying out shares of banks in various countries, giving state guarantees, using a variety of monetary policy operations and the overall fiscal support measures. Net costs of bank rescue programmes (state performed a role of the "Lender of last resort") increased state debt, which compiled up to EUR 690 billion (or 5.2% of GDP) in the EU-27 in 2012. Accordingly, in the eurozone countries, the debt amounted EUR 520 billion (or 5.5% of GDP). The net cost of bank rescue programme increased the budget deficit in the EU-27 by 0.5% of GDP in 2010 (the year of the highest increase). In 2012, the budget deficit in the EU-27 was still 0.4%, while in the eurozone countries – approximately 0.7%. Charles B. Blankart (2011) noticed that state help for banking sector accounted for a large portion of various countries' GDP. For example, state support for banking sector in Ireland constituted 265% of its national GDP, in the United Stated it amounted 80% and in Germany – 20% of their GDP (Blankart Ch. B., 2011).

Primarily, these actions by EU Member States had a negative impact on their public finances. The EU-27 governments are often criticized that bank restructuring is financed by taxpayer money, which fundamentally opposes to state public policy. It has also triggered "moral hazard" – depositors and other parties (investors), seeing that their states spend money for bank restructuring, take excessive risks (hoping that because of active state aid instruments, the banks won't go bankrupt) (Krimminger M., 2006).
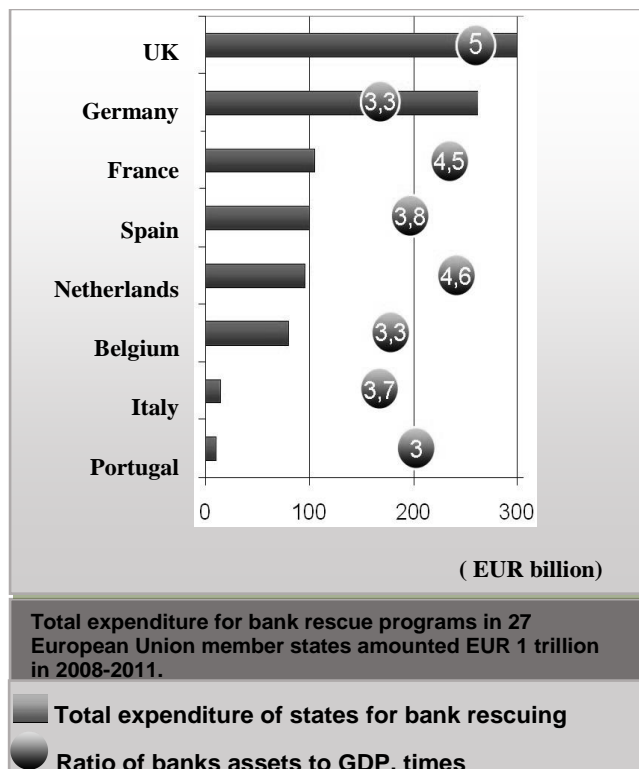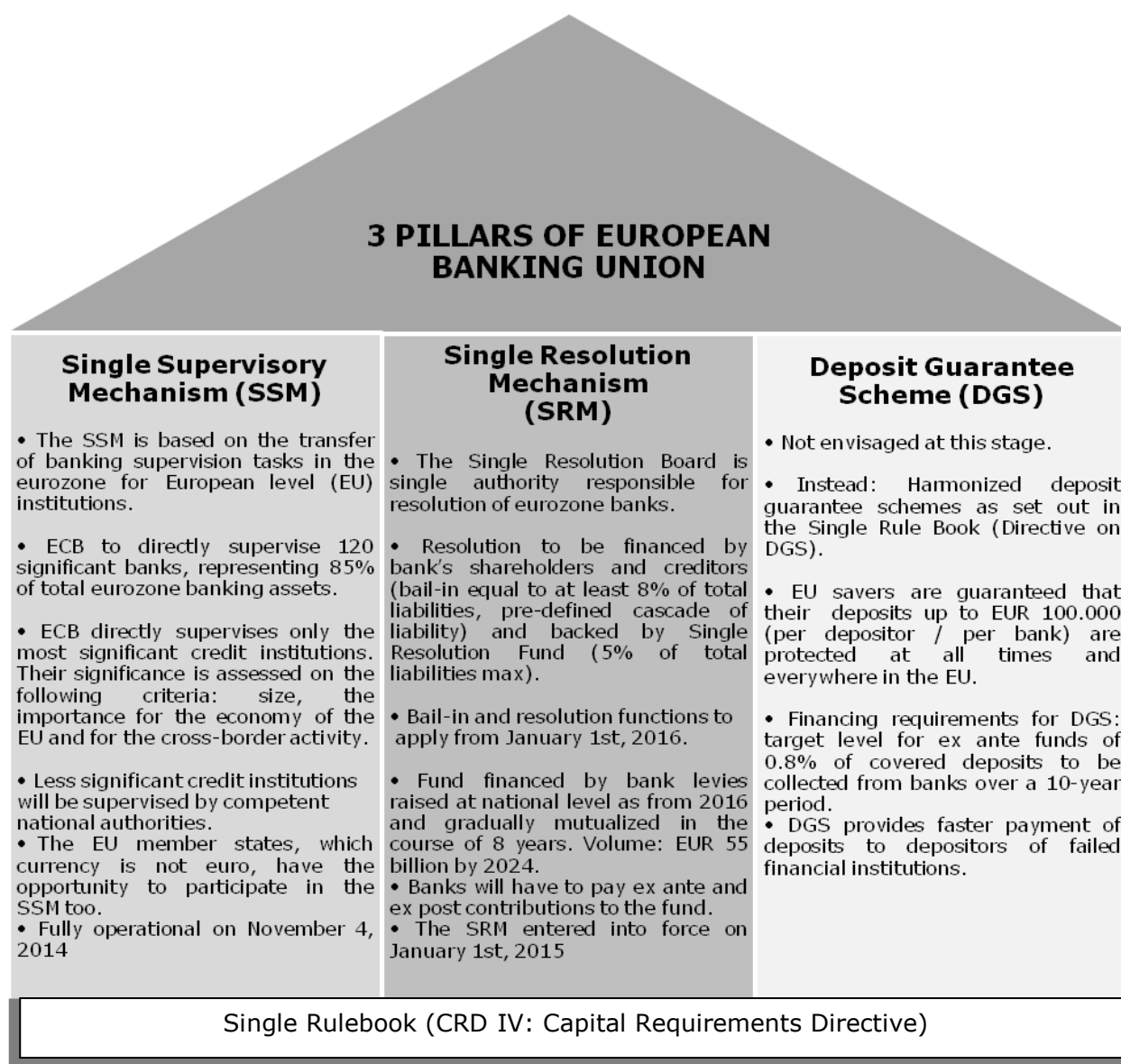
Fig. 1. **Total expenditure for bank rescue programs in some European Union member states, in EUR, 2008-2011**

The EU Member States managed to evaluate the consequences of excessive risk too late. Thus bank debt became an internal European banking sector problem. In the 1970s Member

State politicians had heavily liberalised (deregulated) financial markets to stimulate growth. This enabled financial markets to avoid strict state regulation and control. Scientific studies show the direct link between deregulation and financial crisis. For example, after the bankruptcy of Lehman Brothers, the results of economic activity in 2008-2009 have decreased more significantly in countries in which state regulation of banks was weaker (Weiss S., Hoffman I., 2012).

1. The Integrated financial system: its principles and features of activity

The financial crisis indicated that institutions of European Union and its member states are poorly prepared for dealing with current issues of financially troubled banks in European markets. The major situation changer should be the European Banking Union (EBU), also called as the Integrated Financial System, which will be based on a single set of full and comprehensive rules for financial services. These rules will ensure that the EU member states have the necessary means for involvement and strong intervention in both cases: before problems occurred and at the moment they started. The EBU is based on three stages model, which consists of 3 pillars: 1) the Single Supervisory Mechanism (SSM), 2) the Single Resolution Mechanism (SRM), 3) the Deposit Guarantee Schemes (DGS).

3 PILLARS OF EUROPEAN BANKING UNION

Single Supervisory Mechanism (SSM)	Single Resolution Mechanism (SRM)	Deposit Guarantee Scheme (DGS)
• The SSM is based on the transfer of banking supervision tasks in the eurozone for European level (EU) institutions. • ECB to directly supervise 120 significant banks, representing 85% of total eurozone banking assets. • ECB directly supervises only the most significant credit institutions. Their significance is assessed on the following criteria: size, the importance for the economy of the EU and for the cross-border activity. • Less significant credit institutions will be supervised by competent national authorities. • The EU member states, which currency is not euro, have the opportunity to participate in the SSM too. • Fully operational on November 4, 2014	• The Single Resolution Board is single authority responsible for resolution of eurozone banks. • Resolution to be financed by bank's shareholders and creditors (bail-in equal to at least 8% of total liabilities, pre-defined cascade of liability) and backed by Single Resolution Fund (5% of total liabilities max). • Bail-in and resolution functions to apply from January 1st, 2016. • Fund financed by bank levies raised at national level as from 2016 and gradually mutualized in the course of 8 years. Volume: EUR 55 billion by 2024. • Banks will have to pay ex ante and ex post contributions to the fund. • The SRM entered into force on January 1st, 2015	• Not envisaged at this stage. • Instead: Harmonized deposit guarantee schemes as set out in the Single Rule Book (Directive on DGS). • EU savers are guaranteed that their deposits up to EUR 100.000 (per depositor / per bank) are protected at all times and everywhere in the EU. • Financing requirements for DGS: target level for ex ante funds of 0.8% of covered deposits to be collected from banks over a 10-year period. • DGS provides faster payment of deposits to depositors of failed financial institutions.
Single Rulebook (CRD IV: Capital Requirements Directive)		

Source: authors' construction

Fig. 2. **The three pillars of the Banking Union**

Firstly, Member States of the EU declared the SSM for European banks (Council Regulation (EU) No 1024/2013). The SSM entered into force on 4 November 2014. The European Central Bank (ECB) directly supervises 120 biggest (among 6000 operating banks) eurozone banks now, representing almost 85% of total banking assets in the eurozone. The mechanism is applied for the major and systemically most important eurozone banks. The importance of the bank is evaluated on the basis of these criteria: size, importance for the economy of the EU, or (and) of particular Member State and importance of the bank for the cross-border activity among Member States. The ECB will directly supervise credit institutions, financial holding companies or mixed financial holding companies that are deemed significant. According to this, the credit institution, which is supervised by the ECB, must satisfy any of these conditions: 1) hold assets worth more than EUR 30 billion, or 2) hold assets exceeding one-fifth (20%) of the gross domestic product of the eurozone Member State; 3) be one of the three largest lenders in the participating Member State. The ECB may consider at its own
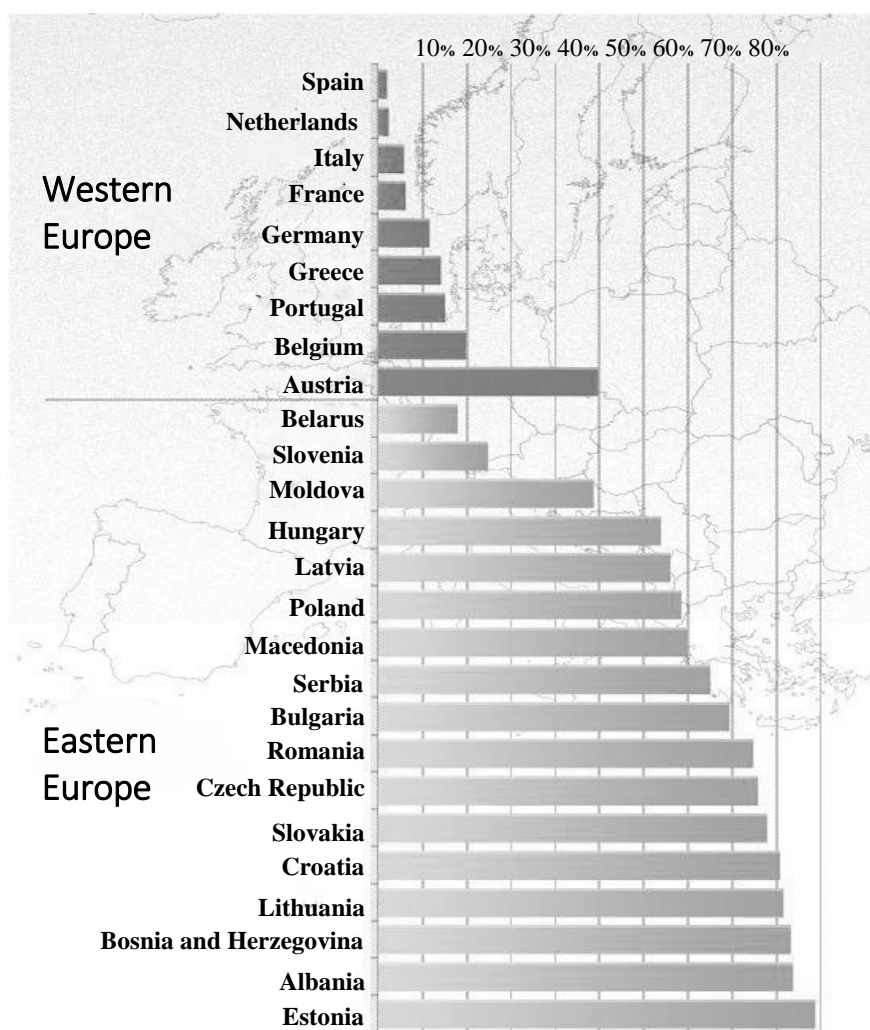
initiative that the credit institution is extremely important if it has established banking subsidiaries in more than one participating Member State and its cross-border assets or liabilities represent a significant part of its total assets or liabilities. The ECB started direct supervision of 3 most significant credit institutions at each participating member state from November 2014. The major aim of this supervision is to ensure that credit institutions are financially reliable and to protect the interests of depositors and the stability of financial system. Other banks, which do not comply with above presented criteria, remain under the surveillance of national authorities but the ECB intervenes, if it sees a need for it.

The other major pillar of the EBU is the Single Resolution Mechanism (SRM). It will supplement the SSM and will be a second step in the creation of Banking Union. This system will facilitate cooperation between national institutions in the cases of the collapse of cross-border banking groups. The SRM will ensure that – not withstanding stronger supervision - if a bank subject to the SSM faced serious difficulties, its resolution could be managed efficiently with minimal costs to taxpayers and the real economy (EU Regulation No 806/2014). Its essence is very simple: to ensure that in case of bankruptcy, a bank would not pose bigger issues {not only for the state in which it operates but for the whole economy of eurozone too}. The Single Resolution Mechanism includes only the banks, which enter into the sphere of SSM activity. Smaller banks, which activity is cross-border ("neighbourhood effect"), have to obey to the SRM rules too. The major principle of SRM is "bail in". So, this should enable the enforcement of a smooth transition from "bail-outs" to "bail-ins". Thus bank supervision will be supplemented with a strong and integrated system, dedicated for the resolution of troubled banks. This mechanism will enter into force from January 1, 2016.

2. Problems with Lithuania's membership in the Banking Union

Lithuania endorsed the creation of the Banking Union and joined the eurozone on January 1, 2015. Above all, the decision to introduce euro and transform the financial sector is of the greatest political importance. The country is now liable to participate in the decision making process which leads to the integration into the EU internal market. Naturally, that causes the emergence of different issues, e.g. what are the possible consequences of the membership in both the eurozone and the Banking Union? What sort of banking union can be most effective for Lithuania? What are the main characteristics of the Lithuanian financial sector?

The answers to these questions are not so simple. The situation in the banking system of each Member State is different. The differences between the bank assets (loans, securities) and bank supervision as well as transformation peculiarities also exist. The new banking system is to provide the possibility to measure and compare banking activities. A supranational supervisory institution can also more efficiently harness the emergence of the so-called "financial nationalism", where the national supervisory institutions seek to restrict home bank loans to foreign entities.

Western Europe

Eastern Europe

10% 20% 30% 40% 50% 60% 70% 80%

Spain
Netherlands
Italy
France
Germany
Greece
Portugal
Belgium
Austria
Belarus
Slovenia
Moldova
Hungary
Latvia
Poland
Macedonia
Serbia
Bulgaria
Romania
Czech Republic
Slovakia
Croatia
Lithuania
Bosnia and Herzegovina
Albania
Estonia

Source: Obserwatorfinansowy. K.Kozlovska. Unia bankowa w intelektualnym koglu-moglu, 2012.

Fig. 3. **The estimated share of foreign banks in the national banking systems (%)**

The analysis of Lithuanian banking sector shows that it is not exceptionally specific. Like other East European countries, Lithuania is dominated by foreign banks, which control 60 to 100% of its market (Fig. 3). On the one hand, the domination of foreign banks increases the number of entities and theoretically promotes competition. On the other hand, foreign banks, as a rule, are huge companies able to promote the consolidation process. Such banks can take the dominating position in the market and significantly influence the performance of minor banks. Less com competition within the banking sector is detrimented to economic growth. Currently, Lithuania has seven commercial banks having the license issued by the Central Bank of Lithuania.

The management of the banks is rather specific: about 90% of the operating banks, such as Swedish SEB and Swedbank, Norwegian DNB and Danish Danske Bank, are managed by the Scandinavian countries which are not members of the eurozone. They can influence the whole system and cause problems to the public finances. If certain banks are not members of the Banking Union and have their homes outside the eurozone, they will be treated as any other bank in Lithuania and other eurozone countries. They would be covered by the EBU and have

to obey the regimes established, specifically, the regime of the general supervision and transformation. The European Central Bank will take over the supervision of the three largest banks registered in Lithuania, i.e. SEB, Swedbank and DNB, and the Central Bank of Lithuania will assist in the supervision. The same model is going to be implemented in other Baltic States. The costs of the Banking Union's entrenchment in Lithuania should be smaller than those of other eurozone countries. The Scandinavian countries have special funds for deposit insurance and bank transformation. In 2009, thirty banks in Denmark were transformed without using taxpayers' money (Verslo zinios, 2013).

Following the EC directions, Lithuania will have to establish a national bank transformation institution responsible for that transformation. The latter will have the right to control the failing or the failed banks, to take over the role of the shareholders or managers, to transfer property and liabilities as well as to ensure the execution of contracts. The transformation institution in settling banking problems will have to keep contacts with other international transformation institutions operating in some Member States and outside the EU. It has to be noted that the influence of the EU regulations on different countries should be different. Lithuania will only have to modify and adapt regulation of its financial sector. Certain regulations have already been embedded in the Law on the Bank of Lithuania and the Law on Financial Stability (Valstybes zinios, 2004, 2009). The European Commission does not identify the institution in charge of the transformation. Therefore, Lithuania can appoint that institution on its own, e.g. the central bank, the institution for financial supervision or the management of deposits security system etc. The EC, however, provides that the supervision institution (The Central Bank of Lithuania) can be a transforming institution only if the transformation functions are distinctly separated from the pursued supervisory functions.

The European Parliament and the EC Regulation No 606/2014 provide that every Member State is obliged to have its national transformation fund to be financed from the banks ex ante contributions and which shall be set up to transform banks provided the financial means of the transformation institution are insufficient. Ex ante support criteria shall be regularly reviewed. The Lithuanian banks are also supposed to pay ex ante contributions. This is the way to reduce the possibility of the state's financial involvement in the transformation procedure. Similarly, the banks registered in Lithuania shall accumulate around EUR 116 million in that fund. But when Snoras Bank collapsed in 2011, the depositors' indemnity required over EUR 1 billion (Verslo Zinios, 2013). It has to be noted that the established minimal values for Lithuania, with small and highly centralised financial system, can be too low while there is no prohibition on Member States increasing those values. Currently, these problems in Lithuania are solved at the expense of the state budget. When Ukio Bankas went bankrupt, the taxpayers' money was used and that was not the fund's money. The bankruptcies of both banks cost around LT 1 million of the taxpayers' money. At the end of 2013, seven banks and seventy-four credit unions deposited money in the deposits insurance fund which accounted for around EUR 1 million.

It is also important to set up a stringent security mechanism to prevent financing of the general transformation fund from the national budget.
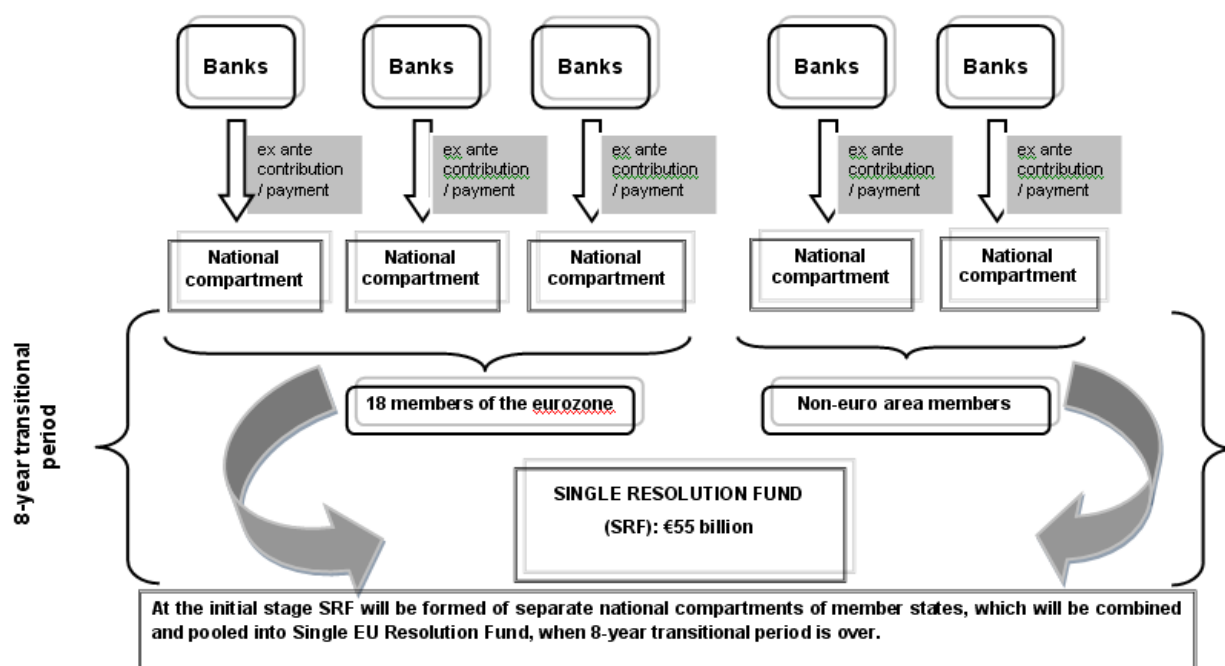
Fig. 4. **Single Resolution Fund (SRF)**

The money accumulated in the national transformation funds shall go to the Common (main) Transformation Fund and it can only be used for the rescue of the country's national banks. Consequently, the Lithuanian fund money in the transitional period cannot be used to finance the transformation or rescue of any Latvian or Estonian bank. The money from the Germany's transformation fund shall be assigned solely for the rescue of the banks of that country. Each country shall rescue its banks on its own account. However, with each year national responsibility shall decrease and the EU responsibility shall increase. After the eight year long transitional period, the national departments will be merged into a single EU transformation fund. That way, ever increasing portion of the money raised by each country shall go to the fund in charge of the transformation of all the eurozone banks. The fund money shall be used for the rescue of all the EU banks. Until the year 2026 as much as EUR 55 billion will be raised by collecting 1% of all the bank deposits. It is officially acknowledged that the Bank Transformation Fund will have the greatest influence on the largest European banks. Also, it is common knowledge that the German banking system is composed of small and medium-sized banks. That means that out of the total EUR 55 billion of the Common Transformation Fund, 90% will be raised from the largest banks of the eurozone, which, according to the data available by the EC, account for about 85% of all the assets of the EU banking system. The banks with the assets smaller than EUR 1 billion and with less than EUR 300 million in deposits are referred to as small size banks, therefore, they shall pay only 0.3% of the money raised for bailing out the failing banks, even though it accounts for about 1% share of the assets of all the eurozone banks. Medium-sized banks, which store about 14% of

all the assets of the eurozone banks, shall contribute 9.7% to the Common Transformation Fund. That means that the Germany's small and regional saving banks, which account for the largest share of the banking system, will pay only 1000 to 50 000 EUR to the Common Transformation Fund annually. The conception of the Common Transformation Fund is based on the idea that the bank contributions will largely depend on their size and risk profile. Currently, the EU institutions do not disclose the amount of each country' contribution to the Common Fund of EUR 55 billion (Ambrazas T., 2014).

The eurozone and Banking Union membership are related to other commitments for the international institutions. Lithuania will have to make its contribution to the European Stability Mechanism (ESM) established in 2012. Its mission is to render financial aid to the eurozone countries facing financial problems which threaten the eurozone stability. Lithuania's contribution is going to amount to EUR 280 million. The payment of that amount will be distributed gradually within five years, i.e. EUR 56 million per year seeking to evade dramatic effect on public finances (The Central Bank of Lithuania, 2014).

Table 1

The contributions of some EU member states to the ESM

Country	Percentage of contributions (%)	Paid-in capital (billion EUR)	Capital subscription (billion EUR)	Percent of GDP (%, 2012)
Estonia	0.19	0.2	1.3	7.6
Latvia	0.24	0.2	1.7	7.6
Lithuania	0.35	0.3	2.5	7.6
Slovakia	0.82	0.66	5.8	7.6
Germany	27.15	21.7	190	7.2

Source: authors' calculations

Some analysts regard it as extremely big costs of Lithuania's accession to the eurozone, others – as investment into the ESM and ECB capital. Lithuania, as other Member States, could seek a proportional share of the profit of those institutions. During nine months of the year 2013, ESM earned around EUR 185 million profit due to the repayment of loans by Spain and Ireland (Veidas, 2014). Lithuania's contributions might be somewhat higher than those of Estonia and Latvia while lower than that of Slovakia (Table 1). This policy tends to cause some doubts about the morality of such contributions.

Conclusions

1. For Lithuania as well as for other EU Member States, the accession to the EU banking union means transfer of important powers of the national state to the EU institutions. Regardless of the above mentioned problematic aspects, it can be stated that only the actions on the European level can ensure that the failing banks are transformed with minimal side effects and coherently in compliance with equal rules.

2. The Lithuanian banking sector is not in any way specific. Like other East European countries, Lithuania is dominated by foreign banks. On the one hand, that domination

increases the number of subjects and theoretically activates competition. On the other hand, foreign banks, as a rule, are large companies which tend to promote the consolidation process. Such banks can occupy a dominating position on the market and significantly influence the operation of smaller banks.

3. The question whether all the problems related to the accumulation and use of the Common Bank Transformation funds are solved, naturally arises. What about the problems resulting from the situation that the Fund was pegged to the rules regulating the uses of national funds first, and only then followed by the money transfer to the Common Transformation Fund?

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ASSESSMENT OF THE GOVERNMENT DEBT POSITION IMPACT ON THE GENERAL TAXATION POLICY

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Abstract. During recent financial crisis number of researchers investigated mutual influence of government debt on the fiscal policy. The present paper contributes to this topic by observational analysis of the world economics, having the goal to evaluate correlation between the value of debt and tax policy indicators over the recession period. The paper analyses public data on 176 countries, extracted from the IMF and the World Bank databases. The findings demonstrate general absence of correlation between the volumes of the state debt and the amounts of the collected taxes both in short-term and long-term perspective. This implies that world countries tend to increase debt and use refinancing to pay debt service costs to keep taxes at the present level at all costs.

Key words: government debt, tax policy

JEL code: H63, H68

Introduction

Reicher (Reicher, 2014) indicated that literature on systematic fiscal policy and macroeconomic performance in industrialized countries is large but fragmented. The empirical literature points toward strong anticyclical policy, which consists of procyclical tax revenues, acyclical tax rates and government purchases, and countercyclical transfer payments. Consolidation in response to the debt has come primarily through adjustments to taxes and possibly purchases. Large governments usually are associated with reduced macroeconomic volatility. Meanwhile, the theoretical literature on anticyclical fiscal policy has turned from focusing mostly on government purchases and tax rates toward transfer payments, although quantitative link between theory and empiric data still is poor.

Díaz-Giménez, J., Giovannetti, G., Marimon, R., & Teles, P. (Díaz-Giménez et al., 2008) considered fiscal discipline as a precondition for price stability, mentioning such rationale behind the Growth and Stability Pact in Europe. The underlying policy debate shows the concern regarding a time inconsistency problem associated with high levels of nominal debt

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that could be monetized. This model is describes the optimal sequential choice of monetary policy in economies with either nominal or indexed debt.

During recent financial crisis, researchers investigated some effects of government debt interaction with the fiscal policy. Klaus (Klaus, 2011) emphasised the fact that larger government debt gives rise to larger risks to the fiscal budget and to the tax rate. This, in turn, has important implications for optimal debt dynamics. In particular, it provides incentives to reduce government debt over time to reduce budget risk (provided the initial debt level is positive). As a result, debt dynamics deviates from random walk behaviour toward a second-order approximation to optimize policy. Typical analyses assume passive fiscal behaviour that couples higher government spending with an equivalent increase in lump-sum taxes to pay for the spending, and active monetary policy (see, for example, Gali et al., 2007; Monacelli and Perotti, 2008). Contrary to above approach, Davig & Leeper (Davig & Leeper, 2011) estimated Markov-switching policy rules for the United States and found that monetary and fiscal policies fluctuate between active and passive behaviour. Some authors are creating data sets for deeper analysis in the Eurozone area. For instance, the policy modelling, displayed in Paredes J et al. (Paredes at al., 2014), analyses fiscal and monetary consequences and points out that the most recent crisis had the largest negative impact on total government revenues. Indeed, in a historical period, which covers a number of economic downturns in the 1980s, in the mid-1990s, in the 2000s and the most recent crisis, only the latest, also called by researchers Great Recession, caused total government revenues of Euro zone countries to enter into negative territory in nominal terms. Kirsanova, T. and Wren-Lewis, S. (Kirsanova at al., 2012) analysed the impact of different degrees of fiscal feedback on debt when monetary policy is determined optimally, rather than following a simple rule. Recent studies indicate that fiscal and monetary policy regimes are not fixed over time and hence fiscal and monetary rules equations should be estimated within a stochastic framework (Cevik at al., 2014; Favero and Monacelli, 2005; Takero et al., 2012; Dewatcher and Toffano, 2011; Ito et al., 2011). For Latvian realities, tax policy is considered separately from debt policy problems. For example, S.Stucere and G.Mazure (Stucere and Mazure, 2013) analyzed tax policy as fundamental instrument for investment promotion affecting the economic competitiveness. This research was aimed on the analysis of basic socio-economic development indicators and the application of immovable property tax. Some aspects of budget policy and state debt were analysed by E.Zubule (Zubule, 2012) and S.Eglite (Eglite, 2006). N. Semjonova (Semjonova, 2012) explored the correlations between public debt and average debt interest rate, taxation rate and long-term growth (evaluated as GDP in 2011 in comparison to 2003).

The aim of the present research is to evaluate correlation between the value of debt and tax policy indicators over the recession period. The corresponding tasks are to analyse correlation between accumulation of the government debt, changes in the average tax rate and debt service costs both in short-term and long-term perspective.

Data and methodology

The object of the research is the world countries economies. The research used public data on 176 world countries from the IMF and the World Bank databases (World Economic Outlook Databases, 2013, World Bank Open Data, 2013). Selection of these 176 countries was made owing data availability: countries with no data were censored out. The analysis covered period from 2003 to 2011.

The paper analyses the following indicators that characterize current economic situation and allow evaluate long-term growth tendencies:

- *D/Y* - government debt to GDP ratio in 2003 and 2011;
- *T* - collected taxes to GDP ratio in 2003 and 2011;
- *b* - debt service costs share of the collected taxes in 2003 and 2011;
- *ΔT* – long-term changes of the collected taxes, calculated as difference between T_{2011} and T_{2003};
- *ΔD/Y* - long-term changes of the government debt to GDP ratio, calculated as difference between D/Y_{2011} and D/Y_{2003}.

While analysing taxes, one did not take into account the social insurance payments.

All 176 countries were broken down into six regions and two categories. Grouping by regions was based on geographic and cultural closeness: Western Europe; Eastern Europe and Central Asia (former CIS countries); South and East Asia and Pacific; Middle East and North Africa; Sub-Saharan Africa; Latin America and Caribbean. The greatest world economies (USA, Canada, Germany, France, Italy, UK, Spain, Japan and Korea) formed the G9 category. The last category included the most significant players on the international debt market, whose debts are indicated by the "Debt Clock" service: G9 plus Argentina, Australia, Brazil, China, Greece, India, Ireland, Mexico, Portugal, Russia, Saudi Arabia (World Debt Clock, 2014).

The correlations between the value of state debt and other indicators were evaluated by means of Pearson correlation coefficient. The statistical significance of the correlation coefficient was tested using Student's criterion with the level of significance α =0.05. Although scatter diagrams were analysed as well, this paper presents only some most interesting examples.

Research results and discussion

The topic of the present research is the relationship between the state debt policy and the tax policy. The main question is whether the states increase their debts to reduce tax burden and minimize distortional effect of taxes on economy. The USA is a typical example of such behaviour (Martin, 2009).

Table 1 summarizes data on correlation between the volumes of the state debt and collected taxes, broken down by world regions. The existence of negative correlation could

indice, that, indeed, "low tax countries" tend to borrow more, and thus, have higher level of the state debt.

<div align="right">Table 1</div>

Correlation coefficients between collected taxes and the value of the government debt *(T - D/Y)*

Group of countries	Correlation with debt in 2003	Correlation with debt in 2011
G9	-0.23 (P=0.56)	-0.19 (P=0.62)
"Debt Clock" countries	-0.26 (P=0.31)	0.06 (P=0.83)
South and East Asia and Pacific	**-0.46 (P=0.05)**	-0.29 (P=0.26)
Western Europe	0.23 (P=0.19)	0.18 (P=0.31)
Eastern Europe and Central Asia	-0.43 (P=0.29)	0.02 (P=0.95)
Latin America and Caribbean	0.30 (P=0.20)	**0.50 (P=0.03)**
Middle East and North Africa	**0.65 (P=0.04)**	0.15 (P=0.68)
Sub – Saharan Africa	-0.31 (P=0.23)	**0.51 (P=0.04)**
Seychelles and Lesotho excluded	**-0.75 (P=0.00*)**	0.05 (P=0.85)
Whole world	-0.05 (P =0.72)	0.13 (P =0.17)

Source: author's calculations based on the World Bank data   **P is < 0.005*

Analysis of Table 1 data demonstrates that for the whole world there is no correlation between volume of the state debt and collected taxes: the correlation coefficient is close to zero and corresponding P-value is high. Graphic evaluation by the scattering diagram (Figure 1) leads to the same conclusion.
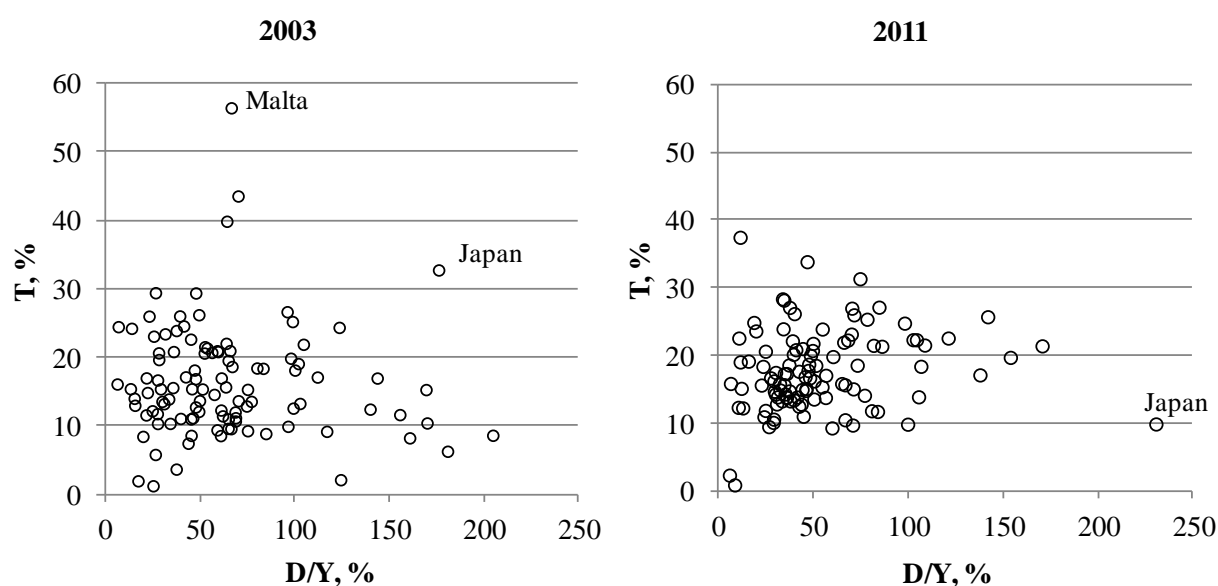
Fig.1. Correlation between collected taxes and government debt, world data

Nevertheless, while analysing situation by regions, one have observed statistically significant correlation between the debt and taxes in some regions. First example is Sub – Saharan Africa region, where, after exclusion of the two obvious outliers, Seychelles and Lesotho, strong negative correlation exists for the year 2003 data (Figure 2). It is remarkable that the correlation disappears in 2011. This could be linked to the debt relief initiative, from

which many Sub – Saharan Africa countries benefited between 2003 and 2011 (Debt Relief...,
2013).
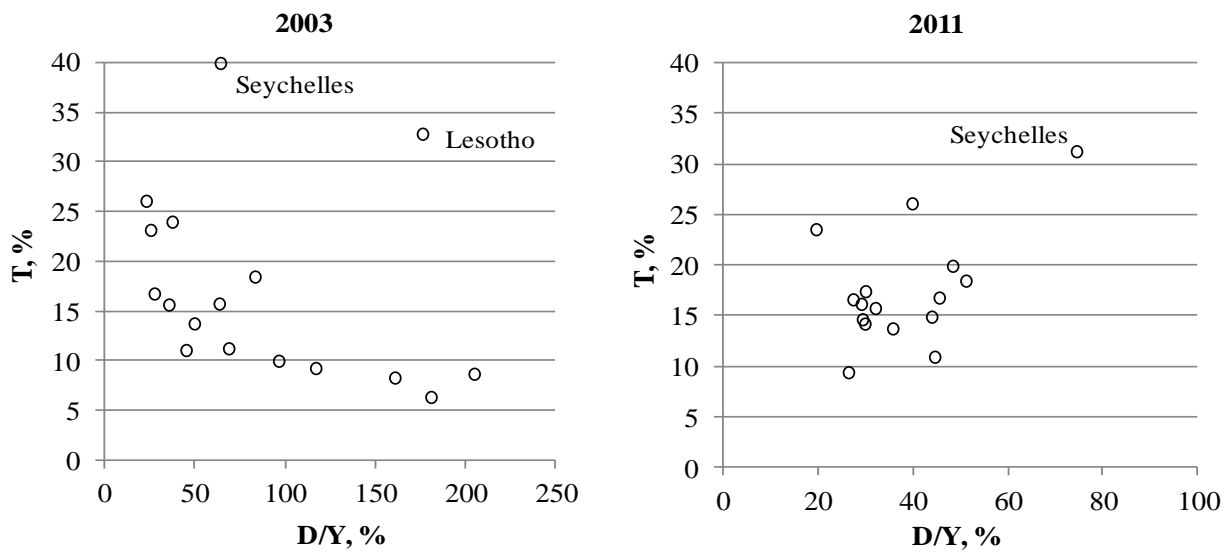
**Fig.2. Correlation between collected taxes and government debt for Sub-Saharan
Africa region**

Moderate negative correlation existed in 2003 in the South and East Asia and Pacific region,
although there was no correlation in 2011.

Moderate positive correlation appeared in 2003 in the Middle East and North Africa region
and in 2011 in the Latin America and Caribbean region, the scatter diagrams for the latter are
presented in Figure 3. Such a positive correlation could indicate the attempts of these region
countries to keep up with the debt by they own.
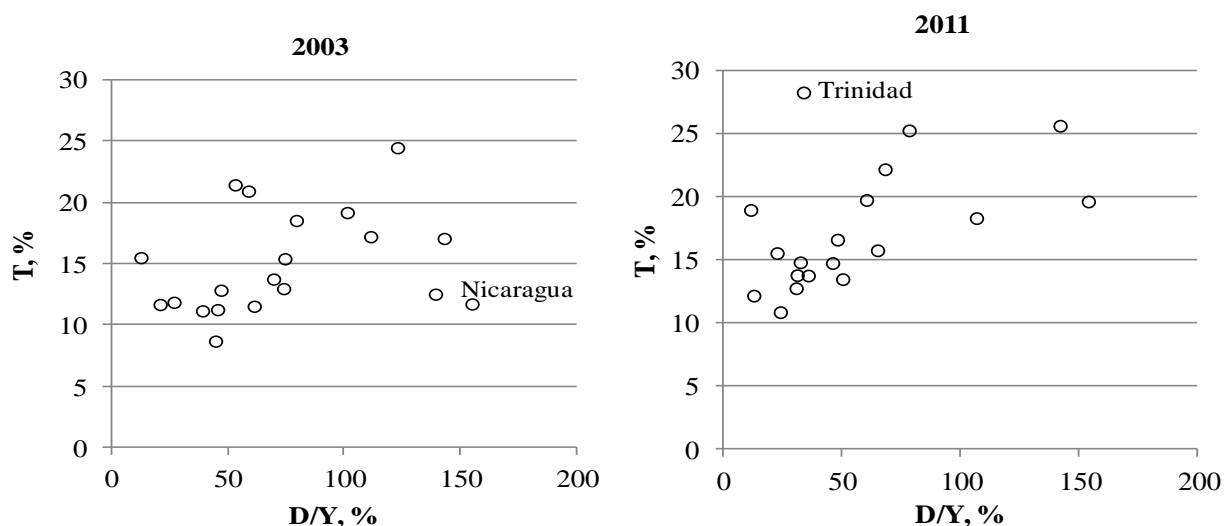
**Fig.3. Correlation between collected taxes and government debt for Latin America
and Caribbean region**

With the increment of the government debt, the debt service costs increases, too. Thus, the share of the collected taxes to be spent on debt service has to increase. Generally, this is true for the world economics, which demonstrated significant positive correlation between taxes share, spent to the debt service and debt itself (Table 2).

Correlation coefficients between debt service costs share from the collected taxes and the value of the government debt (b-D/Y)

Group of countries	Correlation with debt in 2003	Correlation with debt in 2011
G9	0.68 (P=0.05)	0.84 *(P=0.01)*
"Debt Clock" countries	0.56 (P=0.01)	**0.45 *(P=0.07)***
Brasilia and India excluded		0.90 *(P=0.00)*
South and East Asia and Pacific	**0.31 (P=0.23)**	**0.23 *(P=0.37)***
Japan and Singapore excluded	0.68 (P=0.01)	0.56 *(P=0.03)*
Western Europe	0.76 (P=0.00*)	0.77 *(P=0.00*)*
Eastern Europe and Central Asia	0.80 (P=0.02)	0.78 *(P=0.01)*
Latin America and Caribbean	0.58 (P=0.01)	0.69 *(P=0.00*)*
Middle East and North Africa	0.87 (P=0.00*)	0.91 *(P=0.00*)*
Sub – Saharan Africa	**0.21 (P=0.41)**	0.51 *(P=0.04)*
Whole world	0.51 *(P =0.00*)*	0.54 *(P =0.00*)*

Source: author's calculations based on the World Bank data   ***P is < 0.005**

Nevertheless, this correlation appeared non-significant in some regions. Detailed analysis demonstrated that such result is due to influence of some individual countries. For example in the "Debt Clock" group (Figure 4), Brasilia and India have relatively small debt (about 66%) but spend nearly 24% of the collected taxes for the debt service. Such a high expenditures could appear due to low credit reputation of these countries.
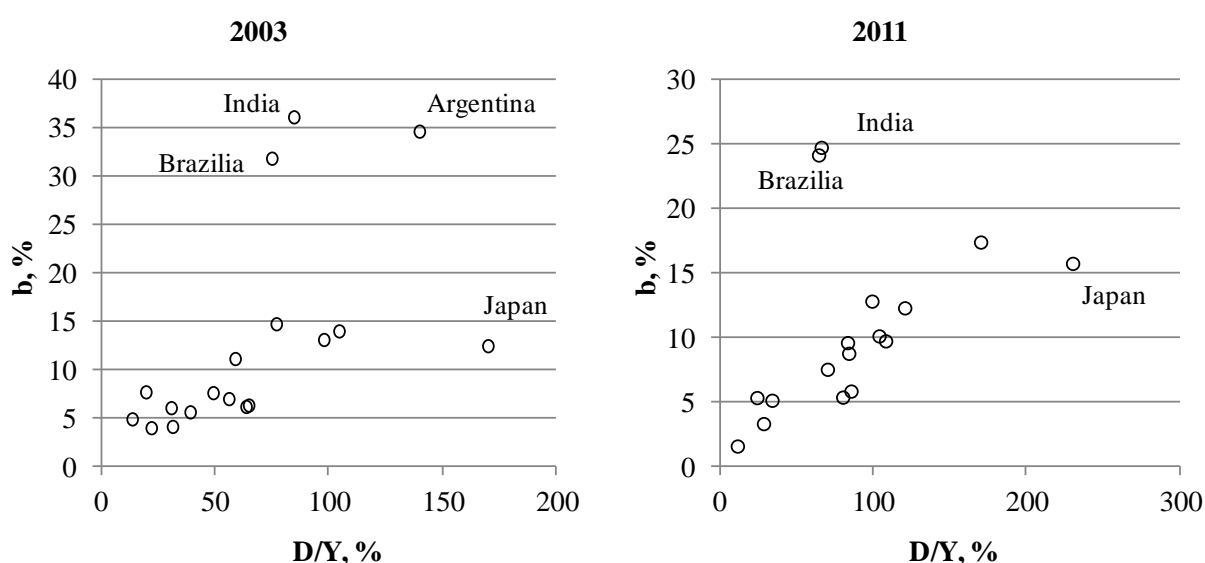
Fig.3. Correlation between debt service costs (in % from the collected taxes) and government debt for the "Debt Clock" countries

In turn, Japan and Singapore (in South and East Asia and Pacific region) have debt of 230% and 105% of GDP, correspondingly, but spend only 16% and 0.01% from the collected taxes to pay debt service.

In both considered cases, exclusion of the "outlying" countries from consideration bring correlation coefficient between the share of the taxes that is spent on the debt service, and the debt itself back to the significance.

Non-significant correlation in Sub–Saharan Africa in 2003 may indicate absence of the sustainable debt policy in the region that finally led to the necessity to implement debt relief initiative.

Another important question is whether the state increases the taxes to cope with the increased debt corresponding service costs. Table 3 shows correlation between long-term changes in the average tax rate and long-term change of the state debt over the period from 2003 to 2011.

Table 3

Correlation coefficients between long-term changes in the average tax rate and the value of the government debt ($\Delta D/Y - \Delta T$)

Group of countries	Correlation with debt	
G9	0.44	(P=0.24)
"Debt Clock" countries	-0.28	(P=0.28)
South and East Asia and Pacific	-0.11	(P=0.68)
Western Europe	0.10	(P=0.60)
Eastern Europe and Central Asia	0.17	(P=0.71)
Latin America and Caribbean	-0.19	(P=0.48)
Middle East and North Africa	0.22	(P=0.61)
Sub – Saharan Africa	-0.22	(P=0.50)
Whole world	-0.16	(P=0.13)

Source: author's calculations based on the World Bank data

The absence of correlation for the whole world and each group/region clearly demonstrates that countries do not increase taxes in response to the increment of the state debt. Instead, they could use other means, such as debt restructuring or re-financing.

Conclusions

1. There is no correlation between the state debt and the amounts of the collected taxes in the whole world and in the major part of the world regions. Besides, in Latin America and Caribbean region in 2011 countries with higher debt had higher level of taxes.

2. There is a significant moderate positive correlation in the world between the part of the collected taxes, that states spend on debt service. Absence of such correlation for some regions is due to influence of few countries that could be treated as exceptions.

3. There is no correlation between long-term changes of the state debt and corresponding long-term changes in the average tax rate both in the whole world and in the each considered region.

4. Observed behaviour implies that the world countries tend to increase debt and use refinancing or re-borrowing to pay debt service costs to keep taxes at the present level, possibly to prevent social tension.

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FOREIGN DIRECT REAL ESTATE INVESTMENTS IN LATVIA IN THE CONTEXT OF THE DEVELOPMENT OF THE NATIONAL ECONOMY

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Abstract. Real estate investing has a major role in the development of each country. Nowadays, in the context of increasing globalization level, one of the most important objects of the analysis is the foreign direct investment in real estate. The investment multiplier effect in the real estate market is also very important, as the real estate market and construction industry investments are approaching also other sectors, which is in turn increasing the gross domestic product. The aim of the study is to analyze foreign real estate investments in Latvia, by examining a number of scientific and practical aspects associated with this matter. The statistical data analysis, comparative and logically constructive methods have been used in the study. The importance of this matter and the direction of future researches have been defined. The study also provides recommendations for branch regulation planning.

Key words: real estate investments, FDI, real estate market, construction development, fiscal policy.

JEL code: E22; F21; F62; R30

Introduction

Real estate investments are one of the most popular types of investments. The total impact of the foreign direct investments on the overall development of the country has been analysed in the study. *The aim of the research* is to analyze foreign direct real estate investment development tendencies in Latvia, by examining a number of scientific and practical aspects associated with this issue as well as by defining their impact on the national economy. The object of the research is the real estate market of Latvia. The statistical data analysis, comparative and logically constructive methods have been used in the study. The importance of this matter and the direction of future researches have been defined as well. The study also provides recommendations for branch regulation. In the course of the study, it has been also observed that the increase in the price level of the real estate objects is also related to the increase in the foreign real estate direct investing. The importance of the study is also determined by the fact that the study of investment is of great importance for the understanding of the business cycles and economic activity (House, 2014).

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1. Theoretical Aspect Overview

It should be noted that the economies of several countries are interrelated, and the increase in the foreign direct investing can be observed in many countries and regions. The interrelation of investment flows and real estate market is being determined by the following major aspects (Vanags, 2007):

- investment relationship with the real estate development process;
- dominant role of the real estate in business and its expansion;
- crucial role of land in agricultural production and construction, business expansion;
- significance of investments in the construction industry;
- impact of the state economic policy on the investment flow and real estate markets as well as other aspects.

Fiscal policy of government plays a great role in regulating investment inflows and outflows. By analysing Hungary, Latvia, Lithuania, Poland and Romania, for the period 2000-2010, the strong support has been defined for the conjecture, which states fiscal policies are determinants for FDI and fiscal competition between governments for FDI is a business environment, which is determined primarily by fiscal policy (Göndör and Nistor, 2012). Measuring the effects of discretionary fiscal policy is both difficult and controversial (Bouakez, Chihi, and Normandin, 2014). At the same time a more countercyclical fiscal policy significantly enhances output growth in more financially constrained industries, in which counterparts are more dependent on external finance or display lower asset tangibility (Aghion, Hémous, and Enisse Kharroubi, 2014).

Investment volumes in the country also affect the interest rates and capitalization rates. Changes in monetary policy affect the conditional mean of the short-term interest rate which in turn affects macroeconomic variables such as output, employment, and inflation (Gust and López-Salido, 2014). A variety of internal and externals factors affects investment decision-making, and one of the most important are provisional results of calculations before making a decision. The choice of capitalization rate is important procedure - a slight change, increasing or decreasing, of the capitalization rate corresponds to significant inverse variations in the estimations (Manganelli, Morano, and Tajani, 2014). Real estate needs effective management in order to generate income in a greater degree than other assets and at the same time (Asaul, 2004):

- real estate is a fairly complicated product as an investment object for most investors;
- it can be the object of investment, allowing to derive more profit for investors with sufficient knowledge in the field of real estate management.

The study of the foreign direct investments should involve also the consideration that several phenomena have both positive and negative effects. In practice, different influences on real estate market and construction sector are observed – at macro level (country and industry), at mezzo level (projects and enterprises) and at micro level - project and organization level (Tamosaitiene, Zavadskas, and Turskis, 2013). Both positive and negative

effects of FDI are obvious. FDI may be considered as a catalyst to business creation, especially in combination with governance strength, by attracting desirable types of FDI (Herrera-Echeverri, Haar, and Estevez-Breton, 2014). The estimated returns of FDI inflow in a host country are technology diffusion, capital accumulation, intellectual property transfer, know-how, acquisition of managerial experience and others (Temiz and Gökmen, 2014). It is important to mention that FDI can have an impact on the economic growth also by affecting technology transfer, mostly when an absorption capability of advanced technologies exists in the national economy (Borensztein, Gregorio, and Lee, 1998). It has also been researched (Aurangze and Borsa, 2014) that the countries with higher levels of FDI inflows have higher factor-productivity in the export sector in comparison with the countries with low FDI inflows and export-oriented policies play an important role during the development process.

At the same time, it is suspected that FDIRE may have a side effect of overheating the real estate market (Hui and Chan, 2014). There are different versions about causes of real estate market overheat. McDonald and Stokes (2013) divide real estate market bubbles reasons to four parts – unsound lending practices created by financial sector, complex mortgage-backed securities, the shadow banking system that relied on high degrees of financial leverage and short-term borrowing as well as other reasons. Also if globalization actually increases within and between countries, as diverse range of exports, inequality above moderate levels may cut world aggregate demand and thereby world economic growth by rising world inequality and slower world growth (Wade, 2004), so international contagion risks exists among real estate markets requires international cooperation among financial regulators (Hatemi-J, Roca, and Al-Shayeb, 2014). As FDI has the potential to provide both positive and negative macroeconomic effects for the recipient countries, it is extremely difficult theoretically to predict the respective degree of these countervailing effects, and therefore the empirical researches have to be made (Iwasaki and Tokunaga, 2014).

Long-term investor experience is better to be captured by compounding short-term returns in order to obtain long-term buy-and-hold returns (Fama, 1998). The nature of investor protection and regulation of financial markets in each country is deeply rooted in the legal structure of each country and in the origins of its laws (Porta, Lopez-de-Silanes, Shleifer, and Vishny, 2000). In addition, there are fundamental differences between small and large enterprises, such as the difference between the size of company and corporate finance practices - small enterprises are less sophisticated when it comes to evaluating risky projects than large enterprises (Graham and Harvey, 2001). The advent of the real estate securitization mechanism provides increased liquidity for traditional real estate investment (Lee, Chien, and Lin, 2012). In investment flow analysis it is necessary also to analyse the factors affecting the demand. The non-price factors affecting the demand are the following (Vanags, 2010):

a) increase or decrease in the income of the participants forming the household and other market demands;

b) state monetary and fiscal policy;

c) changes in state demographic situation;

d) state regional policy;

e) location of saleable immovable product;

f) future expectations of potential buyers;

g) attitude of potential buyers to the environment and other factors.

Demand analysis has a great role in real estate valuation as well. A link between real estate valuation and the current account deficit follows from fact that the growing deficit of the current account is a signal of a growing gap between the spending of domestic residents and their output. This was observed in both periods before and after the crisis of 2008-09 (Aizenman and Jinjarak, 2014). Economy in general has range of tasks, which should be solved, and it is a complicated process. The compromise should be found and the priority targets should be selected. Therefore, the economic policy regulation should also take into account the needs of the society, which would at the same time contribute to the development of the total construction industry and the real estate market.

2. Practical Research Part

By analyzing FDI in Latvia, it can be concluded that the amount of direct investment of the EU countries substantially exceeds the amount of direct investment of any other group of countries, and this predominance is presented in Figure 1 and can be observed in 2012 and 2013.
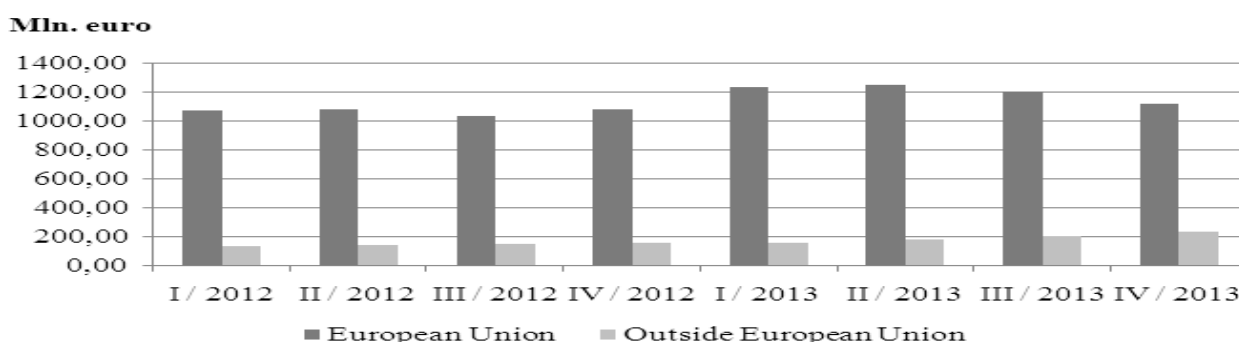
Source: author's construction based on Eurostat Statistical Data

Fig.1. **FDI data in Latvia by countries**

By analyzing results of the construction industry and real estate market, which are presented in Figure 2, it can be concluded that over the period from the second quarter of 2012 to the second quarter of 2014, the ratio of the real estate transactions in the total foreign investments exceeds the foreign investments in the construction industry by approximately two times, and in the analysed period they ranged from 11.93% to 13.29% of the total foreign investments in the real estate sectors, so the ratio of the foreign real estate investing over the analysis period has kept its positions. Since the development of the construction industry creates new jobs, it is advisable to take measures to increase the level of construction investments in order to develop this industry and the economy in general.
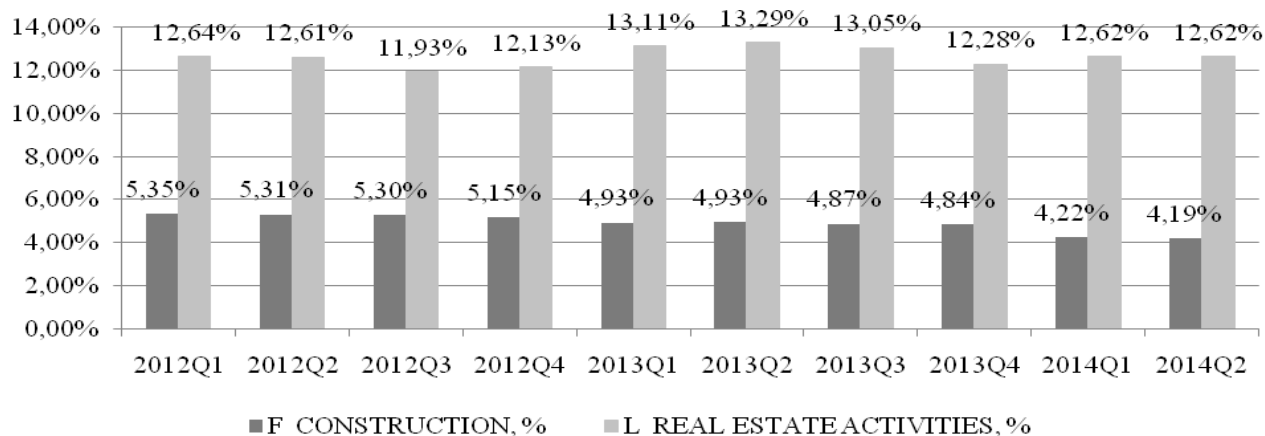
Fig.2. **The share of construction industry and real estate operations in GDP of Latvia, %**

Figure 3 presents the FDI data by kind of activity and house price index in Latvia over the period from 2006 to 2013. By analyzing information, it can be concluded that FDI in real estate development dynamics in Latvia has substantially avoided the crisis in 2009, and after the amendments to the Immigration Law, the real estate investing in Latvia has only increased. Figure 3 presents that the house price index and FDI in real estate had similar development trends in Latvia starting from 2010.
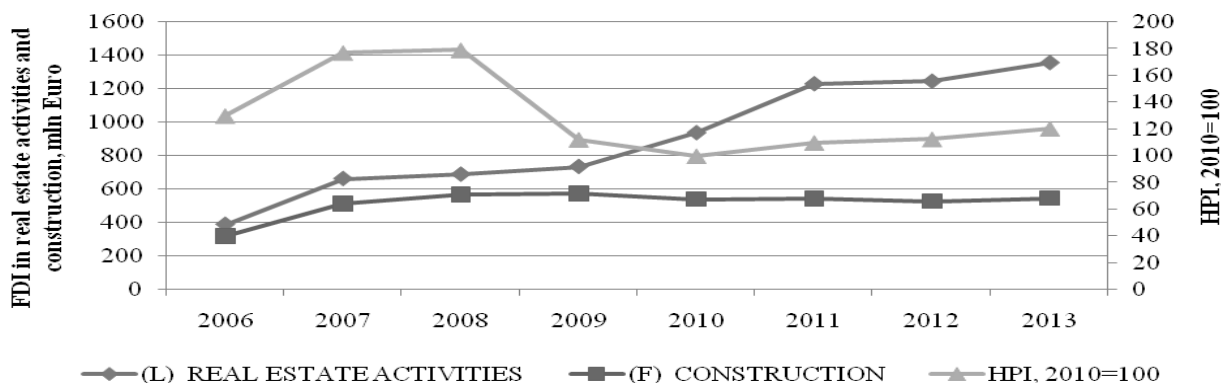
Fig.3. **FDI data by kind of activity and house price index in Latvia**

From the first quarter of 2010 to the first quarter of 2014 the foreign direct investments grew by 95.41% - from EUR 744.26 million to EUR 1454.34 million (see Figure 4). The purchasing power does not grow so rapidly as the real estate prices, which are influenced by the foreign investing. From the first quarter of 2010 to the first quarter of 2014 the average wages in Latvia have grown by 23.97%, the house price index of the new dwellings grew by 78.99% and the house price index of the existing dwellings grew by 20.74%. The largest number of transactions has long been observed in Riga, Riga region and Jurmala (Geipele et al., 2013). The State Land service data (2013) shows that these are the most demanded areas in Latvia for foreign investors.
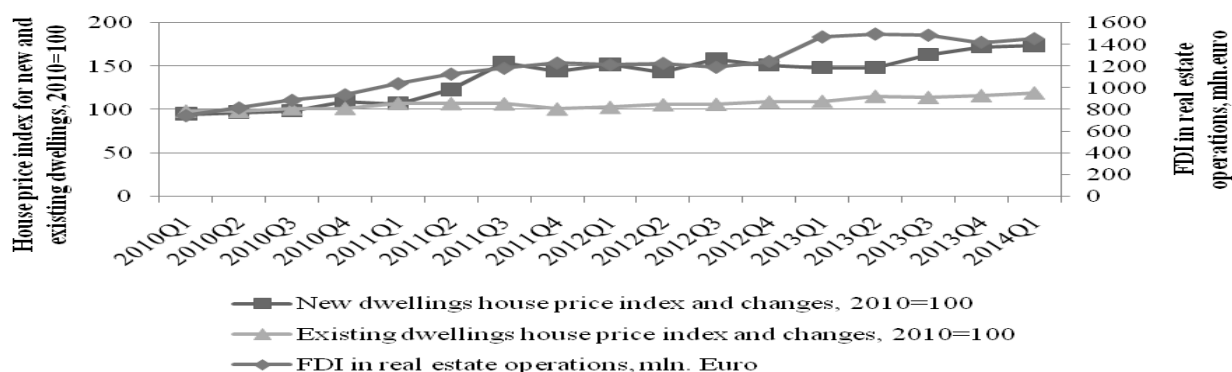
Fig.4. **FDI in real estate operations and house price index for new and existing dwellings in Latvia**

In the context of price level changes, the existing dwellings are less affected, because the foreign investors prefer new dwellings. The average wages in Latvia are also not increasing so rapidly as the number of real estate purchases (see Figure 5).

Fig.5. Real estate deals and average salary in Latvia a State Unified Computerised Land Register

Since 2009 all confidence indexes in construction of buildings, civil engineering and specialized construction activities have been improved, but in 2014 confidence index in civil engineering has reduced in comparison with the previous year. Confidence indicators in construction in Latvia are presented in Figure 6.

Fig.6. Confidence indicator in construction in Latvia (balance, %)

GDP indicators in construction and real estate operations, changes of dwellings price index and unemployment level are presented in Figure 7. From the first quarter of 2010, GDP indicators in construction and real estate operations as well as dwellings price index have been improved, and the unemployment level has been reduced, which was the positive development tendency of national economy.
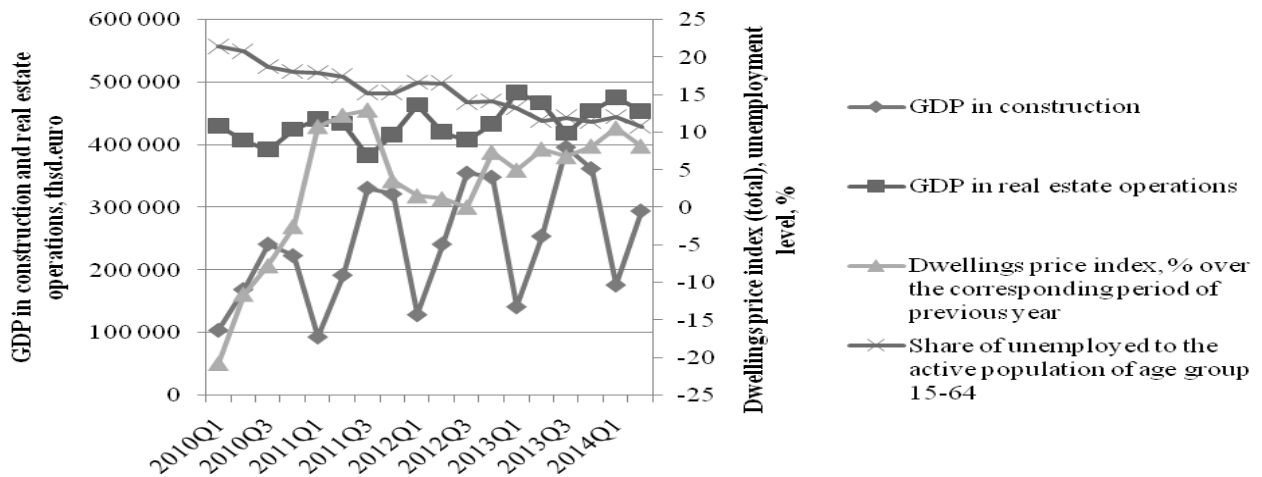
Source: author's construction based on Central Statistical Bureau of Latvia
Fig.7. Real estate market and economic indicators in Latvia

GDP in real estate operations also has a cyclical development tendency. Market integration indicator - Foreign Direct Investment (FDI) intensity index in the Baltic States - varies, and is lower in post-crisis period than in 2005-2007. Market integration indicator – FDI intensity in the Baltic States over the period from 2004 to 2013 is presented in Figure 8.
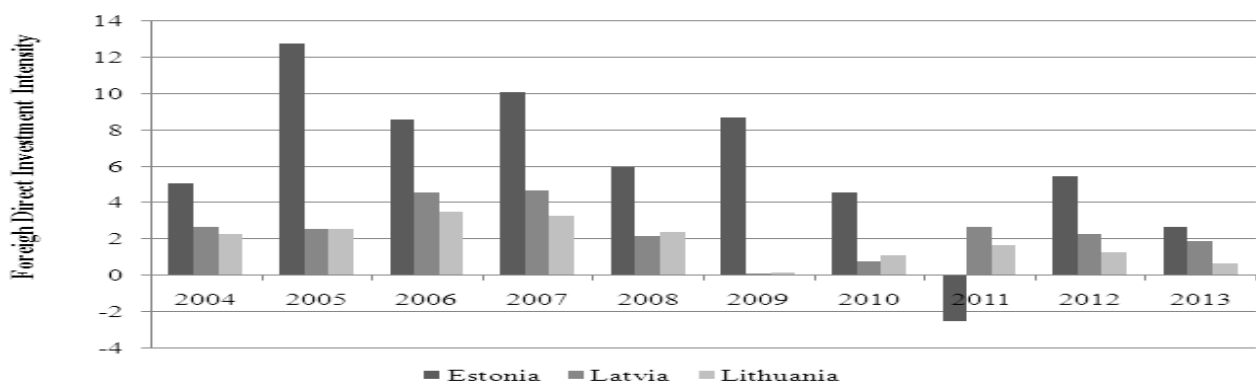
Source: author's construction based on Eurostat Statistical Data
Fig.8. Market integration - Foreign Direct Investment intensity - Average value of inward and outward Foreign Direct Investment flows divided by GDP, multiplied by 100

FDI intensity indicator is one of the market integration indicators, which also presents a globalization level dynamics and Estonia has a leading position and highest FDI intensity level among all Baltic countries.

Conclusions

1. In the current study, the positive and negative FDI effects on the national economy have been reviewed as well as the practical research has been carried out, mainly focusing on the situation in Latvia. The real estate market can solve a number of socio-economic problems, so its importance is growing in the course of time.

2. Taking into account the fact that the investments in real estate market and construction industry are of great importance, they also affecting a national economy development. During the research period, the higher FDI volumes have been invested in real estate operations. In consequence of the development of the construction industry, the new working places are being created, so it is advisable to take measures in order to increase the investments in the construction industry and to develop this industry and the economy in general.

3. Fiscal policy should take into account a number of potential problems, analyze them from different perspectives as well as review the specifics of the investment decision making. Business representatives should regularly follow the development trends of the macroeconomic indicators, including the consumer confidence index as well as the confidence indexes in the industries, in which they are operating. In the further researches, the fiscal policy regulation shall be analysed in more details and more countries shall be involved.

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PUBLIC INTERNAL CONTROL IN THE EUROPEAN UNION

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Abstract. Public internal control differs from country to country as it has to fit into the respective overall governance arrangements with the government and the supreme audit institution as well as the accountability arrangements that exist between stakeholders. The aim of this research is to find out common and different internal control elements in twelve European Union (EU-12) countries. The tasks of this research are: to analyse revenue indicators in the EU countries, to analyse internal control systems in the EU countries, to make conclusions and to make proposals for further research tasks about the internal control of the administration of Latvia and improvements of the internal audit systems. The methods of this research are economic analysis (monograph) method and graphic method. The main results from this research – not all of the countries interpret the concept of internal control in the same way – some countries have special independent internal control institutions, in some countries, decentralised system of internal control is embedded and forms an integrated part of the administration. More and more countries also require top managers to apply systems for managing or mitigation of the risk of not achieving set objectives. Almost all of the EU member states have established internal audit function, but do not cover all systems of public administration.

Key words: internal control, audit, public administration
JEL code: M42

Introduction

Reforms in European Union Member States public administration systems could be explained by the objective need to adjust general reforms and could also be related to trends, such as recognition of the need to manage risk since 2000. In this period, public internal control system has developed into a widely used, integral and vital part of most governance systems in Europe (Compendium..., 2014).

Internal accountability arrangements are also a determining factor, as is the content of accountability of those responsible for carrying out public tasks. A distinction can be drawn here between legal accountability for compliance with rules and regulations and managerial accountability for the use of public resources to achieve goals. Budgeting and accounting

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arrangements also have to be taken into account. The need to establish an internal control, report on it, and apply a risk management approach can be set out explicitly in laws and regulations or derived from existing legal basis. In decentralised systems, top managers have to report on the functioning of the internal control systems. Many countries also require top managers to apply systems for managing or mitigating the risk of not achieving the set objectives (Compendium..., 2014).

The aim of this research is to find out common and different internal control elements in twelve European Union countries.

The tasks of this research are: to analyse the revenue indicators in the EU countries, to analyse the internal control systems in the EU countries, to make conclusions and to make proposals for further research of the internal control of the public administration of Latvia and improvements of the internal audit systems.

The methods of this research are economic analysis (monograph) method and graphic method.

EU countries in taxation perspective

For illustration of differences in all European Union Member States author has compared Member States tax revenue indicators.

In previous researches author has found government revenue as a one of indicators for implementing internal audit systems in Latvia local governments.

The first effects of the global economic crisis were felt on revenues already in 2008 even though in the European Union the annual growth turned negative only the following year — growth slowed down substantially during the third quarter of 2008 and turned negative in the last quarter.

The crisis and the measures of fiscal policy adopted in the European Union countries have a strong impact on the level and composition of tax revenue in 2009–2013, although the first effects had already become visible in 2008.
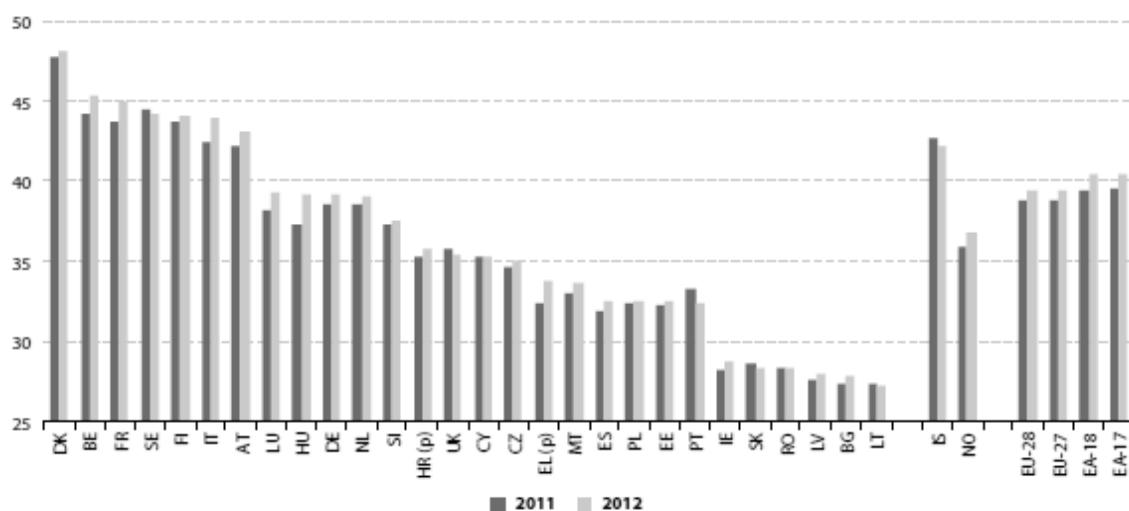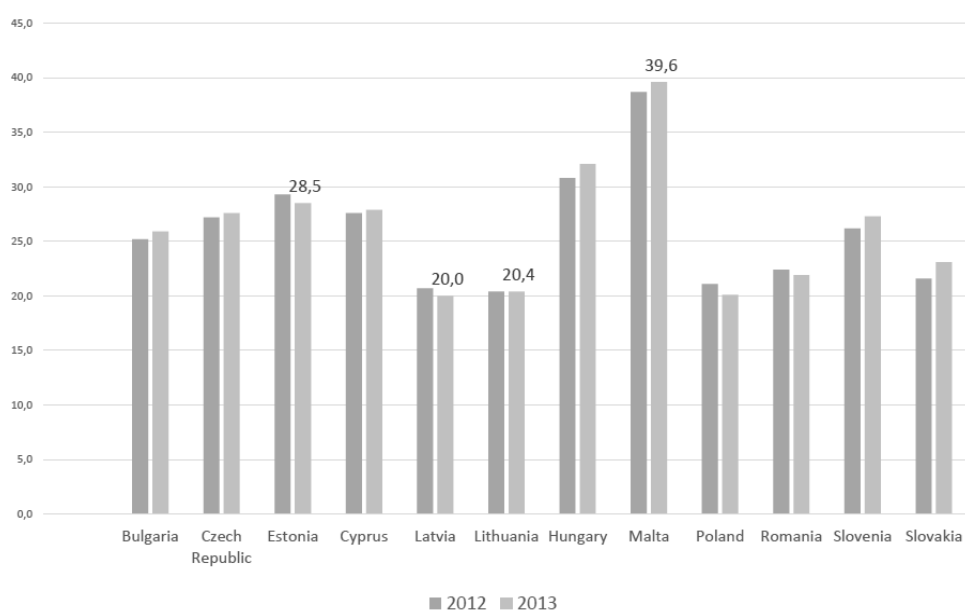
Fig. No.1 **Tax revenue (including social contributions), 2011-2012, % of GDP**

In 2012, tax revenues in percentage of GDP increased in 22 European Union Member States.

In 2013, estimates from main aggregates of general government and quarterly data show that tax revenues as a percentage of GDP are set to continue rising (Taxation Trends in the EU…, 2014)

Author in previous researches has found for Latvia situation government revenue as a one of indicators for implementing internal audit systems in Latvia local governments.

In this research, twelve European Union Member States since 2004 and 2007 have been compared (Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, and Slovenia).

Fig. No.2 **Total general government revenue, percentage of GDP**

In fig. No. 2 is shown the total general government revenue, percentage of GDP: Lithuania and Latvia have similar indicators, but Estonia has the first place of all Baltic States and Malta has the highest level of total government revenue. All new countries, except Hungary and Malta total general government revenue, are at the average of about 25% of GDP.

The tax-to-GDP ratio of Baltic states – Estonia, Latvia, and Lithuania (including the social contributions), since 2007 Estonia has a higher ratio than the other Baltic States, and Latvia has the lowest indicators except for the year 2012.
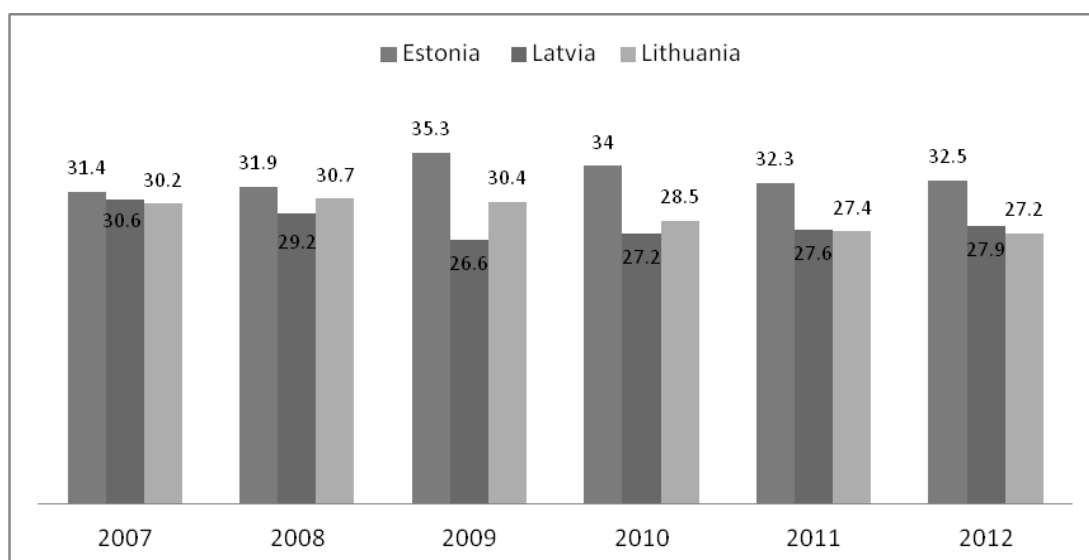
Source: author's construction based on Taxation trends..., 2014

Fig. No.3 **Development of tax revenues** (tax-to – GDP%)

In the fig. No.3, the ratio in Estonia has decreased in comparison with the level of crisis years (peak in 2009 at 35.4%). In comparing the performance of the Baltic States, in year 2012 the Lithuanian tax-to-GDP ratio (27.2%) was close to Latvia (27.9%).

Accession to the European Union has clearly been of fundamental importance for the way in which the newest Member States have reformed their public administration in general and their public internal control systems in particular. (Compendium..., 2014)

Like tax revenue indicators differences in all European Union Member States and similar closed indicators in Baltic States internal control systems in public administration show similar picture.

Internal control and internal audit in EU member states

There are countries where administrative reforms have been aimed at fundamentally devolving or decentralising central public powers (for example Italy and Spain). In other countries reforms have been based in part of the view that some services that are delivered today by non-public or partially competitive organisations (for example Sweden and United Kingdom).

The most striking developments in public internal control components in Europe have resulted from an increasing attention to objectives and performance management, to risks and

governance as a whole, including accountability, as well as to the quality of service delivery and cost efficiency. These developments have led to the wide introduction international or national standards; clearly defined legal basis and clearer mandates for control, internal audit and- where it exists – financial inspection. The functional independence of internal auditors has increased, and they are expected to deliver new or wider services, focusing on economy, efficiency and effectiveness.

Internal accountability arrangements are also a determining factor, as is the content of accountability of those responsible for carrying out public tasks. A distinction can be drawn between legal accountability for compliance with rules and regulations, and managerial accountability for the use of public resources to achieve goals. Budgeting and accounting arrangements also have to be taken into account. The need to establish an internal control, report on it, and apply a risk management approach can be set out explicitly in laws and regulations or derived from existing legal basis. In decentralised systems, top managers have to report on the functioning of internal control systems. Many countries also require top managers to apply systems for managing or mitigating the risk of not achieving the set objectives. (Compendium..., 2014)

Not all countries interpret the concept of internal control in the same way – some countries have special independent internal control institutions, in other countries decentralised internal control system is embedded, and forms an integrated part of the administration. The need to establish an internal control, report, on it, and apply a risk management approach can be set out in regulations and laws or derived from existing legal basis. Some European Union countries also require top managers to apply systems for managing or mitigation the risk of not achieving set objectives (Compendium..., 2014)

Almost all European Union member states have established internal audit function, but do not cover all systems of public administration. Internal auditors use formal and informal ways to achieve a relevant level of coordination and harmonisation. Traditional compliance and financial audits are increasingly supplemented by various consultancy services and audits of performance that require a professional and well trained internal audit staff. Some of the member states have established audit boards or audit committees. The coordination and harmonisation of the internal control and internal audit in the public sector at large or in the government sector is achieved through many different means (Compendium..., 2014).

There are not many comparable internal control indicators for all 12 European Union member states because of the different ways and systems of internal control and internal audit approaches.

Internal control and internal audit systems in 12 European Union countries were established in a period of three years:

2000- **Latvia**, Malta;

2001- Bulgaria, **Estonia, Lithuania**, Slovakia;

2002- Poland, Romania, Slovenia;

2003- Hungary, Check Republic, Cyprus.

Internal control and internal audit systems were one of the major elements for pre-accession in the European Union. All these countries joined the European Union in 2004, except Bulgaria and Romania, which joined the European Union in 2007.

All Baltic States established an internal audit system almost simultaneously in 2000 and 2001.

Audit activity of an effective public sector

European Union Member States are in different situation with internal audit implementation, internal audit system in public sector.

Future plans for some countries are stated (Compendium..., 2014): reforms in public administration or public internal control system, decisions to establish reporting, accounting, internal control and audit systems at regional/local government levels or for non-public/partly public services, with the ambition of ensuring and equal level of protection, transparency and effectiveness, irrespective of where public resources are spent (Estonia, Lithuania, Romania). Estonia, Lithuania, and Hungary are going to introduce systematic quality assessments, quality monitoring (review systems). The Czech Republic, Latvia, and Slovakia plan to simplify the streamline control and audit systems within the government sector, but also in other parts of the public sector.

Public sector audit activities must be configured appropriately to enable public sector organisations to fulfil their duty to be accountable and transparent to the public while achieving their objectives effectively, efficiently, economically, and ethically.

Author fully agrees that nine key elements of an effective public sector audit activity (IIAs 2010 Global Audit Survey – 13500 responses around the world): are comprehensively

1) Organizational independence;
2) Formal mandate;
3) Unrestricted access;
4) Sufficient funding;
5) Competent leadership;
6) Objective staff;
7) Competent staff;
8) Stakeholder support;
9) Professional audit standards (Supplemental guidance..., 2012).

The opinion of the author of the paper is that in Latvia some political influence to organizational independence in internal audit function is the key factor for the law added value of our internal audit in public sector institutions.

Latvia legislation rules require a certification for audit function leaders and experience in internal audit field. Changing of the internal audit function staff cannot provide a competent and objective staff. There is no summarised data about Certified Internal Auditors (CIA) in

Public administration, but there are two internal auditors Certified Government Audit Professional (CGAP).

Conclusions, proposals, recommendations

1. Many countries also require top managers to apply systems for managing or mitigating the risk of not achieving set objectives.

2. Not all of countries interpret the concept of internal control in the same way- some countries have special independent internal control institutions, in some countries decentralised internal control system is embedded and forms an integrated part of the administration.

3. Almost all EU member states have established internal audit function, but do not cover all systems of public administration.

4. Public sector audit activities must be configured appropriately to enable public sector organizations to fulfil their duty to be accountable and transparent to the public while achieving their objectives effectively, efficiently, economically and ethically.

5. The opinion of the author of the paper is that in Latvia some political influence to organisational independence in internal audit function is the key factor for the law added value of our internal audit in public sector institutions.

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BUSINESS ANGELS – POSSIBILITY FOR EUROPEAN SMES

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Abstract. Access to finance remains one of the top problems for SMEs in Europe, mainly because of their high relevance on traditional bank loans. In this paper, the main characteristics of European SMEs will be analysed. As one of the top problems for this class of enterprises in European Union is access to finance - the paper will evaluate the possibilities of Business Angels in solving this issue. The paper will also seek the answer of whether the possibilities of Business Angels meet the financial needs of SMEs and what could be done in order to enhance the positive outcome of their possible cooperation.

The main conclusion of the paper stands that while having a great potential to finance and enhance the outcome of SMEs, so far, the performance of Business Angles had been rather poor. The broad fragmentation of the market, the lack of unified terminology and the absence of well-formed unified legislative base are highlighted as the main reasons for poor private investments in European SMEs.

Key words: SME, Business Angels, alternative investment

JEL code: O16

Introduction

This paper will stress the problem of SME's access to finance paying special attention to one of the alternative financing opportunities – Business Angels. The author will look through statistic data, reviews and publications in order to examine whether Business Angels can be considered as worthwhile opportunity for financing SME's.

Annual report of European SME's 2013/2014, presented by the European Commission on July 2014, claims, that Small and Medium-sized Enterprises (SMEs) still form the backbone of the European economy. According to the statistical data mentioned in the report, some 21.6 million SMEs in the non-financial business sector employed 88.8 million people and generated EUR 3.666 trillion in value added. Expressed another way, 99 out of every 100 businesses are SMEs, as are 2 in every 3 employees and 58 cents in every euro of value added. Stability and growth of SME's are vital in dealing with such topics as unemployment, increase of export

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market share as well as overall economic development. Even though there is a fair work done so far, access to finance still remains one of the top problems for SMEs in Europe. Access to finance was rated as the fifth most pressing problem SMEs face - 14% of EU28 Member State SMEs stressed it to be the most pressing problem (Access to Finance…, 2014). Nevertheless, the author assumes that the real size of this problem might be more intent. For instance bank loans, which are wildly recognised, have several cons. After the crisis banks are less risk-taking, thus, even if accessible this way of gaining the finance became more challenging. Another problem which banks face is the quality of their capital, which is a certain boundary for further credit activities. What is more, traditional bank lawns do not provide any additional support except credits.

Alternative investment continues the development. Such topics as seed capital, securitisation and other ways of funding have been wildly discussed, mainly because of the extra possibilities they bring. In this paper the author will focus on Business Angels, a special class of private investors. On the top of everything, Business Angels, besides the financial investments can also help with business management and share their own business experience, which at the end, can turn to be even more valuable. The top target of this paper is to prove the hypothesis that Business Angels can be considered a good alternative of finance captivation and that they can give the valuable support to SMEs. First thing to be done is the analysis of the structure and main characteristics of SME's in Europe. Then, a brief analysis of alternative investments and evaluation of Business Angels will be done. In order to enhance the analysis, the author will use the following research methods:

- Monographic method;
- The method of economic analysis;
- The method of graphical visualisation.

The object of this paper is the access to finance for SMEs. The main aim of this research is to evaluate the possibilities of Business Angels in financing the SMEs on the basis of the analysis of SMEs in European Union and problems they face to access the finance.

In order to reach the aim mentioned, several tasks have been identified:

1) To analyse the structure of SMEs in European Union;
2) Highlighting the main problems SMEs face;
3) To understand if there is a need in finance and how big is it;
4) To analyse the activity of Business Angels in Europe;
5) To evaluate if Business Angels are capable to meet the needs of SMEs.

Research results and discussion

To start, it should be unified what types of enterprises are considered to be SMEs in Europe. Within the framework of this paper the author will use the definition proposed at Official journal of the European Union (European Commission, 2003).

Table 1

The criteria of SMEs in Europe

Category of a company	Number of employees	Turnover	or	Balance sheet total
Micro	less than 10	< EUR 2 million	or	< EUR 2 million
Small	less than 50	< EUR 10 million	or	< EUR 10 million
Medium	less than 250	< EUR 50 million	or	< EUR 43 million

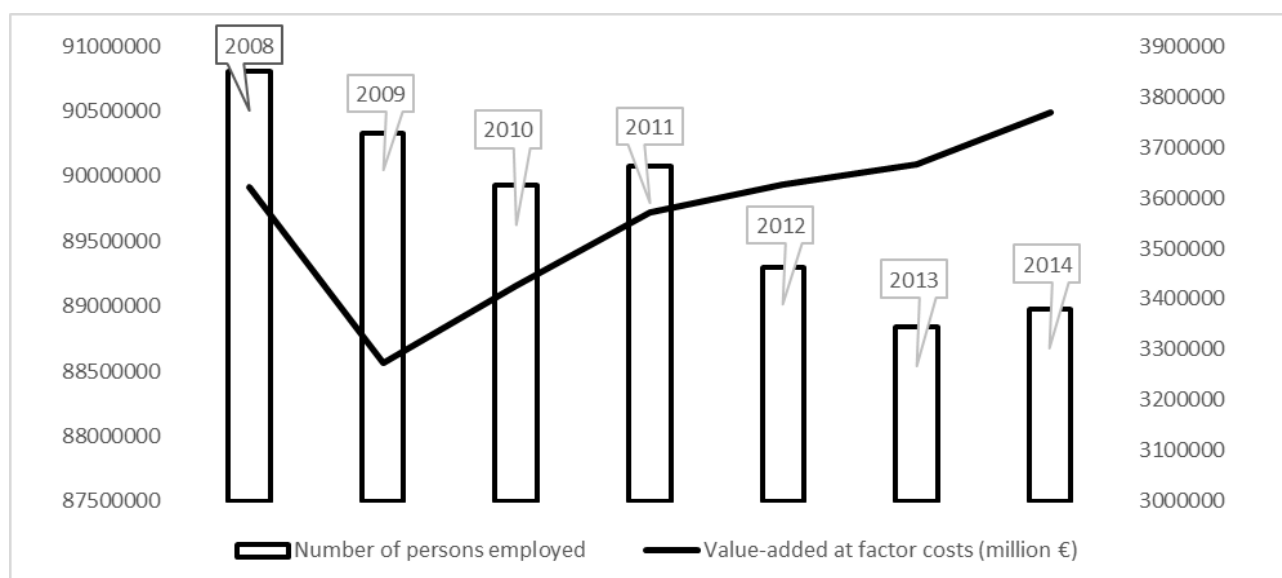**Source: author's summary based on Official journal of the European Union l124/36, 20 may 2003**

From the table above, one can conclude, that the SMEs are the enterprises with total balance sheet less than EUR 43 million or turnover less than EUR 50 million and with less than 250 people employed. Second aspect to be aware of is the total amount of SMEs in Europe – or in other words, SME's market share.
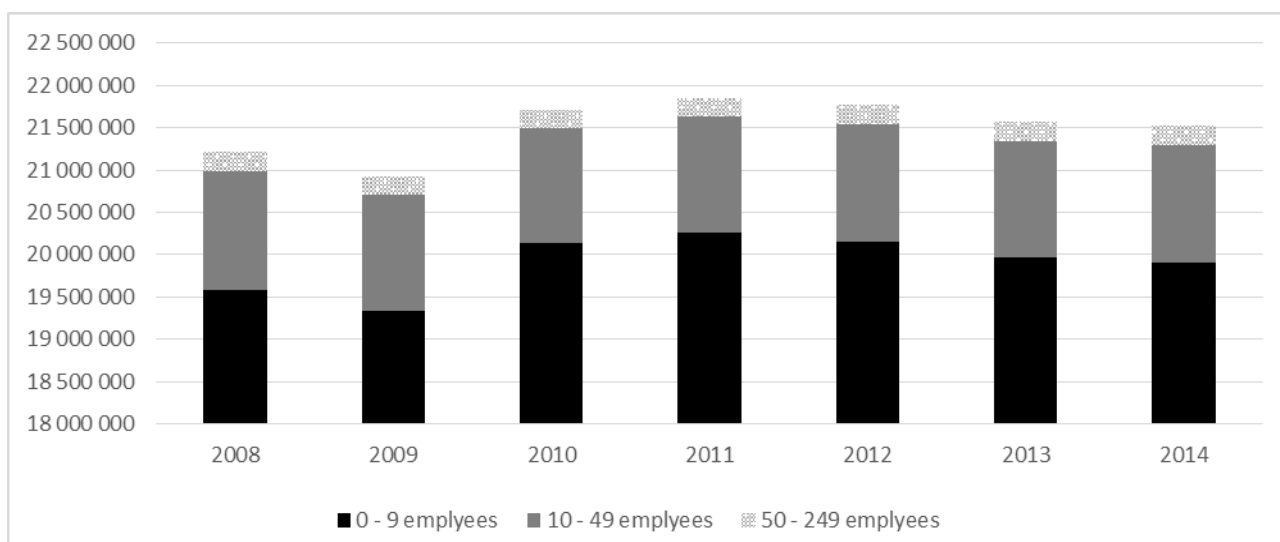
Source: author's construction based on Database for the Annual report on European SMEs 2014

Fig. 1. **Number and size of SMEs in the EU28 by employees**

While analysing the structure of SMEs micro enterprises should be highlighted as they form approximately 92% of all European SMEs. This high proportion varies from 82% in Germany up to 96% in smaller economies, such as Slovakia, remaining vital all over the EU (Annual Report on…, 2014). SMEs have been called the backbone of the European economy and this is not only because of their prevalence in the market. In 2014 SMEs formed around 67% of working places and generated around 58% of all European Union GDP. These data becomes even more interesting when it is reminded that those are for non-financial institutions only (European Commission, 2014).

Fig. 2. **Number of employees and value-added factor cost of European Union SMEs, EUR million**

Data above shows interesting dynamics – while working places declined for six years, generated value added factor managed not only to regain the losses of 2009 but also tends for new highs. On the one hand such tendency shows the increasing output of enterprises that might be quite a positive aspect if problem of unemployment in Europe is not neglected. Another important issue is the economic sector European SMEs represent. Besides all the data on SME sector relevance are crucial for building the right strategy of finance attraction. Later on the author will identify several reasons of why the support of Business Angels can be considered as one of the alternatives for European SMEs. According to the statistics in 2014, the further mentioned sectors formed approximately 78% of European Union SMEs accounting 71% of the value added created by SMEs: wholesale and retail trade, repair of motor vehicles and motorcycles, construction, manufacturing, professional, scientific and technical activities and accommodation and food (Survey on the Access…, 2014). While mentioning these leader groups wholesale and retail trade sector was named as prior, strongly outperforming the others in means of employment, value-added at factor costs and number of SMEs. When speaking about the creation of new working places and boosting economy the question of sector relevance is a must. Even though supporting the economy, retail trade, which was identified being among the first rows, can't handle the whole recovery of European economy. The author suggests that going from money-movement boosting to value or product creation is vital. Concluding the overall reasoning of what SMEs in European Union means for the economic sustainability the expectations of SMEs to grow, creating up to 740000 new jobs in 2015 (European Commission, 2014) is highly crucial.
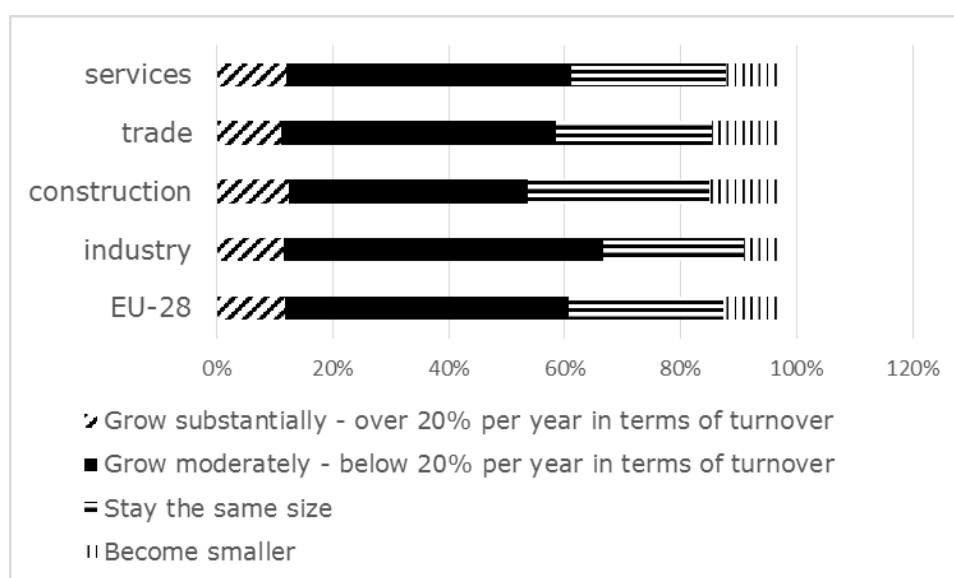
Fig.3. **SMEs growth projections 2014-2016**

Such confidence of SMEs about the possibilities of upcoming growth is a very positive feature. Several positive effects could be hit, for instance, by implementing new technologies or investments in research and development. Survey done by the European Central bank identified the most pressing problems SMEs had to face so far (Survey on the Access…, 2014). According to the latest results, access to finance was named as the fifth most pressing problem among European SMEs. The analytical part of the survey (European Commission, 2014) stressed the following conclusions - micro enterprises consider the problem of access to finance the most pressing, whereas large enterprises find it least pressing and more innovative enterprises experience more access to finance problems than less innovative enterprises. From all information presented above the author assumes, that access to finance will form a great deal of everyday agenda and what is more, in the nearest future this problem might enhance. This assumption finds support in the World Bank featured indicators. It was claimed, that quite a part of SMEs already have outstanding loan or line of credit. For instance, in high-income countries 46% of small SMEs and 60% of medium SMEs employing 20 to 99 employees claimed to have outstanding loan or line of credit (World Bank, 2014). Both, assuming the expectations on growth of SMEs to be right, and keeping in mind their towering place in the EU economy the demand for finance in the upcoming years will grow. The author believes that alternative investment might offer the necessary support for the development.

1. Alternative investment

The common problem of alternative investment sector is that so far, there is no unified definition explaining what it is. Among all, Chartered Alternative Investment Analyst Association also mentioned the absence of union consensus. In Introduction to Alternative Investments paper it was stressed, that alternative investment is a largely new and rapidly changing field. It was assumed that consensus would always remain elusive (www.caia.org).

Klausner (www.forbes.com, 2013) shared quite a similar view. Even more, in 2013 he noted that the complexity of many alternative investments have necessitated that they have been used by institutional or very high net worth investors only. Even though there is a lack of union explanation the high necessity of alternative financing, especially in the SME sector, might play a crucial role. In relation to this topic High Level expert group report might be recalled (European Commission, 2013). The report was dedicated to SME and infrastructure financing overall noting their high importance. Besides all, a well-known fact was recalled saying that financial intermediation in Europe is still largely bank-based. It was claimed that around 80% of debt financing to the economy is provided by banks, in contrast to the US where bank financing is as low as 20% (High Level Expert…., 2013). Knowing the situation in bank sector and related aspects, the author claims having such a high bondage on the bank sector in some form might slag the overall development in Europe. This seeing finds support in mentioned HELG report - outlined suggestions mentioned in the report were inspired by the aim to find the proper balance of roles between bank and non-bank financing. While ascertaining that the topic of alternative investment is crucial, the author will evaluate the possibilities of Business Angels to solve the problem of access to finance and support the SMEs.

2. Evaluation of Business Angels

Concept of Business Angels is both – wildly known and poorly managed. On the one hand, there is vast information available on this topic. EBAN Tool Kit wildly presented Business Angel and Business Angel network definitions in June 2009 (Introduction to Business…, 2009). This publication gave an introduction to Business Angel activity in Europe presenting a summary of different Business Angel types and core elements of Business Angels' networks. Prior to this, Jeffrey Sohl gave a solid analysis in his working paper "Angel investing: changing strategies during volatile times", where he identified trends in the Angel market by examining changes in characteristics and investment behaviour during a time of market expansion and contraction. Finally, in 2012 the European Commission presented the "Evaluation of EU Member States' Business Angel Markets and Policies" – where it was claimed that visible Business Angels market in the EU27 may be a little below 30,000 members – those who are members of networks that provide data on their activities in the EU and about 250000 Angels in networks overall. The total Business Angel market being, perhaps seven time as big (Evaluation of EU …, 2012). In order to understand if Business Angels can be considered as worthwhile opportunity for financing SMEs it would be wise to light a definition of who Business Angels are. As European Trade Association for Business Angels, Seed Funds and other Early Stage Market Players (www.eban.org, 2013) explains, a Business Angel is an individual investor that invests directly or through their personal holding their own money predominantly in seed or start-up companies with no family relationships. Business Angels make their own investment decisions and are financially independent - a possible total loss of their Business Angel investments will not significantly change the economic situation of their assets. They invest with a medium to long term set time-frame and are ready to provide, on top of their individual investment,

follow-up strategic support to entrepreneurs from investment period to exit. They respect a code of ethics including rules for confidentiality and fairness of treatment, and compliance to anti-laundering. While acknowledging other offered definitions it can be concluded that there are no mismatches in overall approach. There is one more common thing mentioned in many sources. Business Angels market being mostly informal has a division in visible side where data on networks and syndicates are more or less available and invisible side where no information is strictly available (Evaluation of EU…, 2012). According to the data provided by EBAN, the total value of the visible segment of the Business Angels' market in Europe in 2010 was around EUR 660 million. According the prior estimation the size of non-visible segment might vary around EUR 4-5 billion, that is about 25% of the size of United States market (Evaluation of EU …, 2012). Therefore, the assumption that Business Angels in Europe have vast possibilities to expand their activity becomes rather sound. It is interesting, that according to the certain estimates there are potentially 350000 individuals only in France with sufficient financial resources to invest EUR 100000 without exposing themselves to that risk by over 5%. (Evaluation of EU…, 2012).

Perhaps one of the main questions when evaluating the potential of Business Angels for European SMEs is the correspondence of necessary and provided investment amount and sector of the economy. According to SAFE report (European Commission, 2014) only 32% of the EU27 SMEs reported of willingness to obtain more than EUR 250000. When comparing the provided survey data to the information given by EBAN the author concludes that in case of proper cooperation Business Angels and SMEs could find themselves in a win-win situation. The data of EBAN suggests that investment per Business Angel tends to vary from as low as EUR 18000 to over EUR 150000 (Evaluation of EU…, 2012). At this point it should be reminded that Business Angels tend to co-invest with other investors, Business Angels, early stage funds and others. It means that the demand of SMEs could be satisfied in quite a big extent. Another question goes to sector relevance. In many countries analysed Business Angels (approximately 50%) invested in healthcare and biotech sectors. The top list implied creative industries, environment and clean technologies, finance and business service (Evaluation of EU…, 2012). All the highlighted sectors are of a great importance when speaking about research and development, which stresses the possible positive outcome of better Business Angel inclusion.

European Business Angels carries quite a good potential to support SMEs. Firstly, the average amount of money needed by SME corresponds to the possibilities of active or potential Business Angels. Secondly, the attention should be given to possible expansion of Business Angels, by latent and hidden Angel activation. Even though there is a great potential for European SMEs to engage in more alternative finance captivation, the lack of unified and arranged system is one of the main drawbacks to fully benefit from the possibilities Business Angels might possess. Moreover, when reviewing 20 years of research on the Angel segment of the venture capital market J. Freear called for longitudinal studies of Angel and entrepreneurial behaviour, information flows, links to other market segments, information

quality, formal and informal networks and the latent Angel problem (J. Freear, 2002). There seems to be quite a number of various Business Angel networks as well as different opportunities for SMEs provided by regional government or the European Union. The author believes that all the work and research done so far, even though valuable enough won't give the wanted effect as long as this information stays rifted. The author suggests thinking about the creation of European Union Business Centre of Alternative Investment. Such an organisation could bring together the needs of SMEs and the potential of Angels all over European Union ensuring better cohesion and greater economic growth. This would strongly ask for deep organisational scheme, division in regions or economic sectors and the possible involvement of the European Investment Bank or equivalent. As long as there is no unified legislative, academic and informative base created, the growth rate of various Business Angel networks won't meet the needs of SMEs. Moreover the unified support from the authorities all over the EU would be highly beneficial. Few steps to be implemented in order to enhance the positive outcome of Business Angel activity were reflected in the Evaluation of the European Union Member States Business Angel markets (Evaluation of EU…, 2012):

• The support for the creation and operation of Business Angels networks;

• The tax incentives or tax relief schemes;

• The co-financing schemes.

Even though the study was based on only eight European countries, the country-to-country results varied a lot. For instance, the effectiveness and success of tax schemes aiming to support Business Angels varied greatly (Evaluation of EU…, 2012) - this again, might be explained by the lack of unified and fine planned policies. According to the OECD study, the initial support from the EU or national governments led to a dramatic increase in the number of BANs in Europe while the investment activity of these BANs varied a lot (OECD, 2011). When speaking about co-financing schemes they seem to be rather effective. Nevertheless, the author would like to spotlight the question of differences and further possibilities of co-investment schemes and various approaches used in different countries. Such an analysis could be beneficial in order to understand the needs and best possible actions for the region or a specific sector of economy. Summing up the research part of this paper it becomes clear that with proper leading and effective government policy the alternative investment of Business Angels can be boosted a lot. The author believes that Business Angels have the potential to support European SMEs and boost the economic development, decrease the bank-addiction and enlarge the research and development.

Conclusions, proposals, recommendations

1. Access to finance remains a high problem for SMEs in European Union.
2. Regarding the expectations of SMEs to grow, summarised using the method of graphical visualisation, the need for additional finance resources in the upcoming years will increase.

3. Business Angel market has the potential to satisfy the needs of SMEs in finance resources.

4. Besides the possible financial investments Business Angels offer extra time for development, more detailed product analysis and support in new strategy implementation as well as management skills of experienced professionals.

5. Business Angels can't be expected to be equally active in all sectors represented by SMEs.

6. According to the statistics, Business Angels choose to invest in healthcare and biotech sectors among others.

7. As it is stressed in various studies there is a lack of unified and arranged system that would organise the market of alternative investment in Europe.

8. Creation of well-structured and single legislative and informative base might enlarge the number of active Business Angels in the European Union.

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EXPORT-IMPORT DYNAMICS WITHIN THE EUROPEAN UNION TRADE POLICY

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Abstract. International trade is an essential part of the market economy and provides great opportunities for small countries to support the internal market with sufficient goods and services as well as ensures an opportunity to participate on the external market. The research aim is to explore export-import dynamics in Latvia and the European Union under the EU trade policy. The following research tasks have been advanced to achieve the set aim: 1) to survey the EU trade policy development; and 2) to analyse the export-import dynamics of the EU and Latvia. The European Union is the leader in the world international trade having provided USD 2307 billion of total world export volume in 2013. The major international trading partners are the United States and China; the main export products are machinery and transport equipment, while the main import products are fuel, lubricants, and related materials. The international trade balance of Latvia has remained negative for several years due to continuing high volume of imports and low volume of exports. However, in 2013, export grew to EUR 10.2 million, while import - EUR 12.64 million. The basic export products are agricultural goods, while import is governed by machinery products. The most important cooperation partners are Lithuania, Estonia, Germany, Poland, and Russia. The research is mainly based on the monographic descriptive method as well as the methods of analysis and synthesis are used to study the problem elements and synthesise coherencies or formulate regularities.

Key words: export, import, trade, Latvia, the European Union.

JEL code: F16, F40, F63

Introduction

The European Union as the world's largest economy is also the biggest exporter and importer, the leading investor and recipient of foreign investment and the biggest aid supporter. With just only 7% of the world's population, it accounts for more than one quarter of the world's wealth (Free Trade is ...., 2014). Therefore, Latvia's accession to the single market in 2004 on the one hand opened a huge potential for the economic growth by

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developing export and offering its products for the entire European market, while on the other hand, Latvia faces the big European countries with historical background and an important position in international trade which means stiff competition. Export with the growth rate of 30.33% in 2010 was Latvia's driver during the global financial crisis and still it has been nominated as one of the most important economic objectives in the near future; although, the growth of exports is decreasing in recent years (Zinojums par Latvijas ...., 2014). In the European Union, international trade is a key factor contributing to the overall development of the market. As stated in Latvia's Stability Programme for 2014- 2017 "in 2011-2012, the growth was largely based on foreign trade because improvements in the global economic environment, which was weakened by the crisis, facilitated increase in demand in the major partner countries of Latvia, despite the Eurozone crisis. This was an important precondition for raising volumes of output in export-oriented sectors and for regaining competitiveness, allowing corresponding to take a larger proportion in the development of the national economy" (Latvijas stabilitates ...., 2013). Nevertheless, the year 2013 was more favourable for companies serving the local market thanks to private consumption.

The EU trade policy has been viewed by several authors (Albornoz, Calvo Pardo et al., 2012; Benkovskis and Worz, 2012; Brulhart and Matthews, 2007; Sen, 2010; Rugaja, 2006 etc.), while various aspects related with export and import have been discussed by Altintas and Turker (2014), Benkovskis (2012), Priede (2013), Priede and Skapars (2011), Berman et al., (2014), Davidsons and Vitola (2008), Lee (2011), Laskiene and Venckuviene (2014), Pelece (2014), Rybakovas (2009), Pineres and Ferrantino (1997), Saboniene et al. (2013) and others. The mentioned authors generally deal with the problem of competitiveness of national commodities, though their studies lack a detailed EU export-import analysis. Therefore, the **hypothesis** of the present research is that the structure of neither EU nor Latvia export-import has changed during the analysed period. The **research aim** is to explore export-import dynamics in Latvia and the European Union under the EU trade policy. The following **research tasks** have been advanced to achieve the set aim: 1) to survey the EU trade policy development; and 2) to analyse the export-import dynamics of the EU and Latvia.

The research covers the period of 2008-2013 and it is restricted to the analysis of international trade of commodities. The information compiled by central statistical offices, like Eurostat, scientific publications of foreign and local researchers, and other materials have been used for the purpose of the study. The research is mainly based on the monographic descriptive method as well as the methods of analysis and synthesis are used to study the problem elements and synthesise coherencies or formulate regularities.

Research results and discussion

Survey on the EU trade policy development

H. Altintas and O. Turker believe that the export and import functions of any country are crucial for the identification of trade dynamics of this country; and the variables forming

the export function are mainly national income, foreign income, foreign direct investment, real exchange currency, and export and import prices (Altintas, Turker, 2014). The economy theory makers have admitted the importance of increasing the level of national prosperity. Mercantilists' view was to increase export by minimizing import, and to export ready-made goods instead of raw materials. Free trade theory, as opposed to the mercantilist policies of protection, was championed by both Smith and Ricardo as a route to achieve production efficiency at a global scale (Sen, 2010). The EU single market being the basis for one of the EU's pillars – economic integration of the Member States, is one of the most unique global markets. The joint European Union trade policy is based on a set of uniform rules under the Customs Union and the Common Customs Tariff and governs trade relations of the Member States with the non-Member States. The result of this policy is clearly expressed in reduction of rates in international movement of goods as well as in various aspects related to investment and intellectual property right protection. Eicher et al. (Eicher, Henn, 2008) in their research have proved that the single market establishment and tariff reduction have a positive impact on the EU's trade performance being the basis for its growth. This is also evidenced by a number of facts as the EU single market volumes have sweepingly increased after 20 years of operation: from 345 million consumers in 1992 to over 500 million consumers in 2011 in 27 EU Member States; for trade between EU countries it has grown from EUR 800 million in 1992 to EUR 2800 billion in 2011 for the value of goods exchanged; for trade between the EU and the rest of the world - from EUR 500 billion in 1992 to EUR 1500 billion in 2011 (20 years ..., 2012). Hanosek J. in his work has analysed factors affecting trade among European countries and he has concluded that infrastructure exhibits larger effect than geography, culture or institutions. He proved that even in a well functioning free trade area of Europe, the key aspect of trade was the efficiency of how goods were transferred across the borders, along with the level of information and communication technology enabling reduction of transaction costs. These results indicate the key importance of trade between the old and new EU members (Hanosek, 2013). However, the EU's policy requires changes after 20 years of successful operation. According to Mario Monti report to José Manuel Barrosu "the development of the single market has stopped following the crisis and a certain "market fatigue" has intervened reducing confidence in the role of the market. In addition, problems arise in the process of market integration delaying smooth development of the market" (Monti, 2010). The global financial crisis revealed the current trade policy weaknesses - research, education, employment, and energy sectors. As indicated by Karel De Gucht (Trade Policy ..., 2010), the 21st century marketing is a global engine for growth in the European Union contributing to long-term jobs and providing consumers with lower prices and bigger choice. The Common EU's Europe 2020 strategy focuses on five objectives - employment, innovation, education, poverty reduction, climate, and energy. The strategy says that the key challenge will be given to free trade agreements, so it assumes a greater role for removal of industrial and agricultural

goods rates as well as increase of market access to services and investment, intellectual property rights and competition (Trade, Growth ..., 2010).

Analysis of the export-import dynamics of the EU and Latvia

According to M. Brulhart and A. Matthews, the external trade policy of the EU impinges on nearly one fifth of the world trade (Brulhart, Matthews, 2007). In 2013, the European Union took a leader position as the world's largest exporter of goods - achieving a record mark of exports volume of USD 2307 billion and a market share of 15.3%. The next largest exporters in the world are China and the USA with USD 2209 billion and USD 1,580 billion export volumes respectively and the corresponding market shares of 14.7% and 10.5%. The World Trade Organisation has identified the largest world importers, which are the same as export Top 3 leaders - the USA with USD 2329 billion (15.4%), the European Union with USD 2235 billion (14.8%), and China (12.9%). In 2013, total export volume equalled USD 15047 billion, which is 18% less than in 2012, when the total world export reached USD 18401 billion. Total import, in turn, evidenced the figure of USD 15121 billion being 19% less compared with USD 18601 billion in 2012 (International Trade ..., 2014).

The EU-28 Member States provide around 1/6 of the global trade volume. The EU export volume has continued to increase every year reaching EUR 1737 billion in 2013, thus, exceeding the 2008 level by EUR 428 billion or 33% (Figure 1).
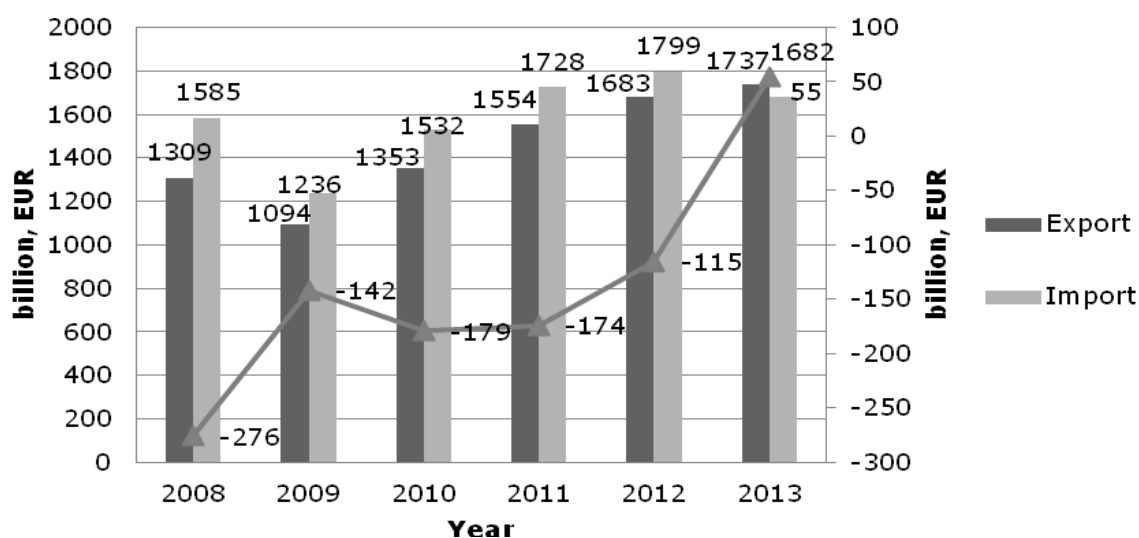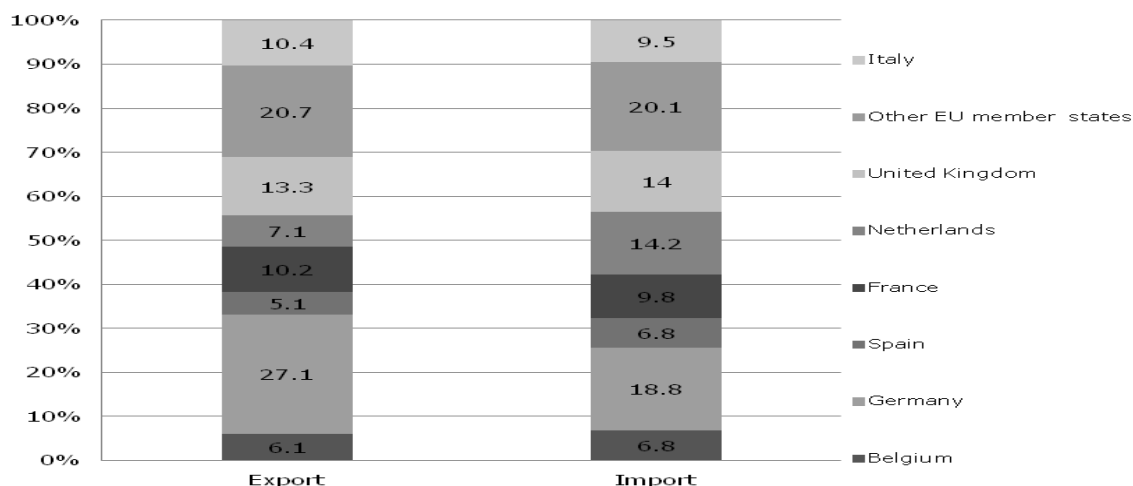

Source: authors' construction based on Eurostat, 2014

Fig. 1. **Export-import in the European Union for the period of 2008-2013, billion EUR**

As shown in Figure 1, total imports of the EU Member States during the period of 2008-2012 have exceeded the volume of exports, thus, resulting in a negative trade balance. However, in 2013 a record high level of export was reached totalling EUR 1737.02 billion, while the level of import decreased by EUR 116.19 billion compared with 2012. This is the first time when the trade balance is positive thanks to the successful implementation of trade policy.

The EU is one of the most open economies in the world owing to its common trade policy and evidenced by the number of trading partners. In 2012, the EU was the largest trading partner for 59 countries, while China and the USA was a trading partner for 36 and 24 countries, respectively. European goods and services account for 35% of the EU's GDP - about 5 percentage points more than the USA (Free Trade is ...., 2014). During the period from 2008 to 2013, the main exporting and importing countries have not changed their positions; Germany is the European leader in international trade both in export and import (Figure 2).

Fig. 2. **Export-import structure in the European Union in 2013, per cent**

In 2013, Germany retained the leading position in the field of foreign trade with exported goods amounting to 27.1% of goods export to the third countries and imported goods accounting for almost one-fifth (18.8%) of the EU-28 Member States imports volume. Germany is the third largest exporter and importer in the world. Much of Germany's export focuses on industrially produced goods and services, in particular, German mechanical engineering products, vehicles, and chemicals are highly valued across the globe. Export of goods and services have also made up about 52% of its GDP. Significantly, the EU integration has greatly intensified intra-European trade, with about 69% of German export shipped to European countries and 58.2% delivered to the EU Member States (Germany ..., 2013).

According to M. Brulhart and A. Matthews, about 46% of extra-EU trade is directed towards developed countries. Within the developed countries group, the United States is the largest trading partner (Table 1) and both M. Brulhart and A. Matthews state that if intra-EU trade is added to extra-EU trade with developed countries, more than four fifths of the Union's trade is with countries of broadly similar income levels. This is a familiar empirical phenomenon world-wide but it runs counter to the expectation that trade flows should be greatest between countries that are most different in economic structure. It has given rise to new approaches to the theoretical modelling of the causes of trade (Brulhart, Matthews, 2007).

Table 1

The main trade partners of the European Union in 2008-2013 (in million EUR)

Export	2008	2009	2010	2011	2012	2013	Changes, 2013/2008 (%)
EU-28	1309147	1093962	1353195	1554252	1683088	1737022	32.68
USA	248057	203756	242672	264055	292815	**288239**	16.20
China	78301	82421	113454	136415	144012	**148269**	89.60
Russia	104970	65697	86308	108587	123401	119775	14.20
Switzerland	100623	88797	110475	142098	133509	**169591**	68.54
Norway	43719	37492	41933	46820	49915	50178	14.77
Turkey	54476	44486	61831	73275	75385	77750	42.72
Japan	42390	35978	43984	49075	55581	54040	27.48
Import	2008	2009	2010	2011	2012	2013	Changes, 2013/2008 (%)
EU-28	1585231	1235636	1532089	1728314	1798576	1682390	6.13
USA	182780	155250	173403	191977	206491	**195989**	7.23
China	249102	215274	283598	294835	291620	**280055**	12.43
Russia	180446	119569	162075	201327	215118	**206478**	14.43
Switzerland	82650	80909	85487	93486	105924	94266	14.05
Norway	95945	68918	79024	93851	101049	90008	-6.19
Turkey	46288	36446	42837	48387	48268	50383	8.85
Japan	76474	58440	67448	70755	64742	56530	-26.08

Source: authors' construction based on Eurostat, 2014

In 2013, the USA, Switzerland and China are the major EU co-partners. Export to Switzerland (up to 27%) has increased most, which is mainly related with the trade volume growth of chemicals and medical products, machinery, instruments, and watches. Though, exports to Turkey and China have shown a smaller increase (only 3.1% and 3.0%, respectively), which can be explained by short-term cyclical changes in demand. In 2013, export volumes showed a declining tendency with Russia and Japan - by 3% and 2.7% respectively compared with 2012. The same refers to a decrease in the import volume for the recent years. In 2013, the largest slow down was observed for Japan (-12.68%), Switzerland (-11.01%), and Norway (-10.93%) compared with 2012. In 2013, the largest importer of the EU's goods has been China; although, the import volume has declined by 4% between 2012 and 2013. The slowdown is mainly due to increasing concerns about the Eurozone stability and the possibility for the EU economy to fall back to the recession caused by the financial crisis.

In 2013, the performance of Latvia's exports has been moderate which according to D. Pelece, an expert from the Bank of Latvia, is a result of difficult situation on global markets, problems in the Eurozone and total decrease in demand (Pelece, 2014). Figure 5 shows Latvian export and import dynamics and the trade balance for the period of 2008-2013, which proves an overall upward trend in foreign trade, yet, simultaneously signalling for the high dependence on related markets, thus, affecting the overall foreign trade growth rates.
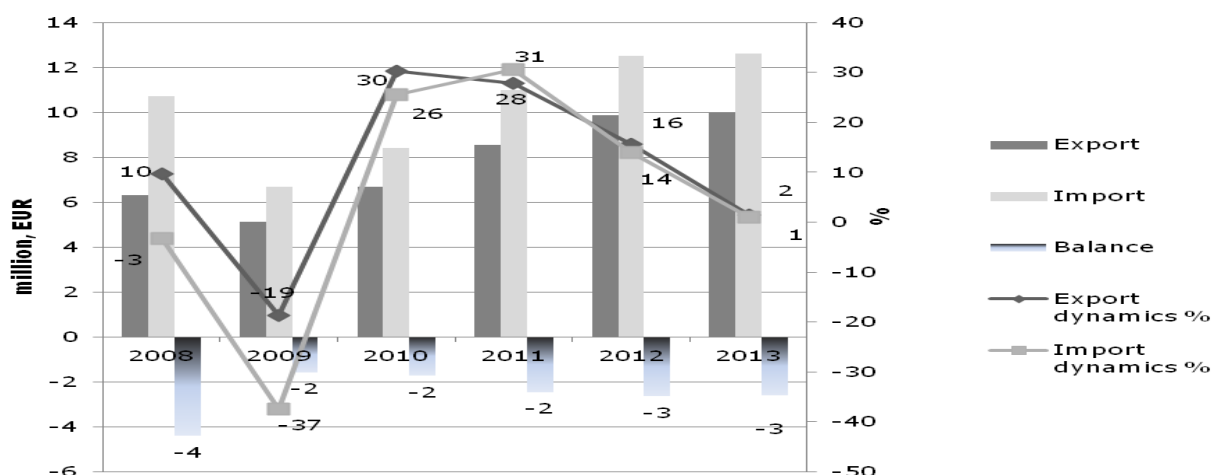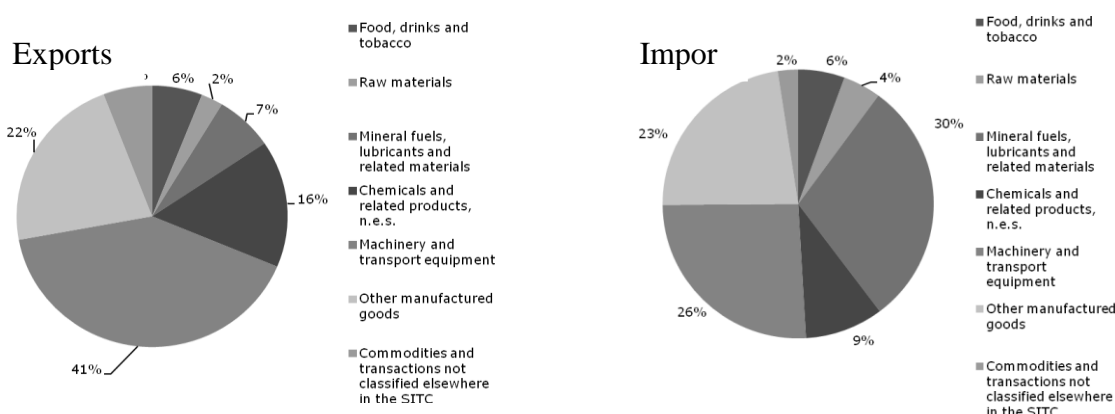
Fig. 3. **Export-import dynamics and growth of commodities in Latvia in 2008-2013**

As shown in Figure 3 Latvia's export growth rates have strongly changed for the recent years. Facing the financial crisis in 2009 with a sharp decline in demand both on domestic and foreign markets, volumes of exports and imports radically decreased – import by 37% and export by 19%. The trade balance fell to a negative figure (- EUR 2 million) already showing the signs of recovery from the lowest peak of the crisis. In 2010, the import volumes increased by 26%, thus, evidencing, a recovery of domestic demand; while the export growth rate amounted to +30%, thus, providing the export volume of EUR 6.68 million. Import growth rate in 2010 shows that the volume of imports has increased during the crisis, though, the growth is slower compared with the volume of exports. In 2012, imports have gone up by 30.57% compared with 2011, while exports produce a less growth (27.77%), again signalling on the domestic demand recovery. In 2013, the export growth rate is much lower, though, it is still positive at 1.52%.

Machinery and transport equipment are the most valuable products exported by the EU Member States. In 2013, they accounting for EUR 709160 million or 41% of total export volumes. Although, their export volumes have increased only slightly, i.e. by 0.6% in the mentioned year, they are still major export products. Other manufactured goods take the second position forming EUR 383034 million or 22% of the export volume and they have increased by 1% compared with 2011. The most significant increase has been observed in the group of food, drinks and tobacco, its value has reached a record value of EUR 104.3 billion and the increase is 5.34% compared with 2012 (Figure 4).

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Exports

- Food, drinks and tobacco
- Raw materials
- Mineral fuels, lubricants and related materials
- Chemicals and related products, n.e.s.
- Machinery and transport equipment
- Other manufactured goods
- Commodities and transactions not classified elsewhere in the SITC

Impor

- Food, drinks and tobacco
- Raw materials
- Mineral fuels, lubricants and related materials
- Chemicals and related products, n.e.s.
- Machinery and transport equipment
- Other manufactured goods
- Commodities and transactions not classified elsewhere in the SITC

Source: authors' construction based on Eurostat, 2014

Fig. 4. **The EU export and import structure by products in 2013, %**

Raw materials, intermediates and various components required by manufacturers constitute the majority of imports. Therefore, the largest proportion of the import volume is composed of mineral fuels, lubricants and related materials. Although, in 2013, the volume of imports has decreased by 9.08% compared with 2012, it still reached EUR 498.6 billion in the analysed year.

It is widely discussed that the driver of Latvia's economy is export; meanwhile the statistics shows that the volume of imports still significantly exceeds the volume of exports and the trade balance remains negative over the analysed period. This means that Latvia's economy cannot provide for its internal market, and obviously there is a demand for goods not produced locally or significantly cheaper ones. As shown by Figure 5, the main Latvian export commodity groups are simple items manufactured less high value added.
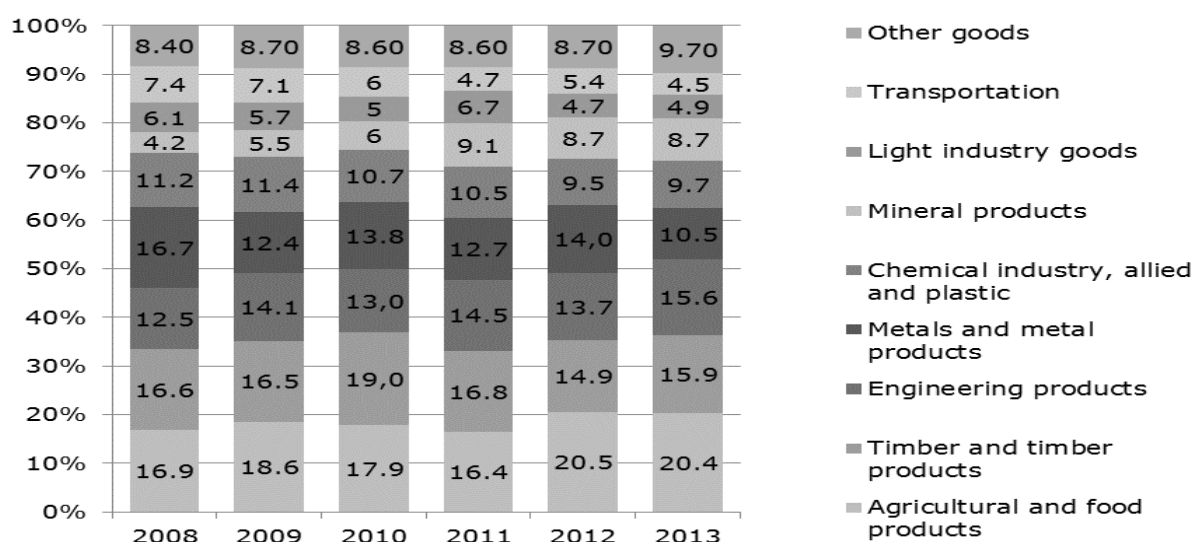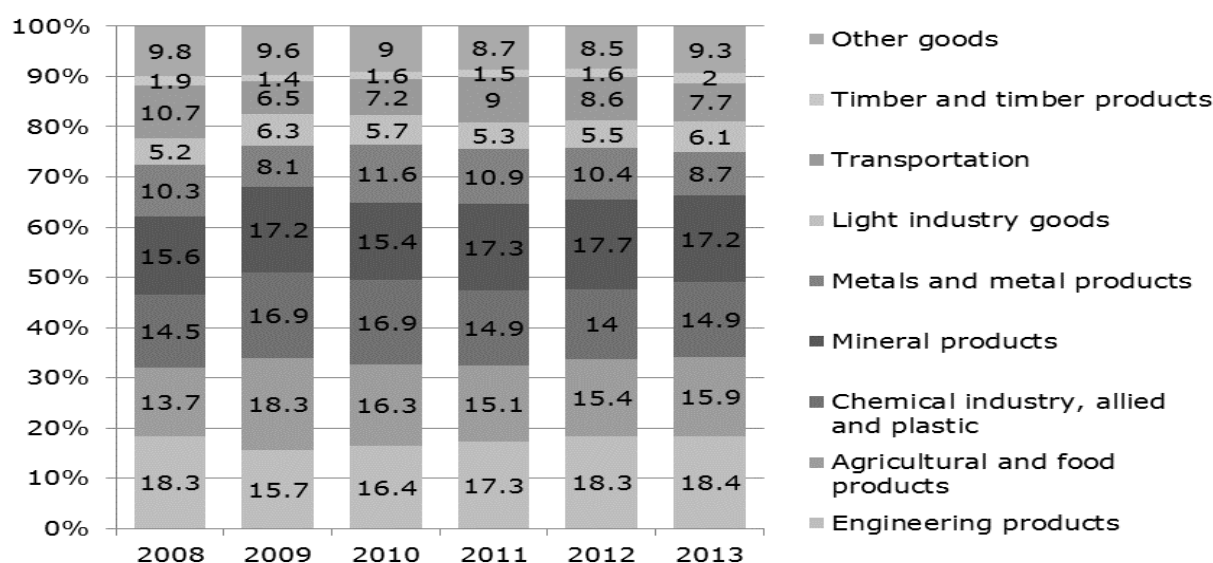

Source: authors' construction based on Zinojums par Latvijas..., 2014

Fig. 5**. Latvian export of goods by main commodity groups in 2008-2013**

Hence, the main export commodity groups are constituted by agricultural and food products with a total share of 20% in total export volumes. Timber and timber products (16%) take the second position, while engineering products (15.6%) - the third one. The analysed period did not reflect significant changes in the proportion of manufactured goods but it should

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be noted that the suspension of SIA Liepajas Metalurgs operation depicts in the decrease of the export volumes in the group of metal and metal products by 3.5 percentage points in 2013. Majority of the exported and imported goods are intermediate goods – 58% of exports, while consumption and capital goods account for only 24% and 10% respectively. For example, the group of agricultural and food products is represented by fish, milk and dairy products mainly exported to Russia, Lithuania, Estonia, and the USA. The group of timber and timber products, in turn, mainly is represented by firewood, timber and wood products exported to the UK, Sweden, and the Netherlands (Central Statistical Bureau, 2014). G. Davidsons has noted that structural transformation is one of the economic growth processes envisaging the transition from production of simpler goods with lower value added to the output of more complex products. The economic development of country is associated with the level of export complexicity (Davidsons, Vitola, 2008). Therefore, export should be encouraged by increasing the production of value added goods and exporting of finished products instead of raw materials.

Latvia's import structure is formed mainly of intermediate goods, which form 59% of the import volume. Consumption goods compose 24% ensuring consumers with wide range of products. Figure 6 shows the structure of imports between 2008 and 2013 and it leads to the conclusions that intermediate goods are mainly required for the production of final goods, such as metal, automotive, and chemical industry products.

Source: authors' construction based on Zinojums par Latvijas ..., 2014

Fig. 6. **Latvia's import of goods by main commodity groups in 2008-2013**

The analysis of Latvia's imports reveals that the most important goods include engineering products - 18% on average, the second position is taken by agricultural and food products – 16% on average, while the third position – by the chemical and plastic products. It is interesting that the import of metal and metal products has also decreased in 2013 by 1.7 percentage points, which could mean that the suspension of SIA Liepajas Metalurgs operation has also affected the decline of imports as various machinery and mechanical appliances,

electrical machinery and equipment are imported in the group of engineering products. Imports in the group of agricultural and food products mostly refer to fresh chilled or frozen poultry meat, cream, and milk products, while imports in the group of chemical industry go to pharmaceutical products and plastic semi finished products. The main agricultural goods importing countries are the Netherlands, Lithuania, and Denmark. Chemical industry products are imported from Poland and Denmark, where raw materials have obviously lower prices. Metal products are imported from the Netherlands, Finland, and Germany.

Conclusions, proposals, recommendations

1. The European Union as the world's largest economy and international trader assumes a greater role for contributing to long-term jobs and providing consumers with lower prices and bigger choice.

2. The global financial crisis has resulted in overall trade policies set as new directions of development - more market liberalisation, market access to services and investment promotion, elimination of industrial and agricultural goods tariff rates, unlimited supply of raw materials and energy, and protection of intellectual property rights.

3. During the period of 2008-2012 the EU's trade balance remained negative, indicating the excess of imports but the implementation of a targeted EU's common trade policy in 2013 resulted in the increase of exports over imports forming a positive trade balance.

4. In 2013, the USA, Switzerland and China were the major EU co-partners mostly importing machinery and transportation equipment from the EU, while China, Russia and the USA exported intermediate goods like fuel and lubricants, equipment, transportation facilities and other manufactured goods needed for final production.

5. The main Latvian export commodity groups are constituted by agricultural and food products, timber and timber products, and engineering products, while also engineering products, agricultural and food products and chemical products are the main import commodity groups. The main cooperation countries for Latvia are Lithuania, Estonia, Germany, Poland, and Russia.

6. The Ministries of Finance and Economics of Latvia should facilitate the granting of aid to sectors promoted in the total EU exports within the common trade policy.

7. In order to develop the competitiveness of Latvian exports, the Ministries of Finance and Economics of Latvia should provide financial support in addition to tax incentives or other bonuses for companies that engage in foreign trade with high added value products.

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ASSESSING THE EXCHANGE RATE SENSITIVITY OF CZECH BILATERAL AGRICULTURAL TRADE

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Abstract. This paper examines the short term and long term effects of exchange rate changes on bilateral trade flows of agricultural products between the Czech Republic and its major trading partners (Austria, Germany, Italy, Poland and Slovakia). In accordance with the J-curve theory, the Johansen cointegration test was employed to analyse the long term relationship and a vector error correction model to explore the short term effects of Czech koruna exchange rate level. The dataset used in this study covers period from 1999:Q1 to 2013:Q4. Agricultural product groups are based on the SITC classification. Results show that if the Czech foreign trade in agricultural sector is disaggregated into particular product categories, there can be found only some sectors significantly connected with exchange rate movements in the long term. The effects of currency depreciation are less than ambiguous and cannot be generalized across the analysed product categories but increasing in particular trade balances after currency depreciation dominates its decreasing. Theoretical short term and long term assumptions were confirmed only in trade of meat and meat preparations with Slovakia.

Key words: exchange rate, agricultural sector, trade balance, cointegration.

JEL code: F1, F31

Introduction

Agricultural and food production is one of the traditional industries of the Czech economy and despite the volume of this whole production was significantly reduced in recent years, the volume and value of trade activities had been constantly growing (Bielik et al., 2010). During the last two decades, agricultural trade in the Czech Republic passed through a series of changes that influenced its shape and character. The Czech agricultural trade development was influenced especially by successful transformation from centrally planned economy to market economy; by entrance of Czechia to the EU; and according to Horska et al. (2011) globalization and integration processes has played the important role as well. The transition

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process and membership in the EU caused changes in the commodity and especially territorial structure of agricultural trade. The Czech Republic changed its trade orientation especially towards the trade with other member states, which means an EU share of over 75% of its total trade (Svatos and Smutka, 2012). Agri-food foreign trade turnover of the Czech Republic in last decade, with exception of the year 2009, has been continuously growing, thanks to increased exports as well as imports. A greater dynamics in the monitored period was shown by exports, which is a very positive feature with regard to long-term trend. One of the characteristics of agricultural foreign trade of the Czech Republic is a continuous negative trade balance. According to Svatos and Smutka (2012), it can be said that the unit prices of Czech agricultural imports have over the long term exceeded the unit prices of Czech agricultural exports, resulting in negative balance of agricultural trade. This indicator has been gradually increasing in its absolute values; however, as a result of faster dynamics of increasing exports, its share in the volume of exports shows a declining tendency.

After joining the EU and the trade liberalization, the Czech agriculture also faced an inflow of cheaper agri-food production from abroad. Insufficient domestic sales and low, respectively unstable purchase prices are solved many times by decreasing or complete termination of unprofitable agricultural production. One of the macroeconomic policy instruments is exchange rate, which can influence the price competitiveness of international traded products. According to Abeysinghe and Yeak (1998) policies prescriptions have generally assumed that currency depreciation stimulates exports and curtail imports, while currency appreciation is detrimental to exports and encourage imports. Domestic currency depreciation (devaluation in fixed currency regimes) increases the price of imports in domestic currency terms, which means more expensive imports. Simultaneously it decreases the price of exports in foreign currency terms, in other words, exports become cheaper. Given the above, price effect of currency depreciation can increase the volume of exports and decrease the volume of imports (Gupta-Kapoor and Ramakrishnan, 1999). Based on this presumption, this paper considers exchange rate as an instrument which plays a critical role in profitability of both export-oriented and import-competing agriculture and can affect the agricultural trade balance.

The aim of this paper is to examine the relationship between exchange rate depreciation and agricultural bilateral trade balances between the Czech Republic and its major trading partners (Austria, Germany, Italy, Poland and Slovakia). Data used in this study cover period from 1999:Q1 to 2013:Q4 and are based on the SITC classification. To distinguish the long term effects from the short term ones, authors apply the J-curve theory which says that currency depreciation improves the trade balance only from long run perspective; in the short run it even worsens the trade balance before improving it (Bahmani-Oskooee and Ratha, 2004). In the study is employed a Johansen cointegration test to analyse the long term relationship between variables. Short run effects are explored by estimating an error correction model.

Research results and discussion

Review of relevant literature

J-curve theory is the traditional instrument to analyse the dynamic effect of exchange rate changes on trade balance. J-curve theoretical basis comes from the Marshall-Lerner condition, which states that the sum of export and import demand elasticity has to be at least one and then the currency depreciation has a positive impact on the trade balance (Auboin and Ruta, 2012). Usually, Marshall-Lerner condition is not met in the short run, goods tend to be inelastic and depreciation deteriorates the trade balance initially. In long run consumers can adjust to the new prices, volume effect is generally believed to dominate the price effect and trade balance will be improved. Short run effect of currency depreciation and related J-curve phenomenon was first advanced by Magee (1973), who pointed that short run deterioration and long run improvement of trade balance after depreciation resemble the letter J.

Literature concerning the J-curve issue tends to fall into one of the following three categories: studies using aggregate trade data; studies employing disaggregate trade data at bilateral level; and recent studies using disaggregate trade data at commodity level. The first type of studies concentrates on the use of aggregate export and import data between a country and the rest of the world in assessing the effectiveness of currency devaluation (e.g. Felmingham, 1988). These studies have to employ the effective exchange rate, what can be misleading when country´s currency appreciate against one currency and simultaneously depreciate against another currency (Bahmani-Oskooee and Brooks, 1999). The weighted averaging will therefore smooth out the effective exchange rate fluctuations, yielding an insignificant link between the effective exchange rate and the trade balance. Therefore, many other studies employ bilateral exchange rates and bilateral trade balance data between a country and its major trading partners (Bahmani-Oskooee and Ratha, 2004). There has been a growing body of literature arguing that the second-generation study may still suffer from the aggregation bias problem, as significant exchange rate impacts with some commodities could be more than offset by insignificant exchange rate effects with others, thereby resulting in an insignificant exchange rate impact and vice versa. Therefore, the newest studies disaggregate data to industry level (e.g. Bahmani-Oskooee and Hegerty, 2011).

In the agricultural trade literature, most studies have mainly concentrated on the effect of changes in exchange rate on agricultural export volume and/or prices (e.g. Gardner, 1981; Bradshaw and Orden, 1990). Limited studies have been made to investigate the impact of exchange rate on the agricultural trade balance. Among studies applying the newest approach to J-curve estimation can be found paper by Yazici (2006). He investigated whether the J-curve hypothesis holds in Turkish agricultural sector. Based on the data covering the period from 1986 to 1998, the results indicate that, following devaluation, agricultural trade balance initially improves, then worsens, and then improves again. This pattern shows that J-curve

effect does not exist in Turkish agricultural sector. Another important finding is that devaluation worsens the trade balance of the sector in the long run.

Douglason Godwin (2009) empirically tested the existence of the J-curve hypothesis using Nigerian agricultural data. The hypothesis asserts that adjustment to a disturbance in payments is not instantaneous since a certain period of time would have to elapse before variation in the exchange-rate can restore equilibrium in the trade balance. The analysed model is a multiplier based framework which imposes an Almon lag structure on the exchange rate regimes. The empirical results indicate that the J-curve does not exist in Nigerian agricultural sector precisely in the long-run since the pattern of lag between the exchange rate depreciation and the trade balance resembles more of an asymmetric S-shape of a horizontal S.

Yazdani and Shajari (2009) published study, where the impact of macroeconomic indicators of Iran and its 20 trading partners on Iran's agricultural trade balance had been investigated. The ARDL approach was applied during the period of 1960 - 2005. They found out that real exchange rate had the positive impact on trade balance indicating that the depreciation improves trade balance.

There was made only few studies concerning the J-curve issue in Czechia, in addition, their results are mixed. Among studies, which do not confirm the J-curve for Czechia is Bahmani-Oskooee and Kutan (2009) who made an extensive study for emerging Europe. Based on data from 12 countries covering the period 1990-2005 they found empirical support for the J-curve effect in Bulgaria, Croatia and Russia. By contrast, no evidence of the J-curve effect was revealed for the Czech Republic. By application a similar methodology, Nusair (2013) tested 17 aggregate trade balances of emerging and transition countries over the period 1991-2012. While the J-curve effect was present in Armenia, Georgia and the Ukraine, the Czech economy still remained free of the J-curve effect. No evidence of this effect can be found also in Hsing (2009), who examined the J-curve for bilateral trade of six CEE countries including Czechia.

Contrary, two studies confirmed existence of some characteristics associated with the J-curve effect on bilateral basis. Hacker and Hatemi (2004) tested the J-curve for Czechia, Hungary and Poland in their bilateral trade with Germany. This study came to the conclusion that trade balance deteriorates within a few months after depreciation and then rises to a long run equilibrium value higher than the initial one. The J-curve effect in bilateral trade between Czechia and Germany was empirically confirmed also in Simakova (2012) by applying a traditional methodology comprising Johansen cointegration and error correction model. Moreover, Simakova (2012) found the J-curve also in the Czechia's trade with Poland.

The only study made for the Czech Republic in the third-generation way was paper by Simakova and Stavarek (2014). They considered the major trading partners of the Czech Republic (Austria, Germany, France, Italy, Poland and Slovakia) and selected product categories, determined on the basis of SITC classification. They employed the Johansen cointegration test to analyse the long term relationship and a vector error correction model to

explore the short term effects of exchange rate level of Czech koruna. Although their findings suggest that product group of food and live animals is related with exchange rate in the long term, the J-curve effect was not confirmed in this sector.

In summary, the existing empirical literature on the J-curve phenomenon concerning the Czech Republic and its international trade is very limited. Results of the few previously published studies indicate almost no evidence for the J-curve effect, i.e. no effect of the CZK depreciation on the Czech trade balance. In addition, none of them is made in third-generation way for the particular agricultural sector. As compared to other papers, this study uses the most recent available data on international trade on the commodity level to avoid the aggregation bias problem which can influence the results. Therefore, this study substantially contributes to scientific discussion in this field and fills the gap in literature about bilateral agricultural trade.

Model and data specification

This study employs a reduced form of trade balance model to analyse the long-run effects of changes in exchange rate on the trade balance. They use a trade model in which trade balance is expressed as a function of exchange rate and the domestic and foreign income. The Johansen cointegration procedure is applied to avoid the main criticism of early studies, whose results could suffer from spurious regression problem because of non-stationary data. For empirical analysis of agricultural trade, the model is specified as follows (1):

$$lnTB_{p,t} = \alpha + \beta lnY_{d,t} + \gamma lnY_{f,t} + \lambda lnER_{f,t} + \varepsilon_t$$

(1)

where TB_p is a measure of the trade balance in time period t defined as the ratio of exports of the Czech Republic to country f over the Czech imports from country f in a selected product group. Y_d is measure of the Czech income (GDP) set in index form to make it unit free; Y_f is the income of trading partner f and ER_f is the bilateral exchange rate. The exchange rate is defined in a manner that an increase reflects a depreciation of the CZK. ε_t represents an error term.

Since an increase in foreign income Y_f is expected to increase the Czech exports to respective country, an estimate of γ is expected to be positive. Contrary, since an increase in Czech income Y_d is assumed to increase the Czech imports, an estimate of β is expected to be negative. Finally, the parameter λ is expected to be positive as the trade balance of respective industry should improve due to CZK depreciation.

In order to test the short run relationship a short term dynamics is incorporated into the long run model. According to Hsing (2009) we apply the following error correction model (2):

$$\Delta lnTB_{p,t} = \alpha + \sum_{k=1}^{n} \omega_k \Delta lnTB_{t-k} + \sum_{k=1}^{n} \beta_k \Delta lnY_{d,t-k} + \sum_{k=1}^{n} \gamma_k \Delta lnY_{f,t-k} +$$

$$\sum_{k=1}^{n} \lambda_k \Delta lnER_{f,t-k} + \vartheta_k EC_{t-1} + \varepsilon_t \text{ (2)}$$

where EC is the disequilibrium term and $\vartheta_k EC_{t-1}$ represents the error correction mechanism.

All time series used for estimation are in the quarterly frequency and cover the period from 1999:1 to 2013:4. Data for GDP and exchange rate are obtained from the OECD iLibrary statistical database in current prices denominated in US dollars. Data for imports and exports flows are obtained from the Czech Statistical Office in US dollars as well. Development of total agricultural trade in the sample period can be seen in Figure 1.
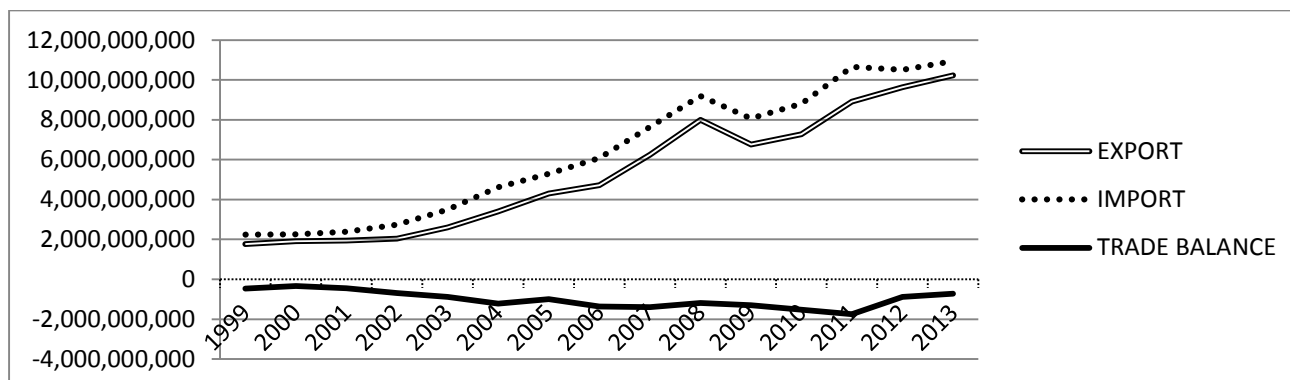
Source: authors' construction based on data from Czech Statistical Office Database

Fig. 1. **Development of Czech Agricultural Trade (1999 – 2013, USD)**

Estimated product groups representing the commodity structure of trade in agricultural sector are determined on the basis of 2 digit SITC classification:

00 Live animals;

01 Meat and meat preparations;

02 Dairy products and eggs;

03 Fish, crustaceans, molluscs etc.;

04 Cereals and cereal preparations;

05 Vegetables and fruit;

06 Sugars, sugar prep. and honey;

07 Coffee, tea, cocoa, spices;

08 Animal feeds, excl. unmilled cereals;

09 Miscellaneous edible products;

11 Beverages;

12 Tobacco and tobacco manufactures;

41 Animal oils and fats;

42 Fixed vegetable fats and oils;

43 Animal/vegetable   fats/oils, processed

285

Empirical results

In empirical estimation we work with five largest trading partners of the Czech Republic (Austria, Germany, Italy, Poland and Slovakia). The selection of trading partners is based on total trade turnover in the Czech agricultural trade. The total share of selected countries is more than 50% on average during the sample period. Logarithmic transformation was performed to reduce skewness and heteroscedasticity and to stabilize variability. Integration of time series was determined using the augmented Dickey-Fuller test. The augmented Dickey-Fuller test for each individual time series confirmed the presence of unit roots, which is the basic precondition of cointegration between variables.

Since the choice of lag orders of the variables in the vector error correction model specification can have a significant effect on the inference drawn from the model, the appropriate lag length for each variable is sequentially determined. The optimal lags for each estimated trading partner within different product groups were determined on the basis of Schwarz information criterion. Results of the cointegration procedure can be seen in Table 1.

Table 1

Estimated Long Run Coefficients of Trade Models

	AT			DE			IT			PL			SK		
	Y_d	Y_f	ER	Y_d	Y_f	ER	Y_d	Y_f	ER	Y_d	Y_f	ER	Y_d	Y_f	ER
00	No cointegration			-4.00	-2.97	-1.31	Data not available			-4.63	6.79	2.80	-4.98	0.17	-1.08
01	-3.77	-1.63	-6.69	-6.22	-3.97	-1.06	-1.83	3.85	-1.08	-15.4	13.76	-0.91	-2.09	2.23	2.87
02	-4.41	1.71	-6.23	6.81	5.18	1.76	No cointegration			-7.59	6.6	-2.27	-2.92	7.92	1.79
03	No cointegration			-8.94	-6.52	-2.34	No cointegration			-5.34	6.26	-3.67	-0.90	-0.10	-4.52
04	No cointegration			9.78	7.08	2.69	No cointegration			0.17	0.49	3.37	-7.48	2.66	-10.84
05	No cointegration			-7.02	2.64	-9.35	0.51	16.0	7.34	-2.21	2.64	2.16	No cointegration		
06	No cointegration			No cointegration			No cointegration			No cointegration			No cointegration		
07	4.51	1.36	5.26	-4.69	-3.45	-1.41	No cointegration			-2.14	-0.24	-1.99	-8.15	7.74	4.61
08	-4.46	6.55	-1.43	3.08	5.85	1.32	-13.63	1.28	-4.67	-2.04	-1.71	-0.48	2.49	-0.25	3.28
09	No cointegration			No cointegration			No cointegration			No cointegration			-0.39	0.58	1.22
11	-2.20	-2.43	-1.19	No cointegration			No cointegration			-6.67	4.68	-1.46	No cointegration		
12	Data not available			No cointegration			Data not available			Data not available			Data not available		
41	Data not available			Data not available			Data not available			Data not available			-17.1	14.52	-13.58
42	Data not available			Data not available			Data not available			Data not available			No cointegration		
43	No cointegration			-15.9	19.6	2.55	Data not available			-4.20	-2.37	-3.32	-16.7	10.66	-1.45

Source: author's calculations

As can be seen in Table 1, only some product categories are significantly connected with exchange rate movements in the long term. With respect to data availability, the least number of cointegrated sectors are in trade with Italy (01, 05 and 08). Per contra, in trade flows with Poland can be observe only two product categories not connected in the long run relationship (06 and 09). Sectoral analysis confirmed the long term relationship between analysed variables in product categories of meat, meat preparations and animal feeds. Among products without any cointegration are sugar, sugar preparations, honey, tobacco, tobacco manufactures and fixed vegetable fats and oils. In comparison to results of Simakova and Stavarek (2014), who revealed long term relationship in overall sector of food and animals,

one can see that deeper data disaggregation can help to avoid the bias of different analysed effects and to detect the particular analysed effects.

As regards domestic income, the theoretical assumption of its negative effect on trade balance was confirmed for most of the country-product group models but each bilateral trade flows contains the exemption. In case of foreign income, most of cases met the theoretical assumption and confirm its long term positive relationship with Czech particular trade balances development as well. The results for variable of exchange rate are more less than ambiguous but the positive effect is dominating. The increase in trade balance after depreciation can be observed for trade with Austria in 07; Germany in 02, 04, 08, 43; Italy in 05; Poland in 00, 04, 05 and Slovakia in 01, 02, 07, 08, 09. In summary of long term analysis can be stated that the theoretical assumptions for all variables were revealed only in bilateral trade flows of animal/vegetable fats/oils with Germany; animals, vegetables and fruit with Poland; meat, meat preparations, dairy products and eggs with Slovakia.

The estimations of vector error correction model are realized only for the variables, which are found to cointegrate (parameters are stable). Paper proceed to examine the dynamic responses by generating impulse response functions showing the response of the trade balance to the CZK depreciation. As indicated before, the short run effects of depreciation are reflected in the coefficient estimates obtained for the lagged value of the first differenced exchange rate variable. The J-curve phenomenon should be supported by negative coefficients followed by positive ones reflected into shape of the estimated J-curves. The representatives of estimated responses can be seen in Figure 2.

Austria

Germany

Italy

Poland

Slovakia
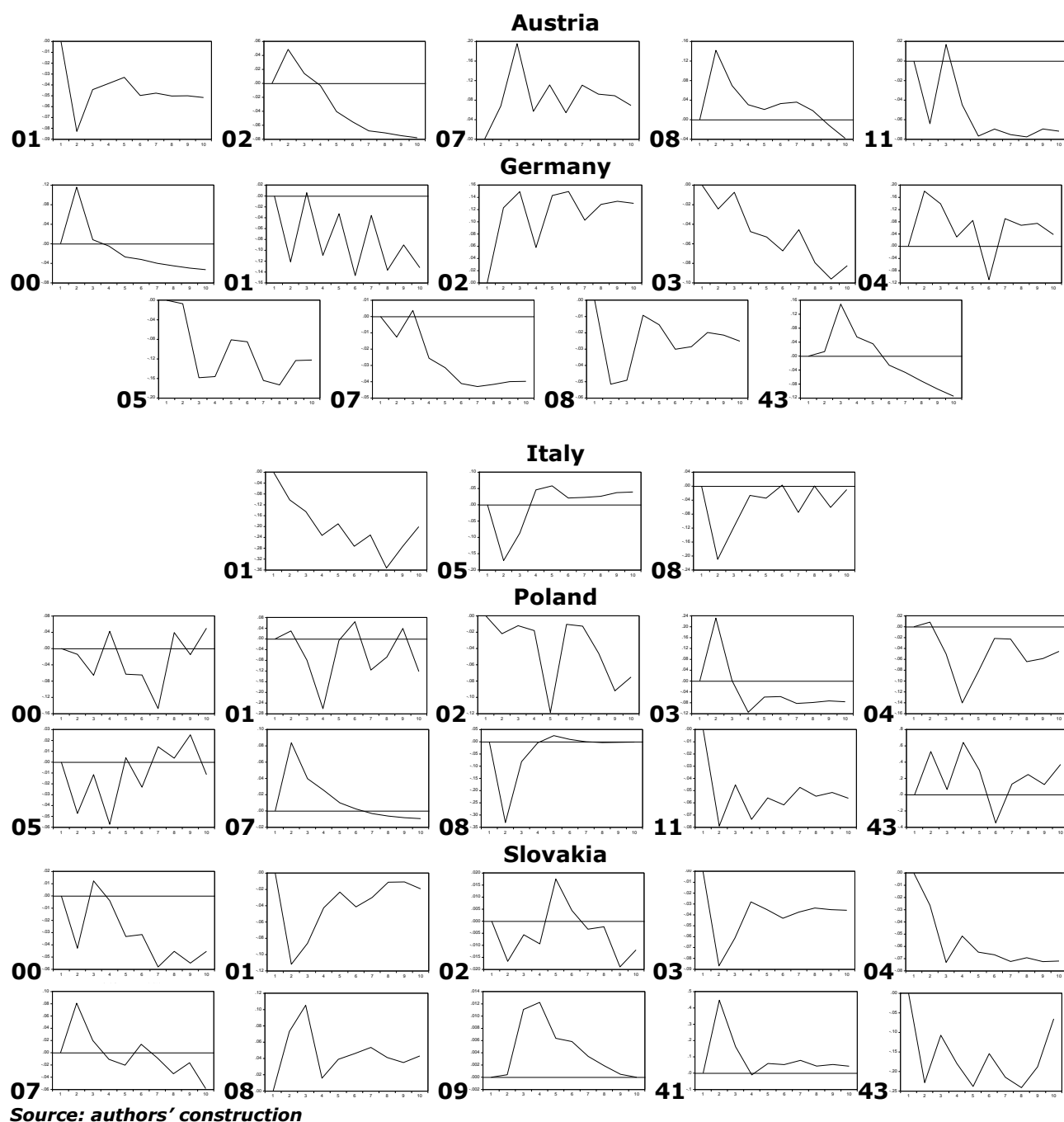
Source: authors' construction

Fig. 2. **Estimated Bilateral J-curves of Czechia in cointegrated product categories**

Graphical representations of the impulse response functions present only few typical J-curves. As indicated before, the short run effects of depreciation are reflected in the coefficient estimates obtained for the lagged value of the first differenced exchange rate variable. The traditional J-curve is, thus, confirmed if the estimate of coefficient for exchange rate is significantly negative at lower lags and is followed by a significantly positive coefficient at longer lags. In this study, impulse response functions confirm the theoretical short run assumptions for Italy in trade with vegetables and fruit; Poland in trade with cereals and animal feeds; Slovakia in trade with meat, meat preparations, dairy product, eggs and fish. For

other cases, the J-curve phenomenon is not supported by estimated coefficients of exchange rates. The results are similar to other studies concerned on Czechia (Bahmani-Oskooee & Kutan, 2009; Nusair, 2013) where (despite revealed long term relationship) does not exist almost no support for the J-curve effect. Theoretical short term and long term assumptions were confirmed for the Czechia only in trade of meat and meat preparations with Slovakia.

Conclusions, proposals, recommendations

1. The aim of this study was to examine the short and long run effects of exchange rate development on trade flows in the context of disaggregated agricultural data of bilateral trade between the Czech Republic and its major trading partners (Austria, Germany, Italy, Poland and Slovakia). Special attention was given to assess the characteristics of the J-curve effect in different product groups and empirically identify whether Czech agricultural foreign trade could benefit from depreciation of CZK. The Johansen cointegration test and the vector error correction model were used for this purpose. The dataset used in this paper covers period from 1999:Q1 to 2013:Q4. Agricultural product groups are based on the SITC classification.

2. By relying on a relatively new approach of testing this relationship, this study shows that the long term relationship between analyzed variables can be found for product categories of meat, meat preparations and animal feeds. Among products without any cointegration are sugar, sugar preparations, honey, tobacco, tobacco manufactures and fixed vegetable fats and oils. The supposed indirect relationship of particular trade balances with domestic income and per contra direct relationship with foreign income and currency depreciation were revealed only in bilateral trade flows of animal/vegetable fats/oils with Germany; animals, vegetables and fruit with Poland; meat, meat preparations, dairy products and eggs with Slovakia.

3. The theoretical short run assumptions were confirmed for Italy in trade with vegetables and fruit; Poland in trade with cereals and animal feeds; Slovakia in trade with meat, meat preparations, dairy product, eggs and fish. For other cases, the J-curve phenomenon is not supported by estimated coefficients of exchange rates.

4. The effects of currency depreciation are less than ambiguous and cannot be generalized across the analyzed product categories but in the sample period, increasing in trade balances after currency depreciation dominates its decreasing and exchange rate as a macroeconomic tool can represent an effective instrument of stimulating the agricultural foreign trade.

Acknowledgement

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