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ANALYSIS OF REGIONAL DIFERENTIATION OF HOG LIVESTOCK PRODUCTION IN POLAND IN 2004

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ABSTRACT

The paper presents an analysis of the regional differentiation of pig production in Poland in 2004. The research included volume of pig stock and production, purchase and slaughter of hog livestock according to provinces. Relative concentration was used for the estimation of the degree of irregularity of distribution pig stock among provinces. Florence location ratio was used for estimation of similarity of distribution of analyzed features. The empirical analyses were based on data carried out by the Central Statistical Office.

Key words: hog livestock. regional differentiation.

INTRODUCTION

Concentration of some kind of production takes place in different regions in each country. Spatial specialization mostly results from tradition as well as climatic and soil conditions. Also certain kind of production has been formed in greater regions, where agri-food industrial enterprises are located.

According to Milewski [2] small differences between spatial disposition of pig production and demand of meat industry and households result from historic events. In the area of central and south-east of Poland predominate local slaughter houses, whereas big industrial enterprises prevail in north-west part of Poland. Structure of suppliers and business customs formed in past is main factor of such differentiation.

The purpose of the paper is indicating of regional differentiation of pig production in Poland in 2004. The research included volume of pig stock and production, purchase and slaughter of hog livestock by provinces.

MATERIALS AND METHOD

Data for the investigation were taken from Central Statistic Office and Faostat [8. 9. 13]. Relative concentration was used for estimate the degree of irregularity of distribution of pig stock among provinces. This analysis was performed with graphical and analytical method. In graphical method the figure of polygon of Lorenz concentration was prepared. In analytical method concentration ratio (K) was calculated, according to the following formula [12]:

$$K = P / T$$

where:
P – concentration field, which can be estimated as P = T – M ,
M – sum of trapezium fields, where the high of trapezium are structure ratios for number of provinces and the base of trapezium are accumulated structure ratios for total number of pigs,
T – field below of diagonal of a square (T = 5000).
Interpretation of graphical method: the greatest concentration field (P) the greatest concentration of analyzed features.

Interpretation of analytical method: concentration ratio values can be: -1< K < 1. The closest value to 1 or -1 the greatest degree of concentration of analyzed feature. In case of K = 0, it means lack of concentration and when K= 1 or K = -1 it means total concentration.

Florence location ratio was used for estimate similarity of distribution of pig stock, production, purchase and slaughter in provinces, according to the following formula [12]:

$$F = \frac{1}{200} \sum_{i=1}^{n} \left| u_{ir} - u_{is} \right|$$

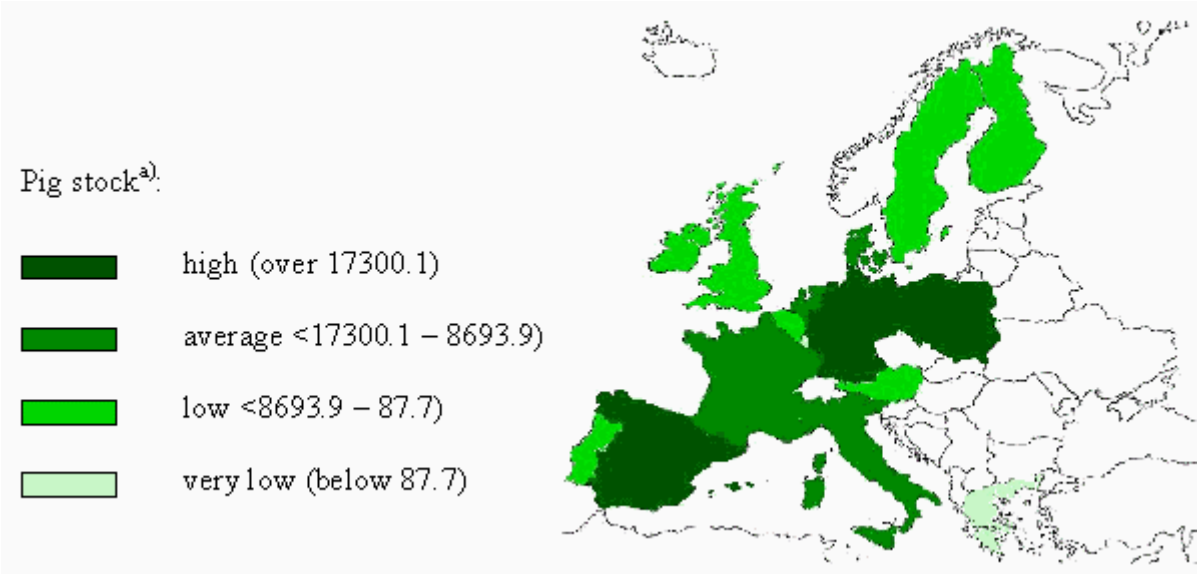
where:
u_{ir} – the percentage of structure of first researched phenomenon according to province,
u_{is} – the percentage of structure of second researched phenomenon according to province,
n – number of provinces.

The Florence location ratio value can be between: <0, 1>. The closest value to 1 of location ratio the greatest degree of divergence characterizing the distribution of researched features. However, the closest value to 0 of location ratio, the greatest similarity of both distributions [12].

RESULTS

The biggest producer of pigs in the world is China. In this country was concentrated about 50% of total pig stock in the world in 2004. The second producer of pig production in the world is European Union and the next – USA. Pig production in European Union (EU – 15) in 2004 characterized strong regional differentiation by countries. The important rank in hog livestock production in EU took two countries: Germany and Spain. Pig stock in these countries were bigger than 17300.1 thousand heads (figure 1). The average level of pig stock had: England, Belgium, France and Italy (17300.1 – 8693.9 thousand heads). And the lowest number of pigs were in Luxemburg and Greece, below 87.7 thousand heads (figure 1).

Figure 1. Pig stock in European Union (EU -15) in 2004 (thousand heads)



a) Classes of pig stock were established by arithmetic mean ($\bar{x}$= 8693.9) and standard deviation (s = 8606.2).
Source. Own elaboration based on [13].

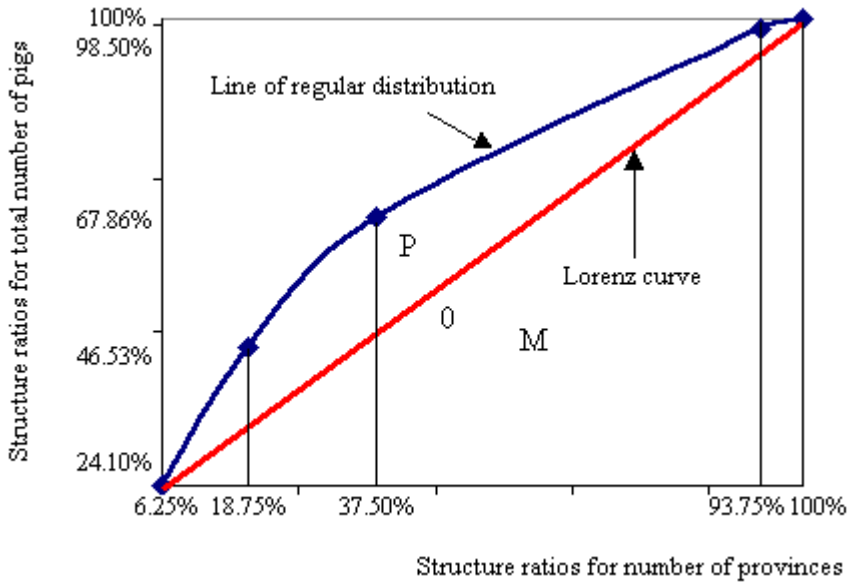
Poland is also the World and European leader of pig production. In 2004 Poland was the seventh in the World and the third of European country of the biggest volume of pig stock [13]. The number of pig stock in Poland in 2004 <footnote1> was 17 395.5 thousand heads and 106.5 heads per 100 hectares of agriculture lands (table 2). Based on the analysis of data from table 1, it is possible to ascertain the occurrence of concentration of pig stock in provinces. Reading in pairs data relevant to the structure ratios for number of provinces and structure ratios for total number of pigs, can notice some differences in the distribution of pig stock according to provinces. For example in provinces of pig stock from 880.2 to 331.3 thousand heads, which represents over 56% of total provinces, pig stock counted about 31% (table 1).

Table 1. Structure ratios in analysis of relative concentration of pig stock in provinces in 2004

Pig stock in provinces (thousand heads)	Number of provinces	Total number of pigs (thousand heads)	Structure ratios for:		Accumulated structure ratios for:	
			number of provinces	total number of pigs	number of provinces	total number of pigs
Over 4192.0	1	4192.5	6.25	24.10	6.25	24.10
4192.0 – 1429.1	2	3901.4	12.50	22.43	18.75	46.53
1429.1 – 880.2	3	3709.9	18.75	21.33	37.50	67.86
880.2 – 331.3	9	5330.8	56.25	30.64	93.75	98.50
Below 331.1	1	260.9	6.25	1.50	100.00	100.00

Source: Own elaboration based on [8].

Figure 2. Lorenz curve



Source. Own elaboration based on table 1.

This analysis confirms counted value of ratio concentration, too:

$$K = (5000 - 6888.17) / 5000 = -0.38$$

This value indicates not very strong concentration of pig stock in provinces.

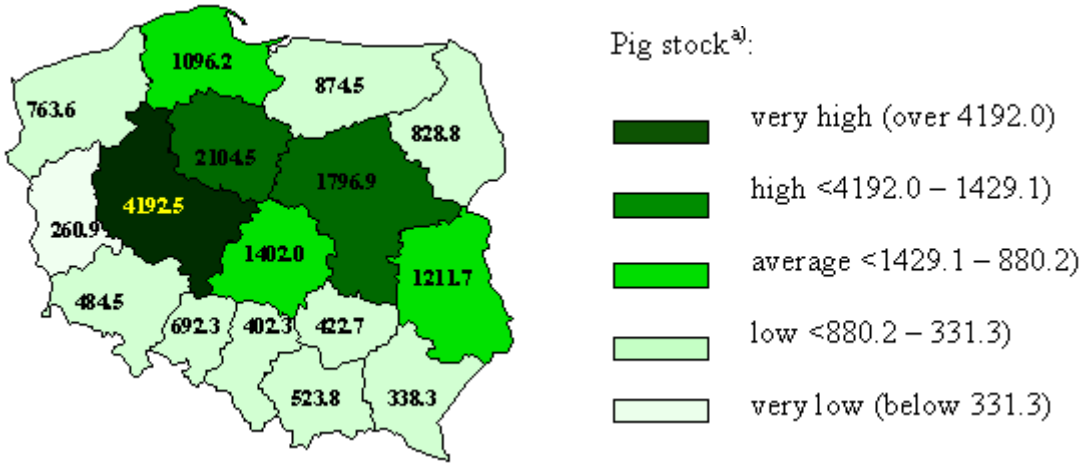
Occurrence of pig stock concentration in provinces also confirms the figure of polygon of Lorenz concentration (figure 2). Concentration field (P) is situated between Lorenz curve and line of regular distribution. The field of concentration (P) is not great, so the degree of concentration is also not high.

Basing on data placed in table 2, it is possible to ascertain, that the central provinces of Poland (Wielkopolskie, Kujawsko-pomorskie and Mazowieckie) had the biggest participation of pig stock in 2004. In these provinces 46.5% of total pigs stock was concentrated (table 2).

The biggest number of pigs stood in Wielkopolska province, where the pig stock exceeded 4190 thousand heads. In Kujawsko-pomorskie and Mazowieckie provinces volume of pig stock was: 2104.5 and 1796.9 thousand heads respectively, however in Lubelskie and Łódzkie provinces pig stock was formed at the level 1211.7 and 1401.9 thousand heads(figure 3). Decisive influence on such distribution of pigs breeding had undoubtedly general level of rural culture, favorable climatic and soil conditions as well as tradition.

However, the smallest pig stock, below 400 thousand heads, was registered at Lubuskie (260.9 thousand heads) and Podkarpackie (338.3 thousand heads) provinces (figure 3). It results from the fact of limited resources of arable lands as well as productivity of cereal in these regions.

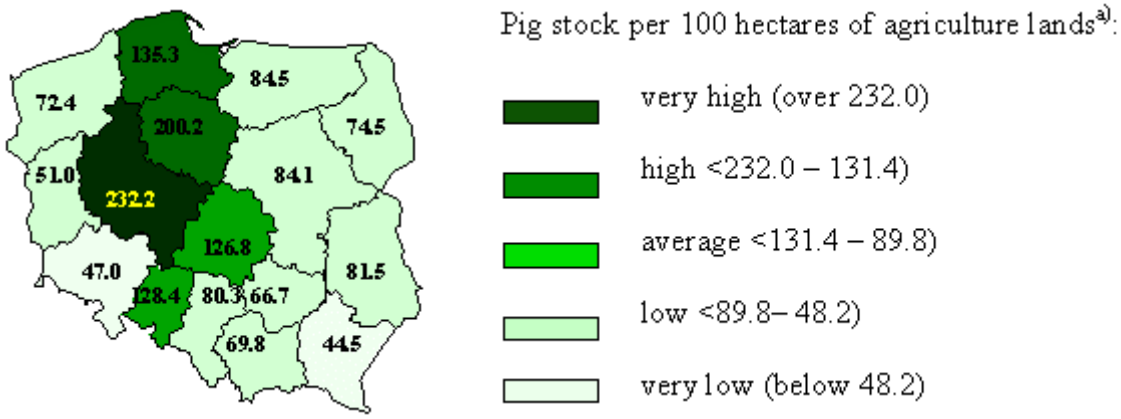
Figure 3. Pig stock according to provinces in 2004 (thousand heads)



a) Classes of pig stock were established by arithmetic mean ($\overline{x}$= 880.2) and standard deviation (s = 548.9).
Source. Own elaboration based on [8].

Big differentiation in regional section also took place in pig stock per 100 hectares of agriculture lands. The biggest intensity of pigs breeding took place in 2004 in Wielkopolskie (232.2 heads/ 100 ha of agriculture lands) and Kujawsko-pomorskie (200.2 heads/ 100 ha of agriculture lands) provinces. Pig stock per 100 hectares of agriculture land was higher from average in country in following provinces: Łódzkie (126.8 heads/ 100 ha of agriculture lands), Opolskie (128.4 heads/ 100 ha of agriculture lands) and Pomorskie (135.3 heads/ 100 ha of agriculture lands), too (figure 4).

Figure 4. Pig stock per 100 hectares of agriculture lands according to provinces in 2004 (heads/ 100 ha of agriculture lands)



a) Classes of pig stock per 100 hectares of agriculture lands were established by arithmetic mean ($\overline{x}$= 89.8) and standard deviation (s = 41.6).
Source. Own elaboration based on [8].

However, the lowest intensity of pigs breeding took place in southern and western Poland, in such provinces as: Dolnośląskie, Lubuskie, Małpolskie, Podkarpackie, Podlaskie, Świętokrzyskie and Zachodniopomorskie. The pig stock in these provinces was within: 44.5 – 74.5 heads per 100 hectares of agriculture lands (figure 4). Therefore it was on an average fourfold lowest than in Wielkopolskie province.

Regional distribution of hog livestock production in Poland in 2004 was similar to that of pig stock. Pig production in Wielkopolska, at the level of 646.8 thousand tones, considerably exceeded other regions. This volume was almost eighteen-fold higher relatively to Lubuskie province (table 2). Pig production over 200 thousand tones was registered at Kujawsko-Pomorskie (277.5 thousand tones), Mazowieckie (264.1 thousand tones) and Łódzkie (261.4 thousand tones) provinces. Hog livestock production in these provinces, along with Wielkopolska region, made 57.1% of total produced of hog livestock in Poland. Hog livestock production, below 70 thousand tones, i.e. not exceeding 3% of total hog livestock production, took place in Lubuskie (36.1 thousand tones) and Podkarpackie (61.1 thousand tones) provinces (table 2).

Central Poland also predominated over other regions in purchase of pigs in 2004. In such provinces as: Wielkopolskie, Kujawsko-pomorskie, Mazowieckie and Łódzkie together 1124.6 thousand tones of hog livestock was purchased. It made about 60% of total purchased hog livestock in Poland. However, in southern and western provinces of Poland (Dolnośląskie, Lubuskie, Małpolskie, Opolskie, Podkarpackie, Śląskie, Świętokrzyskie) only 323.7 thousand tones was purchased, so over threefold less than in central Poland (table 2).

Table 2. Pigs stock, production, purchase and slaughter of hog livestock in Poland and by provinces in 2004

Specification	Pig stock		Production		Purchase		Slaughter	
	thousand heads	%	thousand tones	%	thousand tones	%	thousand tones	%
POLSKA	17395.5	*100.0*	2537.9	*100.0*	1883.5	*100.0*	654.3	*100.0*
Dolnoslaskie	484.5	*2.8*	82.9	*3.3*	53.3	*2.8*	29.6	*4.5*
Kujawsko-pomorskie	2104.5	*12.1*	277.5	*10.9*	212.7	*11.3*	64.8	*9.9*
Lubelskie	1211.7	*7.0*	170.9	*6.7*	118.0	*6.3*	52.8	*8.1*
Lubuskie	260.9	*1.5*	36.1	*1.4*	29.8	*1.6*	6.4	*1.0*
Łódzkie	1402.0	*8.1*	261.4	*10.3*	197.5	*10.5*	63.8	*9.8*
Małopolskie	523.8	*3.0*	74.9	*3.0*	52.9	*2.8*	22.0	*3.4*
Mazowieckie	1796.9	*10.3*	264.1	*10.4*	189.4	*10.1*	74.7	*11.4*
Opolskie	692.3	*4.0*	77.2	*3.1*	44.9	*2.4*	32.3	*4.9*
Podkarpackie	338.3	*1.9*	61.1	*2.4*	43.8	*2.3*	17.3	*2.6*
Podlaskie	828.8	*4.8*	115.0	*4.5*	75.0	*4.0*	40.0	*6.1*
Pomorskie	1096.2	*6.3*	98.0	*3.9*	76.8	*4.1*	21.2	*3.2*
Slaskie	402.3	*2.3*	73.5	*2.9*	57.5	*3.0*	16.1	*2.5*
Swiętokrzyskie	422.7	*2.4*	71.1	*2.8*	41.5	*2.2*	29.6	*4.5*
Warmińsko-mazurskie	874.5	*5.0*	117.7	*4.6*	98.6	*5.2*	19.0	*2.9*
Wielkopolskie	4192.5	*24.1*	646.8	*25.5*	525.0	*27.9*	121.8	*18.6*
Zachodniopomorskie	763.6	*4.4*	109.7	*4.3*	66.8	*3.5*	42.9	*6.6*

Source: Own elaboration based on [8. 9].

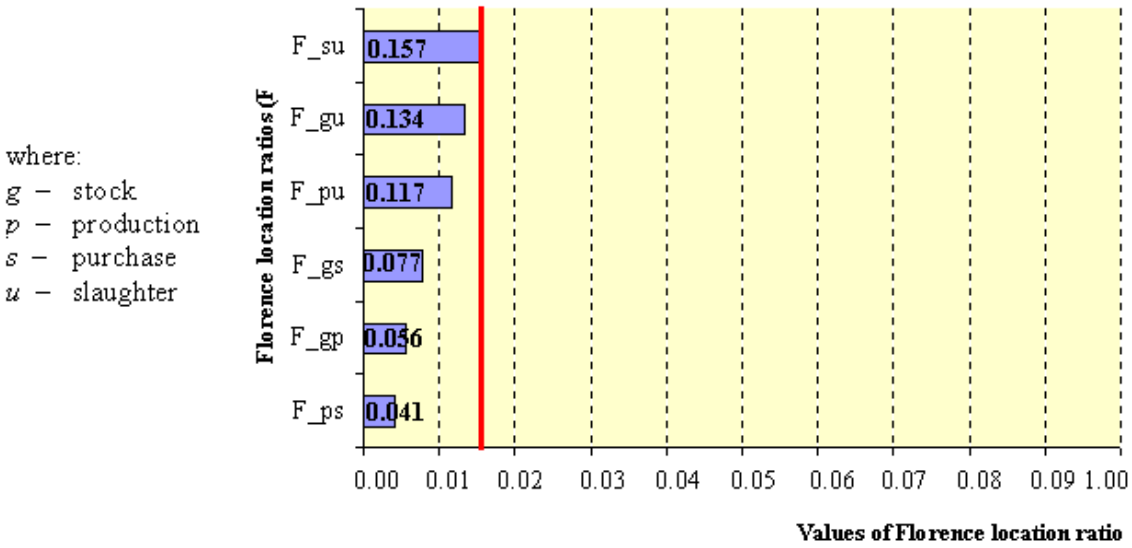
Analysis of volume of hog livestock slaughter across provinces did not show greater disparity relatively to distribution of stock, production and purchase of pigs in particular provinces. In central Poland in 2004, 49.7% of total slaughters of hog livestock was concentrated (table 2). Research of Milewski [3] also indicates concentration of meat industry mainly in these provinces. First of all, in these provinces there are big urban and industry agglomerations and food supply zones. Second, good development of high output animal production and big market. So, it is possible to assume, that central Poland will have the greatest influence in forming of supply of meat preserves.

In all provinces, purchase of pigs exceeded volume of pig slaughters. The biggest difference took place in Warmińsko-mazurskie province. In this region, purchase was over fivefold higher than he amount of hog livestock slaughter.

Development of pig production and increased organization and economic efficiency of raw-material and processing links is possible when development of processing industry will be concentrated around regions of high participation of this kind of production. On this purpose spatial differentiation of pig production in Poland by provinces was

researched. For defining the range and power of coherence between stock, production, purchase and slaughter of hog livestock Florence location ratio was used. Calculated values of this ratio are presented in figure 5.

Figure 5. Values of Florence location ratio



Source. Own elaboration based on [8. 9].

All of the analyzed Florence location ratios were below 0.2. Florence location ratios had the lowest values for coherences which describing purchase and production (F_{ps} = 0.041), stock and production (F_{pg} = 0.056) as well as stock and purchase (F_{gs} = 0.077). Therefore, these values define essential conformability of mutual spatial distribution of researched features. This confirms earlier analysis of pig stock, production and purchase distribution according to provinces (figure 5).

Florence location ratio had somewhat higher values at comparison of distribution of production and slaughter (F_{pu}), stock and slaughter (F_{gu}) as well as purchase and slaughter (F_{su}). Florence ratio had values from 0.117 to 0.157 for these features. That also testifies to conformability of distribution of analyzing features by provinces (figure 5).

Analysis of change of spatial differentiation of pigs breeding in Poland in nineties, carried by Olszańska [5.6] and research of interregional differentiation of pig production carried by Boger [1], Milewski [3], Okularczyk [4], Paszkowski. et. al.[7], Waloch and Witczak [10], Witczak [11] confirm asymmetry of intensity of hog livestock production in according to provinces.

CONCLUSIONS

Pig production in Poland in 2004 characterized very strong regional differentiation according provinces. Counted value of concentration ratio indicated not very strong concentration of pig stock in provinces.

Based on analysis of volume of pig stock, production. purchase and slaughter, it is possible to ascertain the concentration of this kind of animal production in central part of Poland, in which definitely predominate four provinces: Wielkopolskie, Kujawsko-pomorskie, Łódzkie and Mazowieckie.

First of all, the highest intensity of pigs breeding in central Poland resulted from fact, that this region in respect of advantageous natural and agrarian conditions, as well as tradition is predestinated for development of hog livestock production. It is possible to assume, that in future provinces of central Poland will decide about volume of pig stock and production, concentrating around themselves the biggest producers and processing enterprises of hog livestock.

The analysis of spatial distribution of researched features by Florence location ratio also indicated essential conformability of distribution of hog livestock production.

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FOOTNOTE

1. State at the end of November.

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