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SUBJECTIVE POVERTY LINE AS CLASSIFICATION CRITERIA FOR CREDITS PURPOSES OF HOUSEHOLDS

Summary: The structure of Polish household expenditure in the areas with worse economic indicators does not differ much from the expenditures of those households which are located in the regions of good economic indicators. It can be assumed that the reason for the lack of differences is taken out loans and credits. The main goal of this article is to explore the differences between households in Poland. The first criterion of differentiation is loans and credits and the second one – the subjective assessment of the economic situation of a household. It was assumed that the reasons for crediting will be different in the households in a worse economic situation from those which assess their situation better. The hypothesis formulated in this way allowed using the classification of households based on Subjective poverty line including the differences in credit goals by regions.

Keywords: regional disparity in Poland; Subjective poverty line, credits goals of households.

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1. Introduction

The issue of regional differentiation in Poland is widely discussed in literature [see: Kozak 2012; Gorzelak 2010; Przybysz 2006]. Its impact on the living of residents of individual regions is investigated in many aspects. It is important from the perspective of the policy of equality which is a priority of the European Union. This article is another attempt to study this area. Previous studies on the impact of regional diversity on the structure of household expenditure have shown that the structure of household expenditure in the areas with worse economic indicators does not differ from the expenditure of those households which are located in the regions of good economic indicators (see: [Przybysz 2006]). The study attempts to explain the lack of differences by means of a combination of variables, including: variables from socio-economic development area and assessment of financial situation of

households in conjunction with the loans and credits purposes. The main assumption was that the reason for the lack of differences between poorer and better parts of the country was the fact of covering necessary expenses by loans. Therefore, to verify a hypothesis formulated in this way, the conducted study was divided into stages, based on the concept of the TOPSIS method[1]). The modified TOPSIS methodology is a multi-attribute tool and it was employed to a create synthetic measure of the development of regions in Poland. Next this measure will be used as a differentiating variable of regions in the rest of the study.

The first step of the study was to check if there is a significant spatial diversity of the socio-economic situation in different voivodeships in Poland. At this stage, the analysis comprised of a wide range of issues, including the regional data concerning employment, unemployment, income of population, living conditions, poverty, social exclusion, economic development, economic and social infrastructure, public security and social conditions. Thus indicators from following areas were used to show the regional diversity. Next, in order to create synthetic indicators a taxonomic method was used to show differences between regions and, against a background of these differences, households were then classified with respect to loans and credit purposes.

2. Criteria of regional development

Initially, as the criteria of regional development a wide range of measures of the economic development were taken into account, including areas of economic scale, industry structure of regions and living conditions of people. Further, on consideration, they were narrowed to issues representing areas such as: investment, gross wages and salaries, GDP *per capita*, the number of enterprises per thousand people, employment and unemployment. The data were taken from the Central Statistical Office in Poland (2011).

2.1. TOPSIS

According to TOPSIS methodology, which is a modification of the index of the development method first introduced by Hellwig [1968] and has been repeatedly discussed in the literature, e.g. detailed procedure is described in Dziechciarz et al. [1986]. The principal idea is based on the concept that the best possible alternative should have the shortest distance from the ideal solution and the negative ideal solution has the bigger distance. So in order to do the multi-attribute ranking, the alternatives were characterized as stimulants and destimulants and next they were standardized. In the study weights were not applied because of the assumption of

[1] TOPSIS – *Technique for Order Preference by Similarity Ideal Solution* is based on the Hellwig's method of linear ordering (see: [Hellwig 1968]).

equal participation of each variable in the creation of the synthetic measure. The next step was to establish the ideal and the worst alternative. For each region Euclidean distance from pattern (ideal alternative) was calculated. On this basis, a synthetic measure of development for each region was created. The best solution is found under the assumption that the shortest distance from the pattern is also the most distant from the worst alternative. Therefore, the TOPSIS steps were as follows (see: [Dai, Zhang 2011, pp. 136–137]):

1. To express inputs in the matrix form where rows show regions and in columns – the diagnostic variables (characteristics).

2. To construct the normalized matrix by means of standardization.

3. To determine the ideal (S+; pattern of development) and the worst (S−) alternative (pattern formed on the basis of the best occurring values of individual characteristics, the worst alternative – opposite).

4. To calculate the distance of each region from the pattern and the worst alternative.

5. To calculate the synthetic measure M – this measure takes values [0;1], the closer to 1, the better the situation of a region.

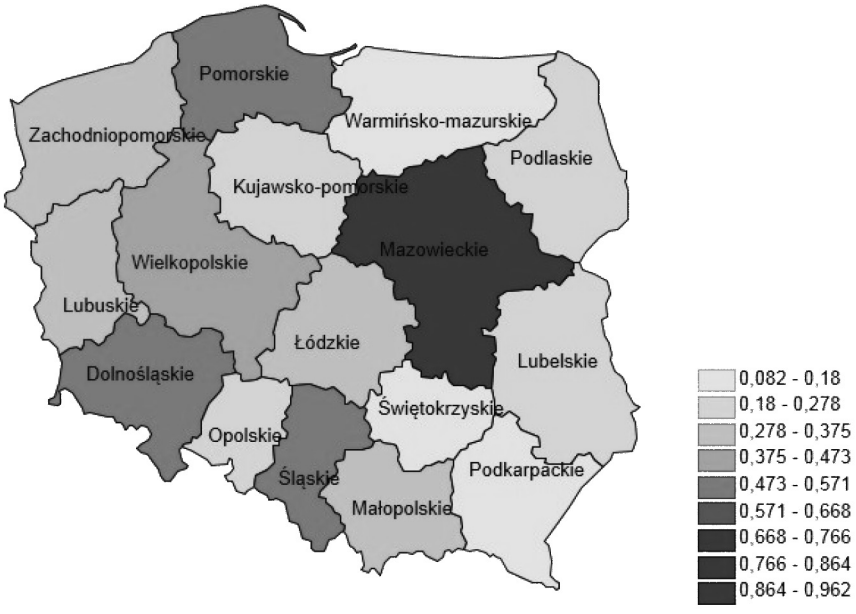

Figure 1. Regions (voivodeships) in Poland by the synthetic measure M

Source: own calculations based on the Central Statistical Office data (2011).

In accordance with the steps already described, the TOPSIS method was applied to evaluate the regional disparity of economic development of the 16 voivodeships

in Poland. The results were visualised in the cartogram (see Figure 1) and in Table 1, where the better socio-economic situation of the region entails the higher value of the measure (closer to one).

Table 1. Regions (voivodeships) in Poland by the synthetic measure M

Group	Voivodeship	Measure	Group	Voivodeship	Measure
5	Mazowieckie	0.961483	2	Zachodniopomorskie	0.285839
4	Dolnośląskie	0.538874	2	Opolskie	0.246834
4	Śląskie	0.515935	2	Podlaskie	0.240147
4	Pomorskie	0.474698	2	Kujawsko-pomorskie	0.238597
4	Wielkopolskie	0.462022	2	Lubelskie	0.18178
3	Lubuskie	0.370292	1	Warmińsko-mazurskie	0.139069
3	Łódzkie	0.356485	1	Świętokrzyskie	0.088841
3	Małopolskie	0.349465	1	Podkarpackie	0.082353

Source: own calculations based on the Central Statistical Office data (2011).

For further calculations regions were grouped into five subgroups, where 1, 2 and 3 have a synthetic measure lower than 0.37 (poorer region – eastern Poland), 4 and 5 have a synthetic measure higher than 0.46 (better developed regions – western Poland). First group included three voivodeships: *Warmińsko-mazurskie*, *Świętokrzyskie* and *Podkarpackie*. The second set involved four voivodeships: *Podlaskie*, *Lubelski*e, *Opolskie* and *Kujawsko-pomorskie*. The third group also contained four voivodeships: *Zachodniopomorskie*, *Lubuskie*, *Łódzkie* and *Małopolskie*. The fourth group included the remaining voivodeships: *Pomorskie*, *Wielkopolskie*, *Dolnośląskie* and *Śląskie*, which were, in accordance with the criteria, better developed than the previously mentioned voivodeships. Due to the much higher level of measurement, *Mazowieckie* could not be included in any of the previous groups (the fifth group).

2.2. Correspondence Analysis

In order to confirm that in Poland one can observe the differences between regions, the correspondence analysis was used. A comprehensive description of the algorithm of the correspondence analysis, computational details and its applications can be found in the classic text by Greenacre [1984].

The outcome of the correspondence analysis was created by employing diagnostic variables such as: investment, gross wages and salaries, GDP *per capita*, the number of enterprises per thousand people, employment and unemployment. Next, the visual analysis of the dispersion of points on the map allowed verifying groups of regions if there were similar to the previous classification based on the socio-economic situation (see Figure 2). Thus, the outcome of the correspondence analysis

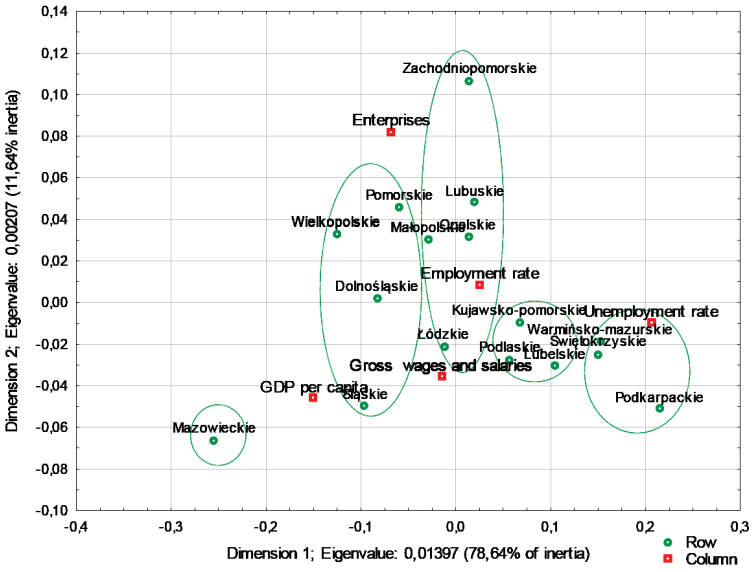

Figure 2. Correspondence analysis of regions and GDP per capita, level of enterprises, employment rate, unemployment rate, gross wages and salaries

Source: own calculations.

confirmed the previously proposed classification of regions based on the synthetic measure. In Figure 2 dimension 1 is responsible for the level of the development of regions (78.64% of inertia). On the left there are better developed areas, which were labelled 5 and 4 (which respond to *Mazowieckie* – the fifth group, and *Pomorskie*, *Dolnośląskie*, *Wielkopolskie* and *Śląskie* – the fourth group). Further to the right in Figure 2 there are the weakest regions. Thus, as before the least developed voivodeships were *Podkarpackie*, *Warminsko-mazurskie* and *Świętokrzyskie*.

3. The study

The assumed hypothesis states that the lack of differences in the structure of households expenditure between regions may be caused by taken out credits and loans. It can be justified by checking the goals of credits and loans with respect to household voivodeship. Empirical studies were carried out based on the data from the Social Diagnosis 2011[2] on the sample of 11 712 households.

According to the computations of the created synthetic measure, regions were divided into five categories, where 1 was assigned for a voivodeship with the

[2] Council for Social Monitoring. Social Diagnosis 2000–2011: integrated database www.diagnoza.com.

worst socio-economic situation (the lowest value of the synthetic measure) and 5 – for a voivodeship in the best situation. Exhaustive CHAID was used as a tree construction algorithm . The maximum depth that was set at 5 and the minimum number of observations in the parent node at 100 and the minimum number of observations in the child node were equal to 50. Each time, only those trees which met the requirements of prediction quality were shown and discussed (see: [Breiman, Friedman, Olshen 1984]).

As the dependent variable Subjective poverty line was used. It is a subjective assessment of households' financial situation (see: [Dziechciarz, Dziechciarz-Duda, Przybysz 2010]). Therefore, the different socio-economic situation in the regions was confirmed by the classification of households due to the variable Subjective poverty line.

The classification tree created based on the described assumptions shows that households perceive their financial situation differently, depending on whether they live in a region with better or worse socio-economic situation (see Figure 3 and 4).

The classification shows that households which live in the voivodeships with a higher synthetic measure have higher financial requirements. In 2011 the national average wage was PLN 3366 (about EUR 800)[3], about 20% of households from each voivodeship had income at the level close to that amount. Even 70% of the households from rich regions declared that this amount is not enough to make ends meet (see Figure 4) but only 30% of households in the poorer regions echoed this opinion (see Figure 3).

The subsequent classification was created to confirm the hypothesis that the reason for the lack of differences in the structure of household expenditures could be contracted loans and credits. The dependent variable was Subjective poverty line and as the independent variables goals of credits and loans declared by households were used.

The variable *Region*, created on the basis of the synthetic measure, each time well divides the households into two groups. In all regions, similar percentage of households assess their financial situation as difficult in different wages intervals. However, households behave similarly in credits and loans decisions regardless of the region in which they live (see Figure 5).

Living conditions of the poor and rich regions varied, for example, due to differences in food prices, wages, etc. – it seems reasonable that the structure of households expenditures and goals of credits or loans will also be the result of differences.

The classification tree shown in Figure 5 do not reflect this point of view. This can be seen when comparing the blue and the green bars in the charts. They seem very similar, regardless of the region of a household. The same situation can be

[3] Published annually by the Central Statistical Office as a notice in the Official Journal of the Republic of Poland "Polish Monitor" within 7 working days of February each year.

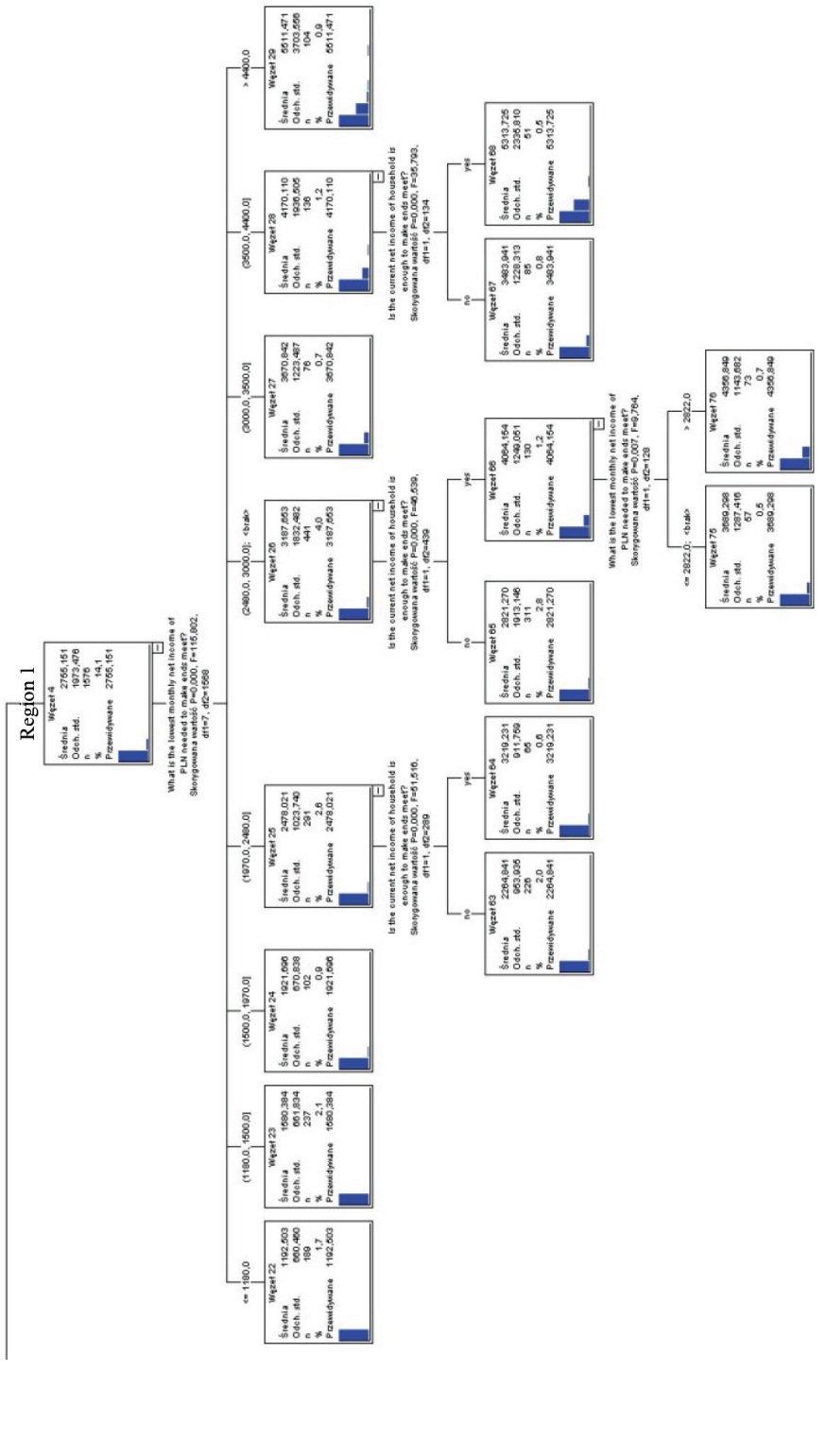

Figure 3. Assessment of the financial situation in poor regions

Source: own calculations based on Social Diagnosis integrated database.

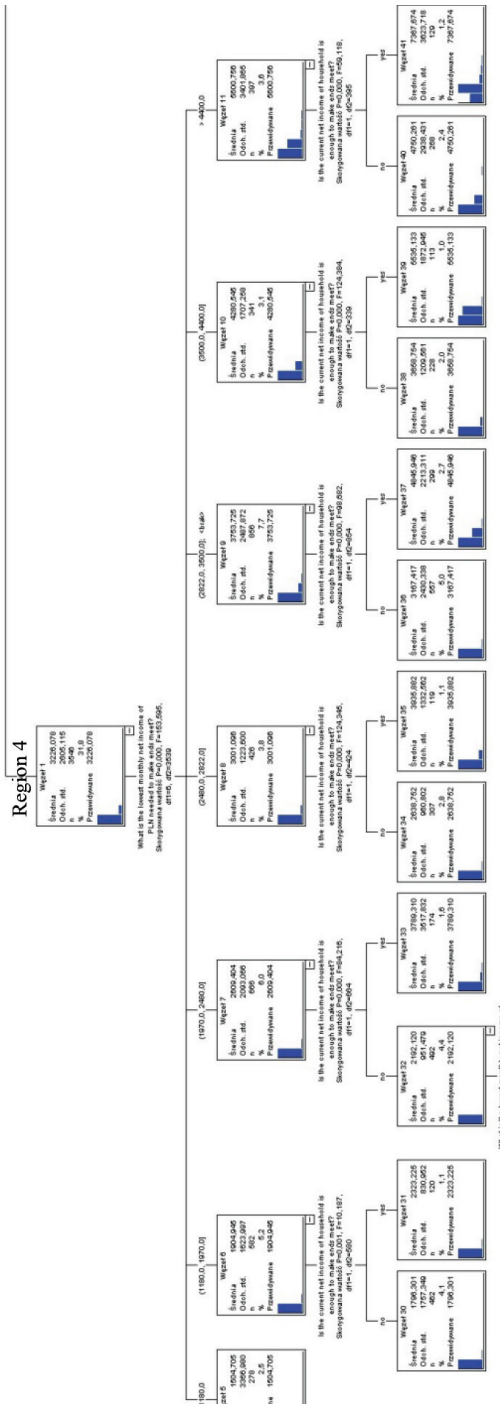

Figure 4. Assessment of the financial situation in rich regions

Source: own calculations based on Social Diagnosis integrated database.

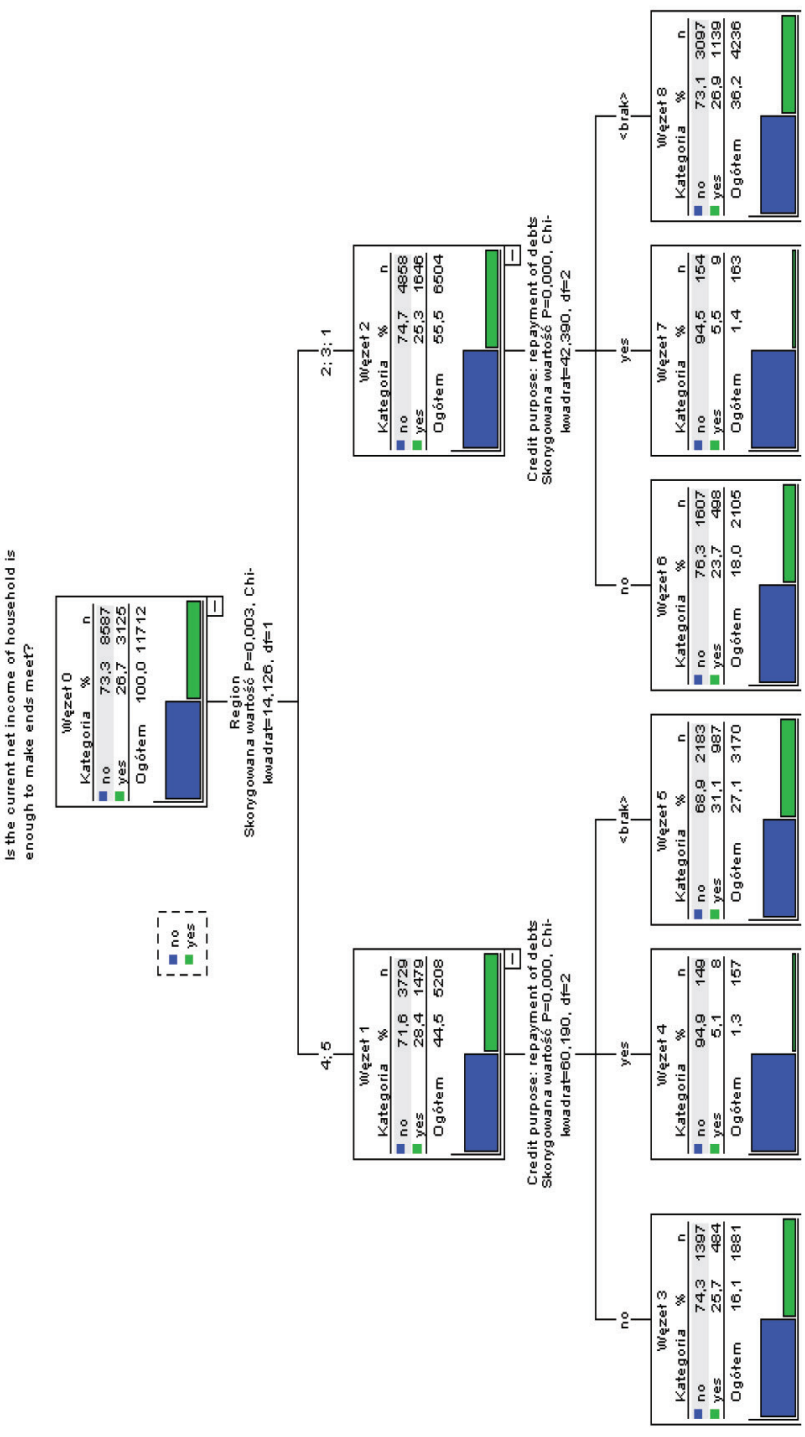

Figure 5. Credit purpose: repayment of debt

Source: own calculations based on Social Diagnosis integrated database.

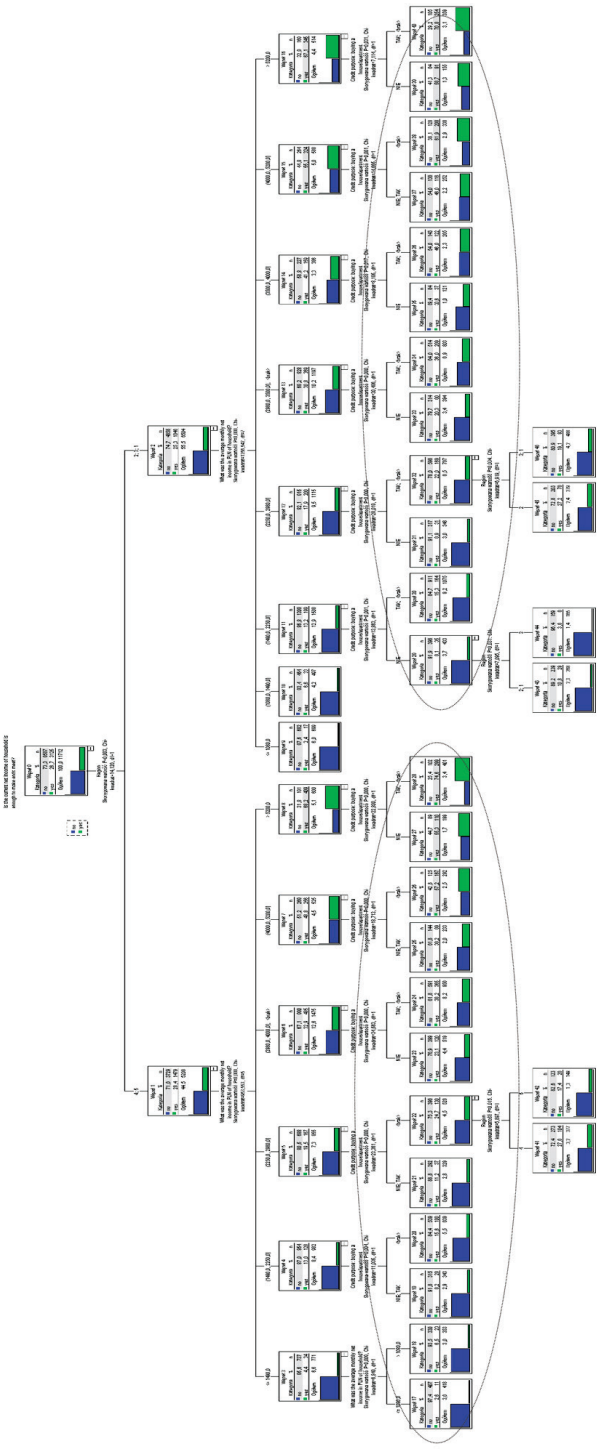

Figure 6. Credit purpose: buying a house or apartment

Source: own calculations based on Social Diagnosis integrated database.

observed in the classification made for other credit purposes used as independent variables. In Figure 6 it can be seen that the behaviour of households in terms of the purchase of a house or apartment on credit does not depend on whether they come from poor (the right side of Figure 6) or rich regions (the left side in Figure 6). On the both sides the height of the blue and green bars is very similar.

4. Concluding remarks

It was assumed that the reasons for crediting will be different for households in a worse economic situation from those which assess their situation better. The formulated hypothesis allows using the classification of households based on Subjective poverty line and goals of credit with respect to a region.

The research does not confirm the hypothesis that the lack of differences in the structure of expenditure of households may be caused by loans and credits. It should be emphasized that classification trees were analyzed not only for credits relating to durable goods. All the variants of credit purposes which respondents were asked about (in the survey) were analyzed (for example, recreation, treatment, current purpose or fixed fees). Regardless of the used independent variables (which were specific credits goals), the significant differences between regions were not observed. Each time conclusions were formulated only after checking the requirements of the prediction quality of classification trees and after the assessment of the stability of the trees.

The reason for these results may be a decrease in interest rates, which made loans and credits cheaper. Recently in Poland the rules for the verification of borrowers have been made less strict. Banks are more willing to give the loans for purchase of durable goods and repair of houses and flats. If more people can afford them, the differences in the standards of living and the assessment of the financial situation of households are blurring. Therefore, the structure of household expenditures of the poor and rich regions is similar; however, purchased goods (even food) have probably different standards and prices.

References

Breiman L., Friedman J.H.,. Olshen R.A, Stone C.J., 1984, *Classification and Regression Trees*, Wadsworth, Belmont.

Dai X., Zhang J., 2011, *The TOPSIS Analysis on Regional Disparity of Economic Development in Zhejiang Province*, Canadian Social Science.

Dziechciarz J. et al., 1986, *Ekonometria z elementami programowania matematycznego i analizy porównawczej*; Bartosiewicz S. (ed.); AE Wrocław, Wrocław.

Dziechciarz-Duda M., Król A., Przybysz K., 2012, Minimum egzystencji a czynniki warunkujące skłonność do korzystania z pomocy społecznej. Klasyfikacja gospodarstw domowych, [in:] K. Jajuga, M. Walesiak (eds.), *Klasyfikacja i analiza danych – teoria i zastosowania*, Prace Naukowe UE we Wrocławiu no. 242, Taksonomia 19, pp. 144–152.

Dziechciarz J., Dziechciarz-Duda M., Przybysz K., 2010, Household possession of consumer durables on background of some poverty lines, [in:] H. Locarek-Junge, C. Weihs (eds.): *Classification as a Tool for Research*, Springer-Verlag, Heidelberg-Berlin, pp. 735–742.

Dziechciarz J., 1993, *Ekonometryczne modelowanie procesów gospodarczych: Modele ze zmiennymi i losowymi parametrami*, AE Wrocław, Wrocław.

Dziechciarz J., Przybysz K., Siedlecki J., 2002, Statistical analysis of youth unemployment in Poland, [in:] E. Elsner (ed.), *Soziale und Ökonomische Probleme in der Großstadt. Armut und Arbeitlosigkeit; Statistisches Bundesamt*, Wiesbaden, pp. 129–142.

Dziechciarz J., Walesiak M., 1997, *Gromadzenie i analiza danych marketingowych wspomagane komputerem*, Prace Naukowe UE we Wrocławiu no. 734, pp. 39–51.

Gorzelak G., 2010, Facts and myths of regional development, *Studia Regionalne i Lokalne*, Special Issue, pp. 5–28.

Greenacre M., 1984, *Theory and Applications of Correspondence Analysis*, Academic Press, London.

Hellwig Z., 1968, Zastosowania metody taksonomicznej do typologicznego podziału krajów ze względu na poziom ich rozwoju i strukturę wykwalifikowanych kadr, *Przegląd Statystyczny*, no. 4, pp. 307-327.

Hwang C.L, Yoon K., 1981, *Multiple Attributa Decision Making Methods and Applications*, Springer Verlag, New York.

Kot S.M., 2000, *Ekonometryczne modele dobrobytu*, PWE, Warszawa.

Kozak M., 2012, Zróżnicowanie regionalne w Polsce na tle Europy i świata, [in:] Z. Sadowski (ed.), *Bogaci i biedni – problemy rozwoju społeczeństwa polskiego*, Polska Akademia Nauk, Komitet Prognoz „Polska 2000 Plus", Warszawa, pp. 106–141.

Przybysz K., 2006, Sytuacja społeczno-gospodarcza województw a struktura wydatków gospodarstw domowych, [in:] S. Mynarski (ed.), *Badanie konkurencji i konkurencyjności przedsiębiorstw i produktów na rynku*, Uniwersytet Ekonomiczny w Krakowie, Kraków, pp. 300–308.

Radziukiewicz M., 2006, *Zasięg ubóstwa w Polsce*, PWE, Warszawa.

Sulmicka M., 2001–2002, Zarys metodologii badania ubóstwa, *Polityka Gospodarcza*, no. 5–6, pp. 319–336.

KLASYFIKACJA GOSPODARSTW DOMOWYCH NA PODSTAWIE SUBIEKTYWNEJ GRANICY UBÓSTWA I CELÓW KREDYTOWYCH

Streszczenie: Struktura wydatków gospodarstw domowych w Polsce na obszarach o gorszych wskaźnikach ekonomicznych nie różni się wiele od wydatków tych gospodarstw, które znajdują się w regionach z dobrymi wskaźnikami ekonomicznymi. Można zatem przypuszczać, że powodem braku różnic mogą być zaciągnięte pożyczki i kredyty. Głównym celem niniejszego artykułu jest zbadanie różnic między gospodarstwami domowymi pochodzącymi z odmiennych obszarów ekonomicznych. Pierwszym kryterium różnicowania były zaciągane pożyczki i kredyty a drugim – subiektywna ocena sytuacji ekonomicznej gospodarstw domowych.

Słowa kluczowe: zróżnicowanie regionalne w Polsce, granica subiektywna, cele kredytowe gospodarstw domowych.