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What explains the differences in material deprivation between rural and urban areas in Poland before and during the COVID-19 pandemic?

Hanna Dudek[1], **Joanna Landmesser-Rusek**[2]

Abstract

We examined the relationships between the compositional changes in demographic and socioeconomic factors and the changes in the prevalence of material deprivation in rural and urban areas in Poland. Using the European Union Statistics on Income and Living Conditions (EU-SILC) data for 2019–2020, we applied the Fairlie decomposition approach for a logit model. We found that the important characteristics affecting a gap in material deprivation between rural and urban areas are: equivalized income, the level of education, the type of household, and the presence of disabled or unemployed people in the household. A non-significant effect of the pandemic on the material deprivation gap between rural and urban areas was observed.

Key words: rural-urban differences, COVID-19, logit model, Fairlie decomposition, EU-SILC.

1. Introduction

In recent years, there has been growing interest in material deprivation. This issue refers to the inability to satisfy needs considered basic in European conditions. By focusing on the financial inability to satisfy these needs, the analysis of material deprivation enables a more direct measurement of the population's standard of living than income indicators.

The relevancy of material deprivation research in the European Union (EU) has grown significantly since 2010 as a result of the adoption of the Europe 2020 Strategy (Guio et al., 2016). As of this time, material deprivation indicators have been used by all EU Member States and the European Commission to monitor national and EU

[1] Warsaw University of Life Sciences, Poland. E-mail: hanna_dudek@sggw.edu.pl. ORCID: https://orcid.org/0000-0001-8261-2745.

[2] Warsaw University of Life Sciences, Poland. E-mail: joanna_landmesser@sggw.edu.pl. ORCID: https://orcid.org/0000-0001-7286-8536.

progress towards the EU's social protection and social inclusion objectives (Fusco et al., 2013; Guio, 2018). Apart from reports of statistical offices, there are currently many scientific papers devoted to material deprivation. Research literature includes studies relating to material deprivation in individual countries (Šoltés and Ulman, 2015; Dudek and Szczesny, 2021a) as well as in the entire EU (Bárcena-Martín et al., 2014; Bedük, 2018; Dudek, 2019; Łuczak and Kalinowski, 2020).

The literature indicates an existing poverty gap between rural and urban areas in Central and Eastern European countries (Bernard, 2019; Swain, 2016). When it comes to Poland, Dudek and Szczesny (2021a) found a higher level of material deprivation among rural than urban households. However, they found that in regression models including typical socioeconomic variables and degree of urbanisation of the place of residence, rural-urban differences were statistically insignificant. Thus, it is essential to pinpoint the causes of the rural-urban gap in material deprivation. This problem was taken up in the present study.

The primary source of information on material deprivation in the EU is the EU Statistics on Income and Living Conditions (EU-SILC) survey. As the EU-SILC survey in 2020 was conducted in Poland in the fall, it is possible to investigate the effect of the COVID-19 pandemic on material deprivation. Thus, we use pre-COVID data (2019) and 2020 data to examine the impact of the COVID-19 pandemic on rural-urban differences in material deprivation.

In this study, we pose two research questions:

(i) How do rural-urban differences in material deprivation vary according to socioeconomic factors?

(ii) Has the COVID-19 pandemic affected rural-urban differences?

In other words, the main aim of this paper is to identify factors influencing rural-urban differences in material deprivation of Polish households. In addition, the study aims to investigate the extent to which these differences are explained by given socioeconomic features. For these purposes, it proposes using the Fairlie decomposition approach. This approach works by decomposing the difference in proportions based on a probit or logit binary model.

Our paper contributes to the literature by exploiting new information collected in 2019–2020 through the EU-SILC survey to provide a snapshot of material deprivation among Polish households when the country continues struggling with the COVID-19 pandemic. The paper also contributes to the literature by providing the first econometric evidence for factors affecting the rural-urban gap in material deprivation in Poland using the Fairlie decomposition approach.

2. Methodology

2.1. Fairlie decomposition method

Decomposition techniques are most commonly used in studying gender pay gaps using linear regression models (see Słoczyński, 2012; Zajkowska, 2013; Śliwicki and Ryczkowski, 2014; Landmesser et al., 2015, Landmesser, 2017). Such studies mainly use the Blinder-Oaxaca decomposition technique, dividing the group differences into two parts: a part explained by compositional differences and a part that is 'attributable to the coefficients' (Blinder 1973; Oaxaca 1973). This technique can be extended to non-linear models, including models with binary dependent variables.

Following the Blinder-Oaxaca concept, Fairlie (2005) proposed the idea of decomposition for binary probit and logit models. Fairlie initially used this method to analyse racial differences in the digital divide (Fairlie, 2005) and race differences among business owners (Fairlie and Robb, 2007). Over the past five years, the Fairlie technique has been widely used in various fields of science, e.g. in analyses of the gender gap in food insecurity (Broussard, 2019), rural-urban inequalities in health (Rahimi et al., 2021), gender differences in saving behaviour (Boto-García et al., 2022). However, it has not been used in material deprivation analysis before.

Thus, this article provides the first results on rural-urban differences in material deprivation using the Fairlie approach. Below we present the concept of this approach.

The standard Blinder-Oaxaca decomposition for a linear regression can be expressed as:

$$\bar{Y}^A - \bar{Y}^B = (\bar{X}^A - \bar{X}^B)\,\hat{\beta}^A + \bar{X}^B\left(\hat{\beta}^A - \hat{\beta}^B\right) \tag{1}$$

where

A – group A,
B – group B,
$\bar{Y}^A, \bar{Y}^B$ – the average values of the dependent variable for group A and B, respectively,
$\bar{X}^A, \bar{X}^B$ – row vectors of average values of independents variables for group A and B, respectively,
$\hat{\beta}^A, \hat{\beta}^B$ – vectors of parameter estimates for group A and B, respectively.

Unlike in linear models, where $\bar{Y}^A = \bar{X}^A\,\hat{\beta}^A$ and $\bar{Y}^B = \bar{X}^B\,\hat{\beta}^B$, which formula (1) implies, in models with a nonlinear function F, $\bar{Y}^A$ does not necessarily equal $F(\bar{X}^A)$ and $\bar{Y}^B$ does not necessarily equal $F(\bar{X}^B)$. However, the following dependencies occur in the logit model:

$$\bar{Y}^A = \sum_{i=1}^{N^A} \frac{F(X_i^A \hat{\beta}^A)}{N^A} \text{ and } \bar{Y}^B = \sum_{i=1}^{N^B} \frac{F(X_i^B \hat{\beta}^B)}{N^B} \tag{2}$$

where N_A and N_B are the sample size for group A and B, respectively.

Thus, following Fairlie (2005), the decomposition can be written as:

$$\bar{Y}^A - \bar{Y}^B = \left[\sum_{i=1}^{N^A} \frac{F(X_i^A \hat{\beta}^A)}{N^A} - \sum_{i=1}^{N^B} \frac{F(X_i^B \hat{\beta}^A)}{N^B}\right] + \left[\sum_{i=1}^{N^B} \frac{F(X_i^B \hat{\beta}^A)}{N^B} - \sum_{i=1}^{N^B} \frac{F(X_i^B \hat{\beta}^B)}{N^B}\right] \quad (3)$$

The first term in brackets measures the disparity due to the differences in characteristics (the 'characteristic effect'), and the second term in brackets measures the disparity due to the different effects of the observed characteristics (the 'coefficient effect'). The second term also captures the portion of the binary outcome variable gap due to group differences in unmeasurable or unobserved endowments.

The estimation of the total contribution is the difference between the average values of the predicted probabilities. Assuming that N_A=N_B, using parameter estimates from the logit model for the pooled sample, $\hat{\beta}^*$, the contribution of X_1 to the rural-urban gap can be written as:

$$\frac{1}{N^B}\sum_{i=1}^{N^B} F(\hat{\alpha}^* + X_{1i}^A \hat{\beta}_1^* + X_{2i}^A \hat{\beta}_2^*) - F(\hat{\alpha}^* + X_{1i}^B \hat{\beta}_1^* + X_{2i}^A \hat{\beta}_2^*) \quad (4)$$

Similarly, the independent contribution of X_2 can be expressed as:

$$\frac{1}{N^B}\sum_{i=1}^{N^B} F(\hat{\alpha}^* + X_{1i}^B \hat{\beta}_1^* + X_{2i}^A \hat{\beta}_2^*) - F\left(\hat{\alpha}^* + X_{1i}^B \hat{\beta}_1^* + X_{2i}^B \hat{\beta}_2^*\right) \quad (5)$$

Standard errors for (4) and (5) can be calculated by the delta method (Fairlie, 2005).

In practice, the sample sizes of the two groups (N_A and N_B) may differ. In such a case, a one-to-one matching of observations from the two samples is needed to be calculated. To address this problem, random subsamples of equal sizes are drawn.

Fairlie (2017) recommended the replication of the decomposition from a minimum of 1000 subsamples and finding the mean values of estimates from each decomposition to obtain an accurate decomposition estimate. More detailed information in this regard was provided by Fairlie (2017).

In our study, we used the STATA program (module) written by Jann (2006) to carry out the analysis. This program enables:

- to draw a hypothetical sample with replacement from both groups, whereby the probability of being selected from the sample is proportionate to the sampling weight;
- to solve the path dependence problem in the detailed decomposition, with multiple estimations of material deprivation with randomised order of the independent variables being performed, and the obtained effects being averaged over all possible orderings.

Thus, using the 'Fairlie' module in STATA (Stata-Corp, College Station, Texas, United States of America), we carried out the decomposition analysis to enable the

quantification of how much of the gap between the rural and urban groups is attributable to differences in specific measurable characteristics.

In the Fairlie decomposition technique, a positive coefficient would result in a positive contribution to the rural-urban gap in material deprivation, and it is interpreted as supporting (increasing) the rural-urban material deprivation inequality (if the disparity is positive). A negative coefficient would similarly yield a negative contribution to the material deprivation inequality and consequently works to decrease the inequality if the inequality is positive.

2.2. Data

To study the ways in which differences between rural areas (thinly populated areas) and urban areas (densely populated or intermediate populated areas) in material deprivation in Poland were affected via various mechanisms, we use 2019–2020 data from the EU-SILC cross-sectional files. EU-SILC provides annual population representative information on material deprivation and several demographic and socioeconomic variables regarding EU countries.

Usually, the EU-SILC survey in Poland is carried out in April – June. However, in 2020 it was conducted by the Central Statistical Office and 16 statistical offices from September 28 to December 4, 2020. The change of the survey date was dictated by the appearance of a pandemic threat during the survey conducted so far (Statistics Poland, 2022). Thus, the surveyed Poles in the fall of 2020 had already experienced some effects of the pandemic caused by the lockdown.

The analysed sample includes 19,874 Polish households from the 2019 wave and 15,281 Polish households from the 2020 wave.

The study considers those indicators that were considered both under the Europe 2020 and Europe 2030 strategies (see: Poverty in Poland…, 2021). All indicators analysed are binary indicators corresponding to given material deprivation items.

These items relate to the inability of a household to:

1) avoid arrears on mortgage or rent, utility bills, hire purchase instalments or other loan payments (the feature short name in our analysis: ‘arrears’);
2) afford a meal with meat, chicken, fish (or vegetarian equivalent) every second day (the short name: ‘food’);
3) face unexpected financial expenses (the short name: ‘unexpected’);
4) afford to keep the home adequately warm (the short name: ‘warm’);
5) afford a one-week annual holiday away from home (the short name: ‘holiday’); and
6) afford a car/van for private use (the short name: ‘car’).

We consider the following set of socioeconomic factors for the decomposition:

- the natural logarithm of annual equivalized household disposable income (using the modified OECD equivalence scale) from the previous year, with 2020 prices (the continuous variable 'income');
- household type (single-person, 2 young adults (age<65), 2 older adults, 2 adults with 1 dependent child, 2 adults with 2 dependent children, 2 adults with at least 3 dependent children, single parent with children, other with dependent children, other without dependent children; the 'household type' variable in the models);
- region of Poland (7 regions; the 'region' variable);
- presence of persons in households whose activities were limited due to health reasons (the 'disability' variable);
- presence of unemployed in the household (the 'unemployed' variable);
- presence of retirees in the household (the 'retired' variable);
- the average age of household's members (the 'mean age' variable in the models);
- highest education level of household members (the 'max education' variable with three response categories: tertiary, upper secondary, lower than upper secondary).

To assess the impacts of the COVID-19 pandemic in 2020 we use the dummy variable 'year 2020' defined as 1 for 2020 sample observations, and 0 for 2019.

3. Results

The results of a preliminary analysis of income changes in Poland and the EU in 2019–2020 showed an increase in median annual equivalized income (measured in purchasing power standards – PPS). Poland saw a rise in income (12,366 in PPS in 2019, 13,381 in 2020), while the EU (27-country area) saw a decrease (17,478 in PPS in 2019, 17,337 in 2020) (Eurostat, 2022). Also, in Poland, the percentage of households showing various symptoms of material deprivation fell in 2020 compared to 2019 (in contrast to the EU as a whole) (Eurostat, 2022).

The main aim of this paper is to identify factors influencing rural-urban differences in material deprivation among Polish households. A preliminary comparison between rural and urban households in terms of given material deprivation items is presented in Figure 1.

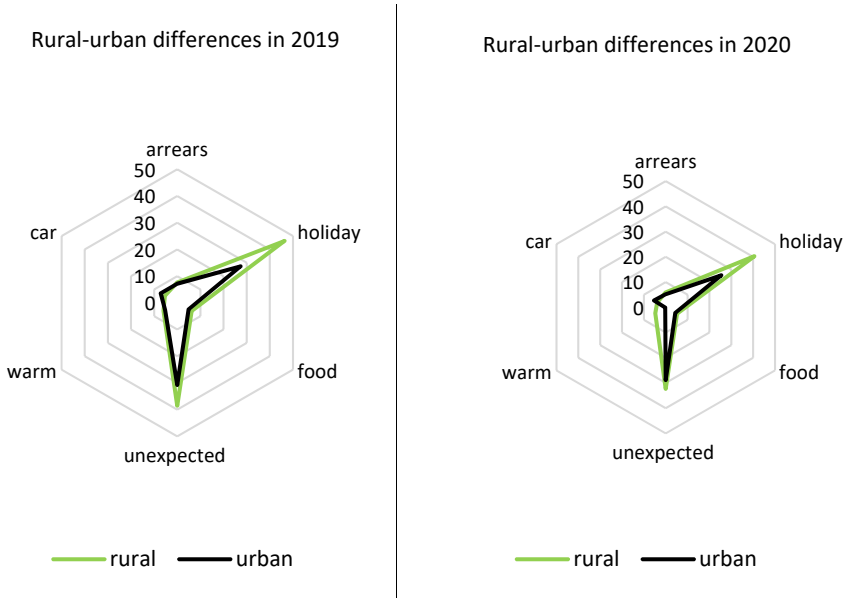

Figure 1: Prevalence of material deprivation among rural and urban households.

Source: Own work.

Based on Figure 1, it can be noticed that material deprivation did not increase in the first pandemic year. Probably, it happened due to the improved income situation of Poles. However, in both analysed years, Polish households were mostly vulnerable regarding the items 'holiday' and 'unexpected'. There were also visible rural-urban differences in these two items. The detailed results of the prevalence of deprivation presented in the Appendix revealed that statistically significant differences between rural and urban households occurred with respect to 'holiday', 'unexpected', 'warm', 'food' and 'car' (the corresponding 95% intervals do not overlap). For the first four items, deprivation in the countryside is greater than in the city. Only deprivation regarding the ability to afford a car was significantly higher among urban households. For the remaining item 'arrears', this difference is not significant at the 0.05 level.

The Fairlie decomposition for binary logit models was conducted to examine the factors affecting the rural-urban gap for each of the six deprivation symptoms. In our study, the process of randomly sampling households and estimating each variable's contribution to the gap was repeated 1,000 times. The order of the variables was randomized on each run to address the issue of path dependence.

The estimated parameters of the logit models enabled the identification of factors influencing the experience of material deprivation. Applying the decomposition technique to the logit model allowed us to extract the factors explaining the observed

differences in material deprivation. Table 1 shows detailed results for the decomposition regarding the two items for which the highest deprivation occurred – i.e. inability to pay for holidays and unexpected financial expenses by place of residence (rural vs urban areas).

Table 1: Results for Fairlie decomposition of differences between rural and urban households concerning 'holiday' and 'unexpected' items

Non-linear decomposition by place of residence						
Specification	holiday			unexpected		
Sample size			34 767			34 687
The sample size for rural areas			11 773			11 745
The sample size for urban areas			22 994			22 942
Deprivation rate in rural areas			0.3879			0.3377
Deprivation rate in urban areas			0.2296			0.2869
Deprivation rate difference	0.1583		100%	0.0508		100%
Explained difference	0.1022		65%	0.0623		122%
Explained part						
Explanatory variable	Coef.			Coef.		
Income	0.0440	**	**28%**	0.0403	**	**79%**
Household type	0.0101	**	**6%**	-0.0229	**	**-45%**
Region	0.0030	**	2%	-0.0014		-3%
Disability	0.0083	**	5%	0.0058	**	11%
Unemployed	0.0049	**	3%	0.0062	**	12%
Retired	-0.0004		0%	-0.0007		-1%
Mean age	-0.0004		0%	0.0000		0%
Max education	0.0328	**	**21%**	0.0351	**	**69%**
Year 2020	0.0000		0%	0.0000		0%
Total explained	0.1022	**	65%	0.0623	**	122%

** – significant at 0.05 level; higher impacts in bold.

Source: own work.

There is a positive difference in deprivation rates between rural and urban households both in their inability to pay for holidays and coping with unexpected financial expenses. The explained effect is high (65% and 122%, respectively). The inequalities examined should be assigned in the majority to the differentiation of individual household characteristics (rather than to parameters in the estimated models).

Regarding differences in deprivation concerning the inability to pay for holidays, the variables that significantly affect the magnitude of deprivation are equivalized income ('income'), household type ('household type'), region of Poland, the presence

of disabled or unemployed in the household, and the highest education level ('max education'). Differences in deprivation due to unexpected expenses are affected by similar variables, except the 'region' variable. The variable denoting the year 2020 was non-significant at the 0.05 level, suggesting an insignificant impact of the pandemic in explaining the rural-urban gap.

The estimated positive coefficients indicate a positive contribution to the rural-urban gap in material deprivation. The values of the variables standing by their support (increase) the observed rural-urban inequality in material deprivation. For example, for the 'holiday' item, the different educational levels of rural and urban residents account for 21% of the observed inequality.

Negative coefficients yield a negative contribution to material deprivation inequality. Thus, the observed differences in deprivation regarding unexpected financial expenses are reduced by the dissimilarity of rural and urban household types (by 45%).

The results of Fairlie decomposition for all analysed symptoms of material deprivation in an aggregate manner are presented in Table 2 and Table 3.

Table 2: Results of Fairlie decomposition for all material deprivation symptoms by place of residence (rural vs urban areas) – influence directions of variables

Specification	arrears	holiday	food	unexpected	warm	car
Pr(Y=1/G=rural)	0.063	0.388	0.053	0.338	0.052	0.048
Pr(Y=1/G=urban)	0.065	0.230	0.045	0.287	0.042	0.068
Difference	-0.002	0.158	0.008	0.051	0.010	-0.020
Explained part	0.011	0.102	0.012	0.062	0.010	0.009
Influence directions of variables						
Income	+	+	+	+	+	+
Household type	–	+	–	–	–	–
Region	ns	+	ns	ns	ns	–
Disability	+	+	+	+	+	+
Unemployed	+	+	+	+	+	+
Retired	ns	ns	ns	ns	ns	ns
Mean age	ns	ns	ns	ns	ns	ns
Max education	+	+	+	+	+	+
Year 2020	ns	ns	ns	ns	ns	ns

+/– means positive/negative contribution of the variable in the explained part at the significance level of 0.05, ns – nonsignificant

Source: own work.

A positive difference in deprivation rates between rural and urban households is found in their inability to pay for holidays, afford food, face unexpected financial expenses, and keep the home warm. A negative difference occurs in the case of the

inability to avoid mortgage or rent arrears and the inability to afford a car. The explained effect is always positive, meaning that the household characteristics included in the analysis magnify the observed rural-urban differences in deprivation.

Equivalized income, disability, unemployment, education level, and household type were the significant variables affecting differences in all symptoms of material deprivation by place of residence. The impact of the region of the household's residence was relevant only for some deprivation items. It was also observed that the presence of retirees and the mean age of household members have no effect. Moreover, 2020 shows non-significance (at the significance level of 0.05), which allows us to conclude that the pandemic has no impact on the material deprivation gap in rural and urban areas.

Table 3: Results of Fairlie decomposition for all material deprivation symptoms by place of residence – percentages of the explained part

Specification	arrears	holiday	food	unexpected	warm	car
Difference	-0.002	0.158	0.008	0.051	0.01	-0.02
Unexplained part	-0.013	0.056	-0.004	-0.011	0	-0.029
Explained part	0.011	0.102	0.012	0.062	0.01	0.009
%Unexplained	650%	35%	-50%	-22%	0%	145%
%Explained	-550%	65%	150%	122%	100%	-45%
Components of the explained part						
Income	-309%	28%	85%	79%	62%	-31%
Household type	197%	6%	-52%	-45%	-41%	26%
Region	34%	2%	13%	-3%	6%	5%
Disability	-145%	5%	19%	11%	14%	-6%
Unemployed	-116%	3%	21%	12%	18%	-10%
Retired	37%	0%	-4%	-1%	-3%	2%
Mean age	73%	0%	0%	0%	-1%	5%
Max education	-308%	21%	74%	69%	49%	-35%
Year 2020	8%	0%	0%	0%	-1%	0%

Source: own work.

The inequalities examined should be assigned in the majority to the differentiation of individual households' characteristics in the inability to pay for holidays, afford food, face unexpected financial expenses, and keep the home warm. Most of the gap is attributed to the parameters in estimated models in the case of the inability to avoid mortgage arrears and the inability to afford a car.

It can be noted that the following variables contribute the most to explaining the observed differences in material deprivation by place of residence: income, education level, household type, and presence of disabled or unemployed people. Variables that provide a negligible explanation for the observed differences are 'region', 'mean age', 'retired', and 'year 2020'.

4. Discussion

Several authors undertook the problem of rural-urban differences in Poland. For example, Landmesser (2009) compared the economic activity of people concerning their place of residence, Sompolska-Rzechula and Kurdys-Kujawska (2020) analysed subjective assessment of the quality of life of rural and urban residents, Kalinowski (2022) investigated poverty in the countryside, Głowicka-Wołoszyn et al. (2019) compared housing conditions and Wołoszyn and Wysocki (2020) focused on income inequalities among rural and urban households. Generally, the mentioned authors found a worse situation in rural areas compared to urban areas.

When it comes to material deprivation, there needs to be more literature on comparisons between rural and urban households. Moreover, most of the research concern a comprehensive analysis of material deprivation (Dudek and Szczesny, 2021a and 2022b; Šoltés and Ulman, 2015). In our study, however, we analyse each symptom separately. This turned out to be important, as urban households were not better off in all items than in the countryside. We found that there was statistically greater deprivation in the urban areas due to the 'car' item.

Not surprisingly, the most important factor influencing the rural-urban gap is income. However, as indicated in the paper (Dudek and Szczesny, 2021b), material deprivation does not coincide with income poverty. Therefore, it is worth considering demographic and socioeconomic factors that may be important in explaining this phenomenon.

This study has some key strengths. Firstly, it uses the newest EU-SILC of nationally representative data. Secondly, it investigates the factors influencing differences in material deprivation between rural and urban areas. For this purpose, it proposes the Fairlie decomposition approach, which has not been used in material deprivation analysis before. Thus, this paper contributes to the literature by providing the first evidence for factors affecting the households' material deprivation in Poland using the Fairlie approach. The main concern with the non-linear model is sensitivity to the order of independent variables included in the decomposition process (path dependency). The Fairlie method solves this problem by randomly ordering the variables across replications of the decomposition.

The limitations of this study relate to the fact that the dependent variables are self-reported and are likely to have reporting bias. Moreover, the data used are cross-sectional and, therefore, we cannot establish any causality between material deprivation and different socioeconomic variables. Despite these limitations, this study gives an understanding and quantification of the drivers and magnitude of rural-urban inequalities in material deprivation.

5. Conclusions

The analysis revealed that both before and during the first year of the COVID-19 pandemic, a significant proportion of Polish households exhibited symptoms of material deprivation. However, material deprivation in Poland decreased during the period studied. Probably, it was the increase in average income that mainly contributed to the decrease in deprivation.

The study focuses on rural-urban differences in material deprivation. Decomposition analysis provided in-depth information about the phenomenon under study. We considered six items of material deprivation analysing each symptom (item) as a binary variable. Separate models were evaluated for each symptom. We used the Fairlie method as it was developed for non-linear regression models, including the logit and probit models. This method basically tests how much of the difference in material deprivation between rural and urban areas is due to differences in the variables included in the analysis. It also goes further to estimate the contribution of each variable to the explained material deprivation difference between rural and urban areas.

It was found that for items 'holiday', 'unexpected', 'food' and 'warm' rural households were significantly more vulnerable than urban, however, a greater prevalence of 'car deprived' was in urban areas. Moreover, for 'arrears' there was no statistical difference in this regard. This means that it is worth analysing each material deprivation item separately.

The detailed decomposition carried out revealed that the important characteristics affecting the occurrence of the rural-urban material deprivation gap are equivalized income, level of education, type of household, and the presence of disabled or unemployed people in the household. However, the results obtained allow us to conclude that there is a statistically insignificant effect of the pandemic in explaining rural-urban differences. It is important to monitor the pandemic effect in the coming years. This would allow the most vulnerable groups of households to be recognized and specific implications for social policy analysis and evaluation to be identified. This issue is crucial as reducing any form of poverty and social exclusion is one of the most important goals of the EU social policy.

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References

Bárcena-Martín, E., Lacomba, B., Moro-Egido, A.I., Perez-Moreno, S., (2014). Country Differences in Material Deprivation in Europe. *Review of Income and Wealth*, Vol. 60(4), pp. 802–820.

Bedük, S., (2018). Understanding Material Deprivation for 25 EU Countries: Risk and Level Perspectives, and Distinctiveness of Zeros. *European Sociological Review*, Vol. 34(2), pp. 121–137.

Bernard, J., (2019). Where Have All the Rural Poor Gone? Explaining the Rural–Urban Poverty Gap in European Countries. *Sociologia Ruralis*, Vol. 59 (3), pp. 369-392.

Blinder, A. S., (1973). Wage Discrimination: Reduced Form and Structural Variables. *Journal of Human Resources*, Vol. 8, pp. 436-455.

Boto-García, D., Bucciol, A., Manfrè, M., (2022). The role of financial socialization and self-control on saving habits. *Journal of Behavioral and Experimental Economics*, Vol. 100, 101903.

Broussard, N. H., (2019). What Explains Gender Differences in Food Insecurity. *Food Policy*, Vol. 83, pp. 180–194.

Dudek, H., (2019). Country-level Drivers of Severe Material Deprivation Rates in the EU. *Ekonomický časopis,* Vol. 67(1), pp. 33–51.

Dudek, H., Szczesny, W., (2021a). Multidimensional material deprivation in Poland: a focus on changes in 2015–2017. *Quality* & *Quantity*, Vol. 55, pp. 741–763.

Dudek, H., Szczesny, W., (2021b). Dudek, H., Szczesny, W., (2021). Multi-Dimensional Material Deprivation in the Visegrád Group: Zero-Inflated Beta Regression Modelling. In: Betti, G., Lemmi, A. (eds.), *Analysis of Socio-Economic Conditions: Insights from a Fuzzy Multidimensional Approach*. London and New York: Routledge, pp. 151–165.

Eurostat, (2022). https://ec.europa.eu/eurostat/data/database. Accessed March 17, 2022.

Fairlie, R. W., (2005). An Extension of the Blinder-Oaxaca Decomposition Technique to Logit and Probit Models. *Journal of Economic and Social Measurement*, Vol. 30(4), pp. 305–316.

Fairlie, R. W., Robb, A. M., (2007). Why are Black-Owned Businesses Less Successful than White-Owned Businesses: The Role of Families, Inheritances, and Business Human Capital. *Journal of Labor Economics*, Vol. 25(2), pp. 289–323.

Fairlie, R. W., (2017). Addressing Path Dependence and Incorporating Sample Weights in the Nonlinear Blinder-Oaxaca Decomposition Technique for Logit, Probit and Other Nonlinear Models. *SIEPR Discussion Paper*, No. 17–013. https://siepr.stanford.edu/sites/default/files/publications/17-013.pdf. Accessed February 7, 2022.

Fusco, A., Guio, A.-C., Marlier, E., (2013). Building a Material Deprivation Index in a Multinational Context: Lessons from the EU Experience. In: Berenger, V., Bresson, F. (eds.) *Poverty and Social Exclusion around the Mediterranean Sea*, pp. 43–71. Springer, New York.

Głowicka-Wołoszyn, R., (2019). Multi-Dimensional Assessment of Housing Conditions of the Population in Rural and Urban Areas of the Wielkopolskie Voivodeship. *Annals of the Polish Association of Agricultural and Agribusiness Economists*, T. 21(2), pp. 79–87,

Guio, A.-C., Marlier, E., Gordon, D., Fahmy, E, Nandy, S., Pomati, M., (2016). Improving the Measurement of Material Deprivation at the European Union Level. *Journal of European Social Policy*, Vol. 26(3), pp. 219–333.

Guio, A.-C., (2018). Multidimensional Poverty and Material Deprivation: Empirical Findings. In: D'Ambrosio, C. (eds.) *Handbook of Research on Economic and Social Well-Being*, pp. 171–192. Edward Elgar Publishing, Cheltenham.

Jann, B., (2006). Fairlie: Stata Module to Generate Nonlinear Decomposition of Binary Outcome Differentials. Available from http://ideas.repec.org/c/boc/bocode/s456727.html. Accessed March 21, 2022.

Kalinowski, S., (2022). Ubóstwo i wykluczenie na wsi. In: J. Wilkin, A. Hałasiewicz (eds.), *Polska Wieś 2022. Raport o stanie wsi*, Wyd. FDPA, WN Scholar: Warszawa, pp. 153–169.

Landmesser, J., (2009). The Survey of Economic Activity of People in Rural Areas – the Analysis Using the Econometric Hazard Models. *Acta Universitatis Lodziensis, Folia Oeconomica*, No. 228, pp. 385–392.

Landmesser, J. M., Karpio, K., Łukasiewicz, P., (2015). Decomposition of Differences Between Personal Incomes Distributions in Poland. *Quantitative Methods in Economics*, Vol. XVI(2), pp. 43–52.

Landmesser, J. M., (2017). Differences in Income Distributions for Men and Women in Poland – an Analysis Using Decomposition Techniques. *Acta Scientiarum Polonorum. Oeconomia*, Vol. 16(4), pp. 103–112.

Łuczak, A., Kalinowski, S., (2020). Assessing the Level of the Material Deprivation of European Union Countries. *PLoSONE,* Vol. 15(9), e0238376.

Oaxaca, R., (1973). Male-Female Wage Differentials in Urban Labor Markets. *International Economic Review*, Vol. 14, pp. 693–709.

Poverty in Poland in 2019 and 2020, (2021). Statistics Poland, Warsaw.

Rahimi, E., Hashemi Nazari, S. S., (2021). A Detailed Explanation and Graphical Representation of the Blinder-Oaxaca Decomposition Method with its Application in Health Inequalities. *Emerging Themes* in *Epidemiology,* Vol. 18**,** 12.

Słoczyński, T., (2012). Wokół międzynarodowego zróżnicowania międzypłciowej luki płacowej. *International Journal of Management and Economics*, Vol. 34, pp. 169–185.

Sompolska-Rzechula, A., Kurdys-Kujawska, A., (2020). Quality of Life of Rural and Urban Population in Poland: Evaluation and Comparison. *European Research Studies Journal*, Vol. 23(3), pp. 645–656.

Statistics Poland, (2022). Dochody i warunki życia ludności Polski – raport z badania EU-SILC 2020. Główny Urząd Statystyczny, Warszawa. Available from https://stat.gov.pl/obszary-tematyczne/warunki-zycia/dochody-wydatki-i-warunki-zycia-ludnosci/dochody-i-warunki-zycia-ludnosci-polski-raport-z-badania-eu-silc-2020,6,14.html. Accessed April 2, 2022.

Swain, N., (2016). Eastern European Rurality in a Neo-Liberal. European Union World. *Sociologia Ruralis*, Vol. 56 (4) pp. 574–596.

Śliwicki, D., Ryczkowski, M., (2014). Gender Pay Gap in the Micro Level – Case of Poland. *Quantitative Methods in Economics*, Vol. XV(1), pp. 159–173.

Šoltés, E., Ulman, P., (2015). Material deprivation in Poland and Slovakia – a comparative analysis. *Zeszyty Naukowe Uniwersytetu Ekonomicznego w Krakowie*, Vol. 947(11), pp. 19–36.

Wołoszyn, A., Wysocki, F., (2020). Income Inequality of Polish Rural and Urban Households in 2010–2017. *Annals of Polish Association of Agricultural Economists and Agribusiness*, Vol. 22(1), pp. 360–368.

Zajkowska, O., (2013). Gender Pay Gap in Poland – Blinder-Oaxaca Decomposition. *Quantitative Methods in Economics*, Vol. XIV(2), pp. 272–278.

APPENDIX

Table A1: 95% confidence intervals for the proportions of households experiencing given material deprivation item in rural and urban households

Material deprivation item	Rural		Urban	
	LCI	UCI	LCI	UCI
arrears	6.29	7.33	5.77	6.61
holiday	42.41	44.45	25.65	27.14
food	5.24	6.12	4.30	4.98
unexpected	34.44	36.37	29.03	30.58
warm	4.94	5.81	4.22	4.89
car	4.22	5.05	5.84	6.66

Source: own work.