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DEPARTURE FROM FARMING IN POLISH METROPOLITAN AREAS – ASSESSMENT OF THE SCALE AND SPATIAL DIFFERENTIATION¹

Summary

Purpose – The aim of the study was to assess the impact of the location of farms, the quality of natural conditions and fragmentation of agricultural holdings on the rate of landowners' departure from agricultural activity, including cattle and pig farming.

Research method – The study covered six provinces: Dolnośląskie, Małopolskie, Lubelskie, Mazowieckie, Pomorskie, Wielkopolskie. The considerations carried out were conducted in the system of districts for the years 2004-2016.

Results – The largest decrease in the number of direct payment beneficiaries in the years 2004-2016 was recorded in the districts located on the outskirts of metropolitan areas. It was observed that in territorial units which obtained a higher evaluation of the quality of agricultural production space the regression in terms of the number of farms involved in animal production was significantly smaller, and the decrease in the number of single area payment beneficiaries was also smaller. In districts with relatively good natural conditions, faster departure from cattle and pig rearing was facilitated by the fragmentation of the area structure of farms.

Originality / value / implications / recommendations – So far, the lack of detailed analyses of changes taking place in agriculture in Polish metropolitan areas has been noted, while this issue has been an important field of interest for researchers in the world for several decades. Therefore it means that work should be considered innovative. The results of the undertaken considerations constitute a significant contribution to explaining the reasons for the deagrarianisation of rural areas.

Keywords: agriculture, metropolitan areas, deagrarianisation, agricultural activity, animal production

JEL Classification: R2, R3, Q1

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1. Introduction

Polish agriculture is entering the next stage of its transformation. In the period of intensive structural transformations of the last decade of the 20th century, caused by the change of the economic system and opening Polish markets to subsidised agri-food products, some agricultural holdings went into the phase of a specific dormancy (economic thanatosis) waiting for the improvement of conditions for agricultural production [Wojewodzic, 2017]. Along with Poland's accession to the structures of the European Union and the inclusion of Polish farmers in various support instruments under the Common Agricultural Policy (CAP), some „dormant” farms made an attempt to restore agricultural activity. Most of them were no longer able to resume suspended production processes due to negligence in restoring productive assets and changes in the owners' lifestyles, work and consumption patterns. The emerging possibilities of support by public funds resulted in greater interest in the purchase of land by economically stronger entities, favoured ordering of ownership issues, restoration to agricultural production or afforestation of previously set-aside land. The economic instruments introduced within the CAP had a limited impact on the improvement of the farms' structure in suburban areas, where land concentration processes were hampered by the owners who counted on the implementation of current and future economic rents [Marcysiak, Prus, 2017]. Some entities, waiting for the increase in land prices in the future and the change of local spatial development plans in order to maximize their benefits, branded agricultural production by applying for area payments for the land previously lent to other entities. The adopted solutions within the scope of support for agricultural production were not able to stop the processes of farmers' withdrawal (departure) from animal production. It was related, among others, to the degree of fragmentation of farms, a decrease in profitability and their low economic efficiency in relation to larger entities. The small amount of land required for the production of animal feed, which is particularly important for ruminants, and the lack of availability of such land have contributed significantly to this [Ziętara, Mirkowska 2018, Kleinhanss, 2015]. A particularly high intensity of agricultural withdrawals is observed in urban and suburban areas, both in Poland and in other countries [Sroka, 2018]. Administrative problems are an additional factor limiting the development of animal production in the vicinity of towns and cities. The development of livestock facilities often causes anxiety among local communities. This effectively discourages farmers from developing existing farms [Ziętara, 2019].

2. Methodological remarks

The aim of the study was to assess the impact of the location of farms, the quality of natural conditions and fragmentation of agricultural land on the rate of land-owners' departure from agricultural activity, including cattle and pig farming. The study covered six provinces: Dolnośląskie, Małopolskie, Lubelskie, Mazowieckie,

Pomorskie, Wielkopolskie. The selection of the research area resulted from the assumptions of the research project NCN 2016/21/D/HS4/00264. For the purposes of the analysis, the studied population of rural districts was divided according to three criteria (table 1). In the analysis of location, the location of the subregion in relation to the metropolitan area (MAs) was taken into account, distinguishing three separate groups, i.e.:

- districts adjacent to province towns – MA centres,
- other districts partly located within the boundaries of the MAs,
- districts remaining outside MAs.

In the assessment of the quality of natural conditions, the index of agricultural production space valorisation – IUNG (WWRPP) was used, and 65 points were adopted as the border caesura of the divisions, which is similar to the Polish average of 66.6 points [IUNG]. The third criterion of the division of districts was the average area of agricultural holdings applying for direct payments. The limit value is 10 ha UAA (utilised agricultural area), which is similar to the data published annually by the ARMA (e.g. 2007 – 9.91; 2016 – 10.56 ha UAA) [www 1].

The source data on the number of beneficiaries of area payments and the number of herds in particular subregions were taken directly from the Agency for Restructuring and Modernisation of Agriculture (ARMA)². Other source data came from the CSO Local Data Bank [www 2].

TABLE 1

Division of the examined districts taking into account the adopted criteria of location, the average size of agricultural holdings and the quality of agricultural production space

Specification	Districts with an average farm size				Total
	≤10 ha UAA		>10 ha UAA		
	WWRPP				
	>65 points	≤65 points	>65 points	≤65 points	
Districts adjacent to the MAs centre	5	6	7	1	19
Districts partly located in MAs	6	6	13	5	30
Districts outside MA	20	25	28	27	100
Total	31	37	48	33	149

Source: own calculations based on ARMA (The Agency for Restructuring and Modernisation of Agriculture) data.

The following research hypotheses were verified during the analytical process: H₁: the processes of landowners' departure from agricultural activity are faster in

² Public sector information request (case file mark: DAiS-WWZiP-ZUI.0163.106.2018.SD).

districts located directly in the vicinity of province cities than in the subregions distant from these economic centres.

In the analysis of source data, tools of descriptive statistics and dynamics indicators were used. The research covered the period from 2004 to 2016. The maximum number of agricultural holdings and animal herds in the years 2004–2006 was assumed as the basis for the construction of the dynamics indicators, as some entities reluctant to integrate with the European Union registered their activity only in the 2nd and 3rd year after Poland's accession to the EU structures, which was particularly visible in the case of pig production.

3. Land rents as a determinant of departure from agricultural activity

Research on changes in the agrarian structure, taking into account the mutual location of subregions with different economic functions, is an important element of economic research. In their genesis, they refer to both classical theories of location, economic rents and spatial economics achievements. Nowadays, there is no doubt that the occurrence of differential and institutional disability pensions, as well as the phenomenon of the pursuit of disability (rent-seeking) described by Krueger [1974] and Tullock [1988], significantly influence the direction and pace of changes in agriculture. The theory of pursuit of disability benefits tries to provide an answer to the question of how economic entities, including agricultural holdings, strive to obtain measurable benefits by obtaining public funds or shaping favourable conditions for conducting economic activity [Czyżewski, Brelik, 2014; Satola et al., 2018]. The pursuit of rent should be considered a common phenomenon in the conditions of an active role of public institutions, including the European Union, in shaping macroeconomic conditions for agricultural production. Differential rents very often arise from local conditions of running a business [Marks-Bielska, 2010] or even from the characteristics of a particular farm.

Differential rent (Differential rent I, Ricardian rent) is a direct consequence of the quality of land. Entities carrying out their activities on better quality soils obtain higher yields than those occupying low quality soils, although they use the same technology. In the context of the conducted deliberations, it is worth noting that the majority of urban centres with a long history are located in areas with favourable conditions for agricultural production, which in the case of urban sprawl may lead to conflicts of interest mainly between farmers and developers.

Obtaining greater benefits from land use may also result from other natural (e.g. landforms), economic (e.g. better infrastructure of the subregion, more favourable location in relation to markets and institutions) or social (e.g. favourable neighbourly interactions, quality of social capital) conditions. These benefits are referred to as differential rent III.

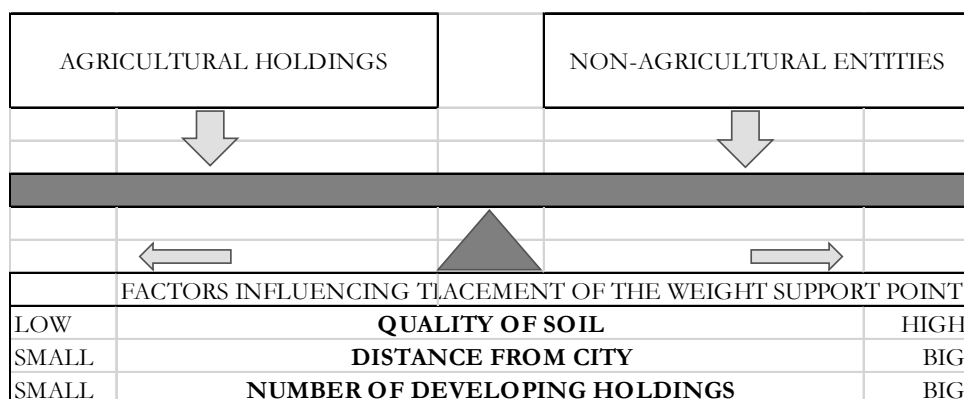
Differential rent IV³ resulting from environmental conditions or related to legal regulations has also the character of geographical rent. The increase in the value of land or the production of land may result from the location of the parcel in an area of high natural value, the high quality of the natural environment or favourable microclimate characteristics.

The high quality of the land or its favourable location do not guarantee obtaining extraordinary benefits from its use. Along with the development of technology and pressure to reduce unit costs to achieve pensions, and in particular differential rent II, resulting, *inter alia*, from the increase in the scale of production, it is necessary to increase the area of individual crops to allow for the possibility of intensification, the use of modern means of production and the implementation of beneficial economies of scale.

The amount of differential rents linked to agricultural production is an important reason for farmers to engage in or give up production. Institutional (economic) rents are important for the preservation of agricultural land ownership. Entities not involved in agricultural production are increasingly seeking to take over the land and the associated (economic) rents. Pressure from non-agricultural entities is particularly strong in the vicinity of large urban agglomerations. Along with the deterioration of land quality and the increase in the fragmentation of agricultural land, the involvement of agricultural holdings in taking over land together with the corresponding rents from entities giving up agricultural activity is decreasing (chart 1). However, the activity of entities not interested in agricultural production activity increases. The reasons for this are to be found primarily in the rising prices of land. Entities withdrawing from agricultural activity located in suburban zones or in the vicinity of industrial zones are delaying the sale of their assets, expecting further price increases and higher capital annuities in the future [Kilian, Salhofer, 2008; Molnár, Vandembroucke, 2010; Ciaian, Kancs 2012; Musiał, Wojewodzic, 2014]. As a consequence of such practices in the vicinity of urban agglomerations, farms are often divided up, part of the land is separated from them for non-agricultural purposes, and relatively less frequently used for full liquidation (palliative divestments). At the same time, the purchase of land for agricultural purposes in suburban areas and along main access routes exceeds the financial possibilities of the owners of agricultural holdings wishing to develop agricultural production.

The implementation of institutional rents by ineffective farms (e.g. collection of direct payments), as well as waiting for the implementation of capital rents resulting from the increase in the value of land, delay the processes of their full liquidation, and, thus, the transfer of their resources to entities with a greater development potential. Structural change is, therefore, slow in the urban environment, often in the form of stagnation or slow departure from farming.

³ The fourth differential rent, the so-called environmental rent, arises in the case of special environmental values of the resource [Czyżewski, 2009, 2013].

CHART 1**Factors affecting the take-up of land-related rents by agricultural holdings and non-agricultural entities**

Source: own elaboration.

Sinclair [1967], developing the theory of the central market, formulated the so-called Thünen's reversed circles theory, according to which, urban agriculture and temporary utilized land will be located closest to the centre, constituting a specific reservoir of space necessary for the future development of the city. Therefore, deagrarianisation processes are clearly visible in the surroundings of large cities, both deagrarianisation of rural areas consisting in limiting the impact of agriculture on the economy and farmers on society, as well as production and income deagrarianisation of individual farms, which are evolving towards households with landowners.

4. Selected parameters of agrarian transformations in metropolitan areas

Verification of the theory of agricultural production location in relation to the central location is nowadays very difficult, because a large group of factors that may mutually even or increase their influence over each other overlap. Similar difficulties are encountered in the analysis of structural changes in agriculture, where the effects of the various CAP instruments should be considered as additional distortions.

In spatial analyses, it can be assumed that economic policy and other macroeconomic factors have a similar impact on the processes taking place in economic entities throughout the country. It allows to focus on the influence of local and location factors and of endogenous conditions of agricultural holdings on the changes taking place in the agricultural sector..

The group of districts distinguished in terms of location was diversified both in terms of parameters describing the level of socio-economic development, living conditions of the inhabitants, labour market, natural values and agrarian structure. The analyses carried out showed that as the proximity of districts to metropolitan

areas' centres (provincial cities) increased, the indicators describing the intensity of urbanization, the average monthly salary, and the density of economic entities increased as well. At the same time, the unemployment rate in districts bordering the centre of the MU was lower than in distant units, on average by about 6 percentage points. However, the correlation analysis did not reveal any statistically significant dependencies between the selected socio-economic factors and the pace of resignation from agricultural activity. On the other hand, soil and climatic conditions (WWRPP) and internal structure of agriculture had a significant influence on the processes under consideration (table 2).

TABLE 2

Pearson's assessment of linear correlation

Specification	Correlation coefficients *		
	change in the number of direct payments beneficiaries	change in the number of cattle herds	change in the number of pig herds
Average area of the holding receiving direct payments in 2004 (ha)	<u>0.29</u>	<u>0.21</u>	<u>-0.20</u>
Valorisation of Agricultural Production Space	<u>-0.17</u>	<u>-0.57</u>	<u>-0.43</u>
Share of small agricultural holdings (under 5 ha) in 2010 (%)	<u>0.21</u>	0.15	<u>0.17</u>
Share of agricultural holdings receiving income mainly from agricultural activity in 2010 (%)	<u>-0.55</u>	<u>-0.53</u>	0.09

* the statistically significant values of the correlation index were underlined at the level of $p=0.05$

Source: own calculations.

The analysis of spatial diversification of the processes of farmers' departure from production activity showed that in districts adjacent to province towns, the share of small agricultural holdings was generally higher than in other areas, and the share of beneficiaries of direct payments was lower (table 3). The reasons for this state of affairs should be seen, among others, in the pursuit of economic rents by landowners, which makes it very difficult for production entities to concentrate their land in urban areas. High demand for land for residential, economic and infrastructural purposes contributes to the increase in land prices.

In the years 2004-2016, the greatest decrease in the number of beneficiaries of the direct payment was observed in districts located on the outskirts of MAs. The landowners who live there usually have less possibilities to use the land for non-agricultural purposes, but still have relatively easy access to the labour market in the Province town. However, daily commuting to work takes more time than in the case of inhabitants of towns near the centre of a metropolitan area, and, thus, hinders

agricultural activity and favours the decision to stop agricultural production and close down the farm. Limited access to the labour market of inhabitants of localities located at a significant distance from metropolitan areas should be considered as a factor hindering the process of farm owners' departure from agricultural activity.

TABLE 3

**Change in the number of direct payments beneficiaries
in the years 2004-2016 (%)**

Specification	Average agricultural holding area in districts				Total
	≤10 ha UAA		>10 ha UAA		
	WWRPP				
	>65 points	≤65 points	>65 points	≤65 points	
Districts adjacent to the MAs centre	-8.0	-8.7	-5.3	-0.6	-7.1
Districts partly located in MAs	-9.1	-14.2	-6.9	-4.3	-9.4
Districts outside MA	-8.2	-9.8	-8.7	-4.3	-8.0
Total	-8.3	-10.2	-7.6	-4.2	-8.1

Source: own calculations based on ARMA data.

Detailed analyses showed that in districts with highly fragmented area structure and bad natural conditions for agricultural production, agricultural holdings withdraw from the direct payments system more often. The „departure from agriculture” observed here is a consequence of the small size of the area and the impossibility of obtaining land rents resulting from the quality of the land. On the other hand, in subregions where the average farm area in 2004 was greater than 10 ha UAA, agricultural activity was more often abandoned by entities located in those units where the quality of land and natural conditions were better. In these areas, there are more entities capable of taking over the land and implementing on its basis rents resulting both from quality (differential rent I) and production intensification (differential rent II).

The value of the indicator describing the change in the number of direct payments beneficiaries was very diversified among the examined districts ($W_z=78.5\%$) and ranged from +9.0% (Pruszków district) to -29.4% (Suski district). Among the ten districts which recorded an increase in the number of beneficiaries of area payments in the years 2004-2016, four of them were directly adjacent to province towns (metropolitan centres), which may be the result of both the division of farms and the purchase of agricultural land by people who were not farmers before. In the vast majority of the surveyed districts, the number of farms benefiting from support

decreased very clearly to the area of UAA. The largest decrease in the number of direct payments beneficiaries took place in Malopolskie province (- 15.1%)⁴.

Resignation from animal production may constitute the initial phase of departure from agricultural production as such (palliative divestments) or may be a manifestation of simplification of the farm structure and concentration on plant production (anticipatory divestments) [Wojewodzik, 2017]. The intensity of the departure processes from cattle and pig farming shows significant regional differences.

The analysis for the years 2004-2016 showed that the process of departure from cattle breeding concerned almost 43% of agricultural holdings conducting such activity in the first years after Poland's accession to the EU structures. While still in 2004 cattle were kept in about 58 farms per 100, in 2016 there were only 34 entities per 100 receiving direct payments. Higher indicators describing this process were characteristic for districts with fragmented agrarian structure. It should be noted, as an interesting observation, that farms which operated in more favourable natural conditions gave up cattle farming much more often than those in which the value of the agricultural value index of the production space was lower than the national average (table 4). This confirms the well-known fact that on relatively lower quality soils, the importance of animal production increases, especially for those species which are fed mainly locally produced feed.

TABLE 4

Change in the number of cattle herds 2004-2016 (%)

Specification	Average agricultural holding area in districts				Total
	≤10 ha UAA		>10 ha UAA		
	WWRPP				
	>65 points	≤65 points	>65 points	≤65 points	
Districts adjacent to the MAs centre	-60.2	-25.0	-49.8	-29.8	-45.0
Districts partly located in MAs	-58.6	-46.7	-33.2	-26.5	-45.9
Districts outside MA	-56.3	-40.1	-42.9	-26.2	-42.3
Total	-57.2	-39.6	-41.7	-26.4	-43.0

Source: own calculations based on ARMA data.

The average values for particular groups of districts divided on the basis of their distance from the centres of metropolitan areas are very similar. In all the surveyed districts, the number of cattle herds decreased in the discussed period, and the values of the dynamics index ranged from -3.7% (Chodzież district) to -81.2%

⁴ Dolnośląskie (-11.5%); mazowieckie (-6.9%); lubelskie (-5.9%); wielkopolskie (-4.5%); pomorskie (-3.8%).

(Olawa district). In the regional system, it should be noted that farms in Dolnośląskie province gave up cattle farming most often (-61.8%).⁵

The index describing the change in the number of cattle herds was quite strongly and statistically significantly correlated with both the index describing the change in the number of direct payments beneficiaries ($r_{xy}=0.52$) and the index describing the change in the number of pig herds ($r_{xy}=0.44$). However, there was no correlation between the change in the number of direct payments beneficiaries and the change in the number of pig herds (table 2). As in the case of cattle, pig breeding was more often abandoned by farmers operating in districts with better natural conditions for agriculture (table 5). The average size of farms had a different effect on the change in the number of animal herds. In the case of cattle, a greater herd loss was observed in territorial units with more fragmented agriculture ($r_{xy}=0.21$). In the case of pigs, however, a greater herd loss was observed in districts with a larger average farm area ($r_{xy}=-0.20$). In both cases, these dependencies, although statistically significant, should be considered to be slight and, therefore, difficult to see in the aggregates presented in tables 4, 5.

TABLE 5

Change in the number of pig herds 2004-2016 (%)

Specification	Average agricultural holding area in districts				Total
	≤10 ha UAA		>10 ha UAA		
	WWRPP				
	>65 points	≤65 points	>65 points	≤65 points	
Districts adjacent to the MAs centre	-37.6	-20.8	-33.5	-17.4	-32.0
Districts partly located in MAs	-35.4	-21.0	-32.2	-27.7	-30.5
Districts outside MA	-43.7	-33.6	-38.4	-34.1	-37.6
Total	-41.9	-31.7	-36.2	-32.8	-36.1

Source: own calculations based on ARMA data.

In spite of a significant diversification of the departure process of agricultural holdings from pig farming ($W_z=84.7\%$), it is very difficult to indicate regularities in this respect. In spatial terms, the greatest decrease in the number of pig herds was recorded in the Dolnośląskie Province (-54.4%). In districts where the highest increase was recorded in the analysed period, e.g. Tatrzański district (+100.0%), Nowy Targ district (+31.8) or there was a decrease in the number of herds, e.g. Suski district (-86.7), Chrzanowski district (-80.0%), such phenomena resulted mainly from the incidental nature of those activities, where even a slight increase or decrea-

⁵ Lubelskie (-56.0%), małopolskie (-55.2%), pomorskie (-36.1%), mazowieckie (-28.5%), wielkopolskie (-27.6%).

se in the number of breeders caused a very large change in the discussed indicator. This leads the authors to develop a very cautious approach to the results obtained regarding the departure of farmers from pig farming. In addition, the observed processes will continue to be strongly interfered with by the consequences of the presence of African swine fever (ASF) on the Polish territory.

6. Conclusions

The conducted studies do not give grounds for a positive verification of the hypothesis indicating that in the vicinity of province cities the processes of departure from agriculture take place faster than in subregions distant from them. The number of beneficiaries of area payments decreased the fastest in districts located on the outskirts of metropolitan areas, where it is relatively easy to organise commutes to work in a large urban centre. However, due to the commuting time it is difficult to combine paid non-agricultural work with running a farm. There are also lower expectations regarding future economic rents for land ownership, which facilitates the decision on its resale or long-term lease.

The scale and scope of departure of some agricultural holdings from agricultural activity were more affected by natural and economic conditions than the location itself. In territorial units which obtained agricultural production space of better quality, the regression in terms of the number of agricultural holdings carrying out animal production was much smaller, and the number of beneficiaries of direct payments was also decreasing more slowly. In districts with relatively good natural conditions, a higher intensity of departure from cattle and pig farming was observed in the areas where the fragmentation of agricultural holdings was more significant.

The presented research results focused on the number of agricultural producers but did not allow to assess the changes in the scale and structure of agricultural production in particular zones. These issues require separate analysis.

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