Impact of the COVID-19 Pandemic on Poverty and Income Inequality in European Union Countries: A Multilevel Analysis

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Presentation Outline

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Purpose of the Study

- Analyzing Changes in Poverty and Income Inequality among the Poor and Non-poor Populations in EU Countries during the Pandemic.

- Exploring the Main Drivers of Inequality and Poverty Changes during the Pandemic.

Data Source and Scope of Comparisons

- **Data Source:**

    Panel data from the EU Statistics on Income and Living Conditions (EU-SILC) survey for the years 2020 and 2021.

- **Scope of Comparisons:**

    The study covered 23 EU countries.

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Methodological Assumptions

- **Methodological Assumptions:**

    The poverty and inequality analyses are based on household equivalent disposable income.

    Equivalent disposable incomes were calculated by dividing disposable household income by the OECD modified equivalence scales.

    Identification of the subpopulation of the poor using national poverty lines, computed as 60% of the national household equivalent median income for each country separately.

    To ensure alignment with Eurostat's 2019 poverty assessments, relative national poverty lines were adopted.

    For analyses of changes in poverty over time, 2019 national poverty lines were used to prevent them from being solely determined by changes in income inequality.

    Income values were expressed in 2019 prices for all surveyed years.

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Measurement of Poverty and Its Changes

Poverty Headcount Ratio: represents the percentage of individuals with incomes below the poverty line.

$$H = \frac{n_u}{n},$$

where n is the number of individuals in the analysed population and n_u is the number of impoverished individuals in the analysed population.

Poverty Gap Index: measures the average gap between the poor individuals and poverty threshold

$$I^u = \frac{1}{n_u} \sum_{i=1}^{n_u} \left(\frac{y^* - y_i}{y^*} \right).$$

where y_i is income of the *i*-th individual and y^* is poverty line.

Measurement of Income Inequality Between the Poor and Non-poor Populations

Zenga Index

Calculation of the arithmetic means of the incomes of two separate and exhaustive groups, called the lower and upper groups:

$$M^-(\boldsymbol{y}, y_i) = \frac{\sum_{i=1}^{n_{k-1}} y_i}{n_{k-1}} \qquad \text{and} \qquad M^+(\boldsymbol{y}, y_i) = \frac{\sum_{i=n_k}^{n} y_i}{n - n_{k-1}}$$

where y=$(y_1; y_2; \ldots; y_n)$ is an ordered vector of non-negative values $y_1 \leq y_2 \leq \ldots \leq y_n$, representing the distribution of income and n_k is the number of individuals with income equal or lower than the poverty threshold.

Zenga point index:

$$Z = \frac{M^+(\boldsymbol{y}, y_k) - M^-(\boldsymbol{y}, y_k)}{M^+(\boldsymbol{y}, y_k)},$$

where the point of the division of the ordered data is an income equal to the poverty line ($y_k = y$ *).

Drivers of Changes in Poverty Depth during the Pandemic

Initial Hierarchical Linear Modeling (HLM):

$$y_{til} = \gamma_{000} + \mu_{00l} + r_{0il} + e_{til},$$

$$\mu_{00l} \sim (0, \sigma_\mu^2), r_{0il} \sim (0, \sigma_r^2), e_{til} \sim (0, \sigma^2).$$

where:

y_{til} - represents the poverty depth index for t-th wave, i-th individual, and l-th country,

γ_{000} - is the constant term,

μ_{00l} - is the random country effect, measuring the differences between the average poverty depth index in l-th country and the overall average,

r_{0il} - is the random individual effect, quantifying the deviation of i-th individual average poverty depth index from the average in l-th country,

e_{til} - is the random effect at level 1, capturing the unexplained variability in the poverty depth index after accounting for the country effect and individual effect.

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Drivers of Changes in Poverty Depth during the Pandemic

Estimation of Interclass Correlation Coefficients (ICCs):

ICC for the level of the country (inter-country):

$$ICC_{country} = \frac{\sigma_\mu^2}{\sigma_\mu^2 + \sigma_u^2 + \sigma_r^2 + \sigma^2}$$

ICC for the level of the individual (intra-individual):

$$ICC_{individual} = \frac{\sigma_r^2 + \sigma_\mu^2}{\sigma_\mu^2 + \sigma_u^2 + \sigma_r^2 + \sigma^2} \ .$$

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Drivers of Changes in Poverty Depth during the Pandemic

Inclusion of Covariates in the Model:

$$y_{tjl} = \gamma_{000} + \gamma_{100}\,(wave\ e_{til}) + \sum_{q=1}^{s}\gamma_q Z_{qtil} + \sum_{j=1}^{m}\gamma_j W_{jil} + \mu_{00l} + r_{0il} + e_{til'}$$

where:

γ_{100} -   is the average change in poverty depth for the same individual over time.

γ_q and γ_j -   denote fixed-effects estimates of all *q* time-varying covariates and *s* time-constant variables.

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Results

Poverty incidence

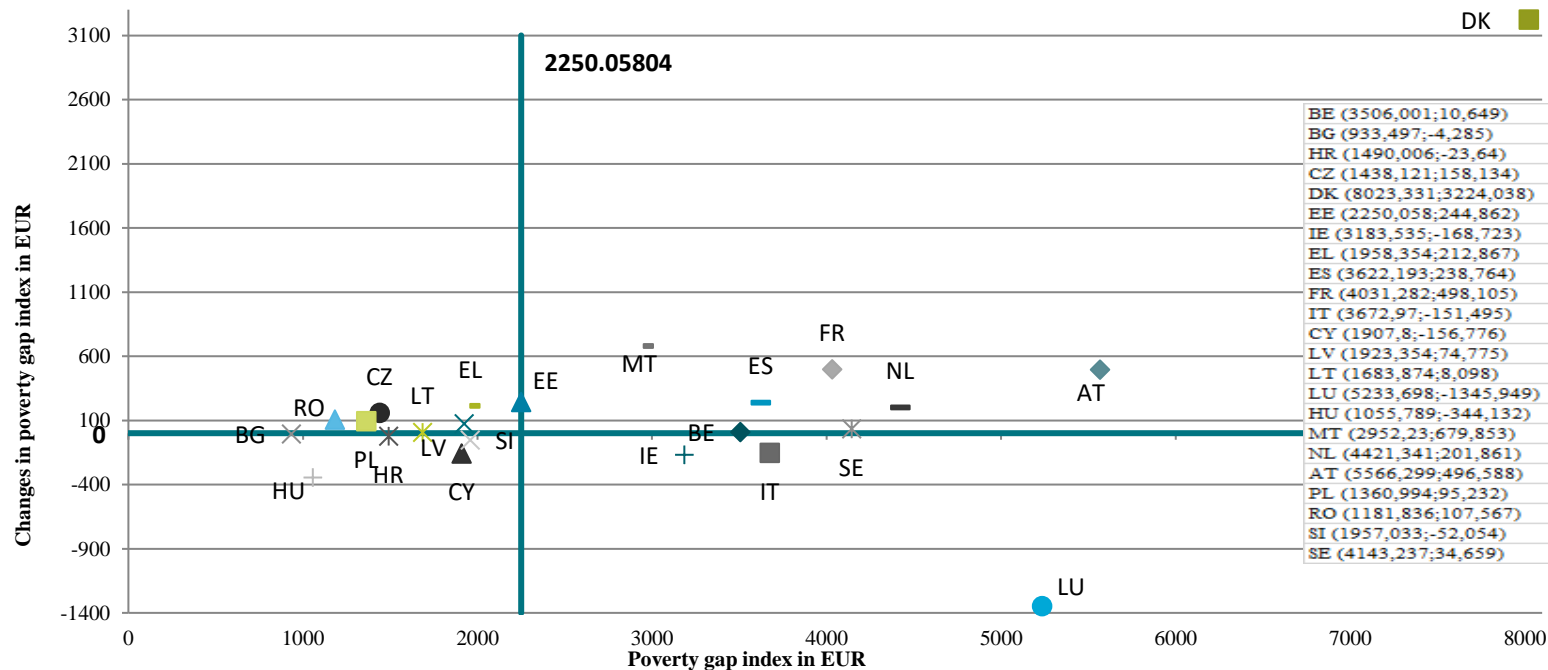|	
BE (17,133;3,29)	
BG (22,963;-1,45)	
HR (20,589;2,215)	
CZ (12,235;3,547)	
DK (11,526;-2,145)	
EE (23,677;2,424)	
IE (11,593;-1,901)	
EL (20,242;1,434)	
ES (23,982;4,019)	
FR (15,304;1,509)	
IT (21,917;2,356)	
CY (13,189;-1,069)	
LV (26,682;4,188)	
LT (23,081;0,168)	
LU (15,665;-2,783)	
HU (21,179;8,982)	
MT (17,807;1,098)	
NL (16,006;0,171)	
AT (16,97;1,364)	
PL (18,702;2,825)	
RO (26,313;1,147)	
SI (12,777;0,427)	
SE (16,898;1,511)	

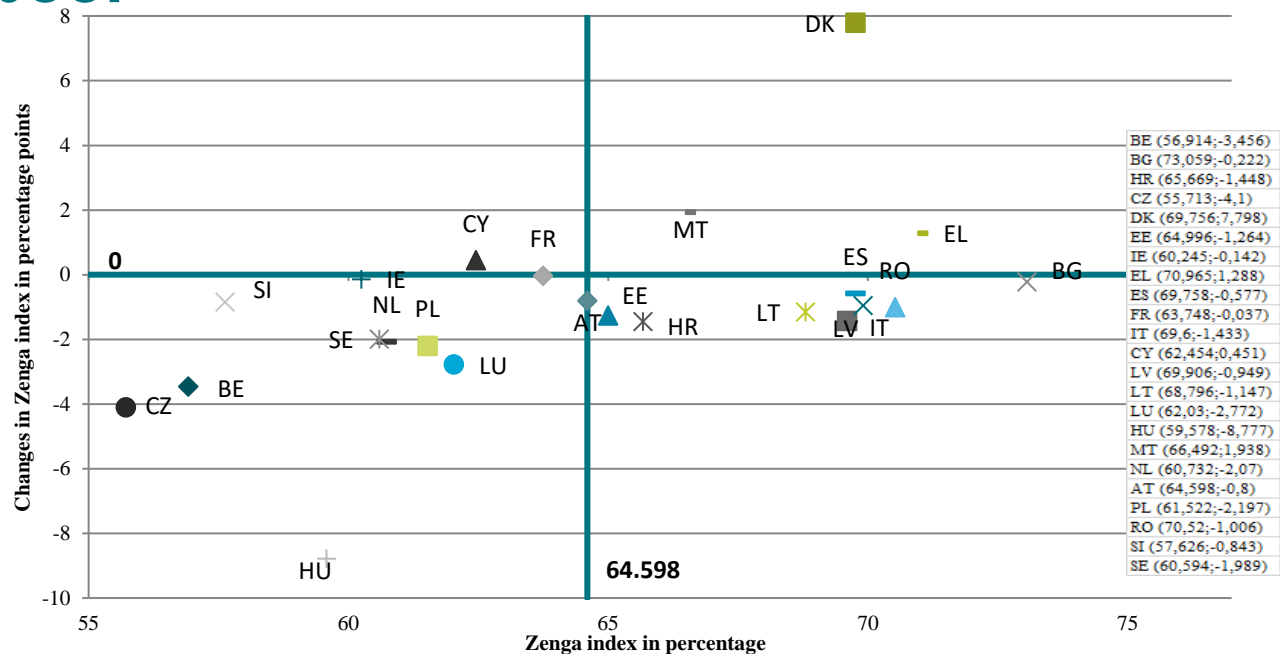*Source: Own analysis based on EU-SILC.*

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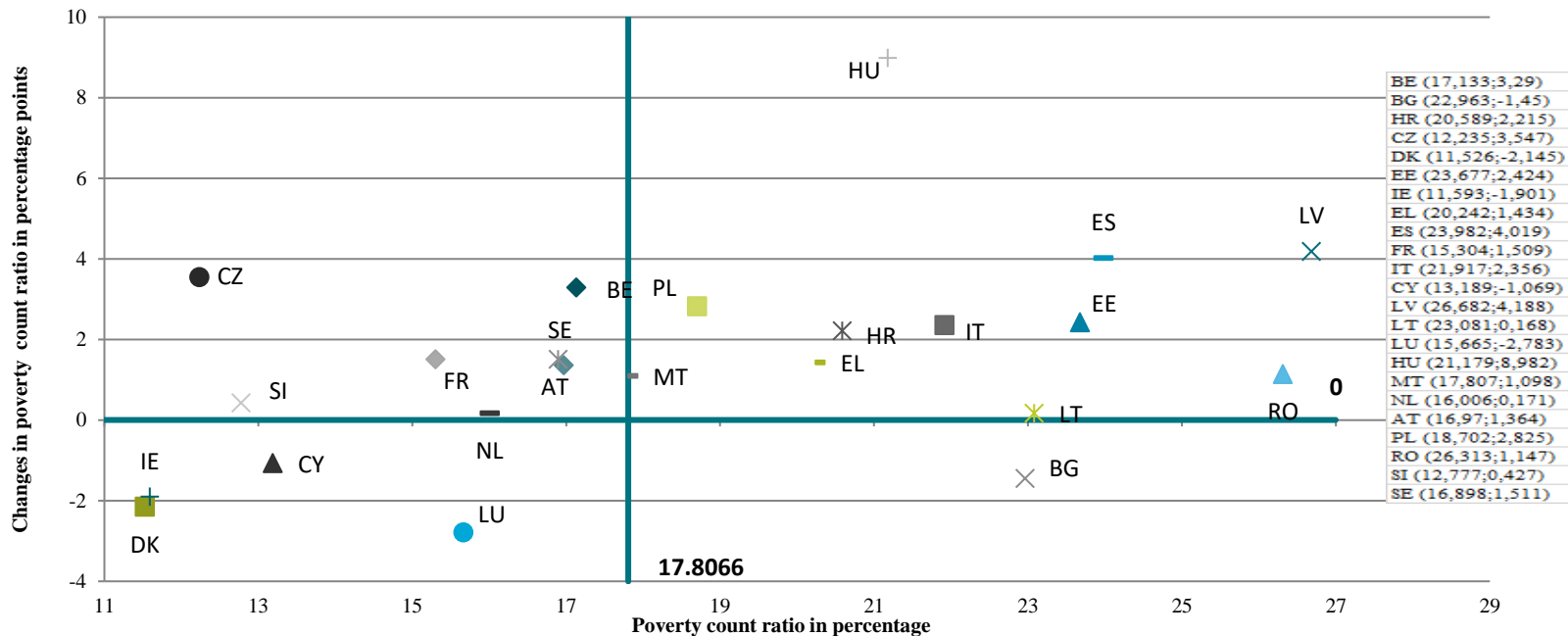
Poverty depth

Source: Own analysis based on EU-SILC.

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Main Results – Incidence and Depth of Poverty

- The most favorable outcomes regarding poverty incidence in 2020 and its change from 2019 were observed in Denmark, Ireland, Cyprus, Luxembourg, and the Netherlands. In these countries, not only was poverty incidence relatively low in 2020, but it also decreased during the study period.

- Conversely, a significant number of countries, including Latvia, Romania, Spain, and others, witnessed relatively high and increasing poverty.

- Hungary, Bulgaria, Cyprus, Croatia, and Slovenia experienced relatively low poverty depths in 2020 and decreases in the first year of the pandemic.

- In contrast, Austria, Switzerland, France, and other countries had relatively higher poverty depths in 2020, which increased during this period.

Income inequalities between the poor and non-poor

Source: Own analysis based on EU-SILC.

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Main Results – Income Inequality

Luxembourg, Poland, Sweden, and other countries exhibited lower income inequalities between the poor and non-poor in 2020 and a decrease in inequality in 2020 compared to 2019.

Denmark, Greece, and Malta experienced higher inequalities that increased during the pandemic.

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Multilevel regression analysis of influence of wave, individual and country factors on poverty depth●

Variables	Model 0	Model 1	Model 2	Model 3	Model 4
Wave		198.5*** (25.5)	200.6*** (25.6)	498*** (170.0)	509.7*** (169.4)
Individual variables change over time					
Place of residence (reference: cities)					
towns and suburbs			-40.6 (110.7)	-46.8 (110.7)	-45.5 (110.7)
rural areas			72.6 (104.7)	67.6 (104.8)	71.2 (104.8)
Household type (reference: one person household)					
alone parent with at least one child aged less than 25			-366.5* (217.9)	-374.2* (218.0)	-375.5 * (218.0)
alone parent with all children aged 25 or more			-271.6 (265.7)	-270.6 (266.0)	-263.5 (266.8)
couple without any child(ren)			261.7* (159.0)	263.2* (159.1)	264.9* (159.1)
couple with at least one child aged less than 25			-454.6** (206.0)	-461.2** (206.3)	-457.6** (206.2)
couple with all children aged 25 or more			-491.4* (274.9)	-490.4* (275.0)	-485.5* (275.0)
other type of household			-322.4 (239.3)	-323.9 (239.4)	-316.1 (239.4)
Household size			15.2 (44.8)	14.6 (44.8)	13.8 (44.8)
Economic status (reference: at least 1 unemployed person)					
no unemployed person			-413.1*** (124.0)	-419.2*** (124.0)	-418.7*** (123.9)

Country variables change over time					
GDP				0.053** (0.025)	-0.019 (0.371)
unemployment rate				1.95 (36.0)	2.02 (35.1)
Strigency Index				-0.71 (3.37)	-0.85 (3.37)
Economic Support Index				-2.42 (1.56)	-2.35 (1.56)
percentage of population 65 and over				-432.2*** (164.3)	-457.7*** (155.0)
Country variables remain constant Country groups (reference: post- communist countries)					
Southern Europe					1062.4 (912.0)
Northern Europe					6210 *** (1652.0)
Western Europe					2599.2* (1427.0)
Cons	2875.9 (425.6)	2771.8 (426.7)	2319.6 (528.2)	11598.4 (3984.5)	12511.9 (3769.6)
σ_μ (level 3)	11258	11258	11253.3	11256	11256
σ_r (level 2)	2140	2143	2150	1857	1337
σ^2	3277	3275	3275	3272	3272
AIC	1904489	1904430	1904408	1904391	1904384
BIC	1904526	1904477	1904568	1904607	1904628
L2 Log-Likelihood	-952240	-952210	-952187	-952172	-952166
ICC level 3	0.9244	0.9245	0.9245	0.9240	0.9231
ICC level 2	0.0322	0.0323	0.0325	0.0245	0.1284

Significance level, * p<0.05, ** p<0.01, *** p<0.001

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Main Results – Modeling Poverty Depth

- The introduction of individual variables into the model does not result in a significant change in the country-level ICC or individual-level ICC.

- The inclusion of country variables in the model shows that the changes in the country-level ICC are insignificant.

- When dummy variables referring to country groups are included, the country-level ICC decreases slightly from 92,4% to 92.3%. The individual-level ICC also decreases from 3.2% in the null model to 1.3%

- Pandemic caused an increase in poverty depth – poverty depth on average increased.

- The most significant individual-level factor leading to increased poverty depth is the presence of an unemployed persons in household.

- At the country level, percentage of population 65 and over is significantly associated with lower poverty depth.

- When comparing Northern and Western European countries to post-communist countries, these factors are found to have a negative and significant effect on poverty.

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Future Research Directions

- Explore the long-term socioeconomic impacts of the COVID-19 pandemic on poverty and income inequality.

- Investigate the effectiveness of specific government policies and interventions in mitigating poverty during times of crisis.

- Analyze the interplay between income inequality and other societal factors, such as political stability and social cohesion.

- Investigate regional disparities in poverty and inequality within individual countries.

- Study the effects of global economic trends and trade policies on income inequality in the EU.

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