Poverty as a Determinant of Corruption – A Parametric Approach

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Abstract

The aim of this study is to evaluate the impact of poverty rates upon corruption phenomena. Reducing poverty and social exclusion has become crucial nowadays, bringing along positive effects upon the perceived cleanliness from corruption. Our paper evaluates various poverty proxies as subjectively assessed corruption determinants through linear and parametric approaches, for the sample of EU-27 member states and for the 2015-2022 time span. We determine threshold values for the at risk of poverty rates on genders and age groups, as inflection points for the second degree polynomial function of poverty's impact upon the Corruption Perception Index. Policy implications emerge, in order to maximize the beneficial effects of poverty reduction upon corruption.

Key words: poverty rates, at risk of poverty, corruption, panel data, parametric approach
J.E.L. classification: I32, D73

1. Introduction

Poverty has always been a major social problem. It intersects itself with corruption phenomena, and they both go hand-in-hand and create a vicious cycle that can be detrimental to the well-being of individuals and societies. The poverty-corruption nexus springs from the negative effects of poverty upon individuals, determining their engagement into corrupt behaviors, in order to escape from poverty.

Poverty has been defined as a condition characterized by a lack of money for satisfying a person's needs (Mabughi and Selim, 2006). A higher level of poverty in a country may deteriorate economic and social development. Thus, the very first sustainable development goal of the 2030 United Nation's Agenda is to "end poverty in all its forms everywhere".

A major determinant of poverty is corruption. Corruption represents the misuse of public power for personal gain (Oliveira da Silva *et al*, 2022). It reunites several immoral and illegal activities carried out by individuals in positions of authority or by various groups, with the ultimate purpose to obtain material or moral benefits. The used means are those of blackmail, deception, bribery, intimidation and or nepotism. Moreover, corruption phenomena directly affect macroeconomic monetary and fiscal policies, causing slow economic growth, unemployment and income inequality (İnam *et al*, 2019).

As such, corruption finds itself like a barrier that hinders the successful eradication of poverty. Moreover, combating corruption is a crucial part of the poverty reduction process (Negin *et al*, 2010).

Our paper aims to examine the effect poverty has upon corruption, using a panel data analysis for the EU-27 member states, from 2015 to 2022. The originality of our study resides in the fact that it uses a parametric approach, which is proven to be better than the classic linear approach found in the present specialized literature. The remaining sections of this research paper are organized as follows: theoretical background, research methodology, the empirical findings with discussions and robustness checks, ending with conclusions.

2. Theoretical background

The state of the art in this field has identified many critical links between corruption and poverty ever since the 1970s. Jeng (2018) affirms that corruption and poverty have bi-directional relationship, suggesting that corruption tends to cause poverty and vice versa. In addition, he explains that poor people are those who are more likely to break the rules in order to get to have a better life, through any means, due to the lack of necessary financial resources for covering their basic needs and buying essentials goods.

Furthermore, the positive impact of poverty on corruption is empirically demonstrated by Mustafa and Julide (2016). A higher level of poverty leads to a higher level of corruption. Corruption may ruin the process of poverty eradication and it may even deepen poverty levels. According to Jeng (2018) the reason behind this would be the distortion of the decision-making process related to public sector programs and policies.

Our study positions itself in this literature strand of direct impact of poverty upon corruption. Dincer and Gunalp (2008) also support this, their findings concluding that corruption, proxied by the Corruption Perceptions Index (CPI), clearly leads to a high level of income inequality and poverty.

Then, the study of Domashova and Politova (2021) emphasizes the idea that corruption levels increase along with poverty levels, because poorer countries are less likely to allocate the necessary resources that are required for developing an effective legal system.

3. Research methodology

The dependent variable (corruption) is here represented by subjectively assessed corruption, as provided by Transparency International (2023), through scores. The Corruption Perceptions Index (CPI), a measure of corruption, is an index of worldwide countries spanning from the lowest corruption level (100 – very clean from corruption) to the highest corruption level (0 – the highest corruption), used to measure the perceived levels of public sector corruption.

The independent variable (poverty) is represented by the percentage of total population living in households, where the equalized disposable income (after the social transfer) is below the poverty threshold (60% of the national median equivalised income), i.e. the so called At risk of poverty incidence rate (AROP). Our dataset includes subcategories of AROP, like the incidence of AROP for the male and female population (AROPmale and AROPfemale) and the incidence of AROP within various age groups, as follows: the 0-17 age interval (AROPunder), the 18-24 age interval (AROPover), the 25-49 age interval (AROPadult), the 50-64 age interval (AROPmidAge) and over the age of 65 (AROPsenior). These data are provided by Eurostat (2023). For our robustness checks subsection, we have used the poverty rate at national lines (PovN), as provided by World Data Bank (2023).

Our unbalanced panel dataset includes the 27 EU member states and the analyzed period covers the 2015-2022 time span. The summary statistics are presented in Table no. 1.

Table no. 1 Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
CPI	216	64.0185	14.1019	41	91
AROP	216	16.6166	3.9082	8.7	25.4
AROPmale	216	15.7384	3.6289	7.2	25.1
AROPfemale	216	17.4384	4.2586	10.1	26.3
AROPunder	216	18.6967	5.8265	9.1	38.1
AROPover	216	20.9754	6.7964	8.1	39.4
AROPadult	216	14.0944	3.6668	6.6	23.9
AROPmidAge	216	14.9611	4.1979	5.3	24.6
AROPsenior	216	18.8745	9.6734	4.6	52.3
PovN	141	16.7985	4.1352	8.6	25.3

Source: Authors’ processings in Stata

According to the summary statistics listed above, the highest level of the CPI is recorded in Denmark, which scores 91 in its CPI, being the least corrupt EU country during the analyzed period, while the lowest level of CPI is found in Bulgaria, i.e. 41, which proves to be the most corrupt EU country. For the entire time span of this study, the average level of CPI is of approximately 64.02 in the EU. Moreover, we may notice that the CPI values tend to fluctuate depending on the country, which means that during the analyzed period some EU countries increased their levels of corruption and others did not. For instance, Bulgaria, which is the only developing country in EU, registers an increasing trend in its CPI, becoming less clean from corruption over the years. Other countries that have strong economies and high levels of their CPI, such as Finland, Germany, Sweden and Netherlands, recorded a decreasing trend of their CPI, thus becoming cleaner from corruption.

Regarding the level of poverty measured by AROP, the highest level is scored in Romania, at a level of 25.4%, being the poorest EU country in 2015, while the lowest level is scored in the Czech Republic (8.7%). The mean value of EU-27 AROP is at a level of 16.62%, with an oscillating trend over the years.

When it comes to the first subcategory of AROP, by gender, the poorest men seem to be recorded in Romania (25.1%) and the least poor men are in the Czech Republic (7.2%), while the average value of AROPmale is at a level of 15.74% in the EU. Then, the poorest women are those from Latvia (26.3%) and the least poor women are, again, in Czech Republic (10.1%). Over the years, EU scored an average value of AROPfemale at level of 17.44% which leads to the conclusion that EU women are poorer than EU men.

In the second subcategory of at risk of poverty levels, by the age intervals, the poorest individuals under the age of 18 (AROPunder) are found in Romania (38.1%), while the least poor ones are found in Finland at a level of 9.1%. People aged over 18 years old, but under 24 years old who live in miserable conditions (AROPover) are those from Denmark, at a level of 39.4%. Conversely, the lowest level is reached by Ireland, at a level of 8.1%. The highest level of poverty among the adults aged between 25 and 49 years old (AROPadult) is scored by Romania (23.9%) and the lowest is the one in the Czech Republic (6.6%). Middle-aged people (50-64 years old, AROPmidAge) are the poorest in Latvia, at a level of 24.6%, while the least poor people for this age subgroup are in Denmark (5.3%). The poorest retirees (AROPsenior) are recorded in Estonia with a level of 52.3%, while the lowest level is scored in Hungary (4.6%). As a conclusion, it is noticeable that the poorest people in EU are those aged between 18 and 24 years old, at an average level of 20.97%, while the least poor EU people are between 25-49 years old, who might be considered as the most stable age segment when it comes to employment, which brings them a consistent income, justifying the minimum poverty rate levels.

Another way of measuring poverty is the poverty ratio at national poverty lines (PovN) indicator, provided by World Data Bank (2023). PovN reaches its highest level in Romania (25.3%) and its lowest level in the Czech Republic (8.6%), while the average level is around 16.79% when it comes to the EU-27 as a whole. This poverty proxy is used for the robustness checks of our findings.

Table no. 2 Correlation matrix

n=216 obs	**CPI**	**AROP**	**AROP male**	**AROP female**	**AROP under**	**AROP over**	**AROP adult**	**AROP midAge**	**AROP senior**
CPI	1								
AROP	-0.3929	1							
AROPmale	-0.3742	0.9803	1						
AROPfemale	-0.3989	0.9882	0.9388	1					
AROPunder	-0.4607	0.7636	0.814	0.7085	1				
AROPover	0.3405	0.3235	0.41	0.247	0.291	1			
AROPadult	-0.3315	0.811	0.8738	0.7428	0.8733	0.5226	1		
AROP midAge	-0.4778	0.8286	0.8046	0.8229	0.5287	0.018	0.5913	1	
AROPsenior	-0.2578	0.6537	0.5286	0.7303	0.1297	-0.1617	0.1274	0.5955	1

Source: Authors' processings in Stata

Regarding the correlation matrix between our variables of interest, we may observe that the great majority of poverty proxies are indirectly correlated with the CPI (second column in Table no. 2), thus the cleaner from corruption an EU member state is, the lower its poverty rates are. Indeed, with the exception of AROPover, we expect higher poverty rates to determine a higher corruption development.

Our study uses a linear approach based on the method of ordinary least squares (OLS) for panel data. The baseline model uses the simple regression method, and a parametric approach as well.

$$\mathbf{CPI_{it} = \beta_0 + \beta_1 POV_{it} + \varepsilon_{it}} \quad \text{Equation (1), linear regression}$$
$$\mathbf{CPI_{it} = \beta_0 + \beta_1 POV_{it} + \beta_2 POV_{it}^2 + \varepsilon_{it}} \quad \text{Equation (2), parametric regression}$$

Equation (1) estimates the effects of poverty rates upon the cleanliness from corruption scores of European nations, while Equation (2) uses a parametric approach, modelling the effects of poverty upon corruption with the help of a second degree polynomial function, using the notations below:

CPI_{it} – corruption perceptions index score of EU-27 country i in year t;
β_0 – constant terms;
β_1 - linear effects' parameters;
β_2 – quadratic effect parameter;
POV_{it} – various poverty proxies of EU-27 country i, year t;
ε_{it} - the residual.

4. Findings

Our main results are synthesized in Tables no. 3 and 4 respectively. Table no. 3. estimates Equations (1) and (2) for the impact of AROP (model (1)), AROPmale (model (2)) and AROPfemale (model (3)) upon CPI. The first set of estimations belongs to the linear fit (Equation (1)) while the second set of estimations in each model belongs to the quadratic fit (Equation (2)).

Table no. 3 Corruption (CPI), EU-27, as a function of poverty (by total and gender substructures)

CPI	(1)		(2)		(3)	
	Simple regression	**Parametric regression**	**Simple regression**	**Parametric regression**	**Simple regression**	**Parametric regression**
constant	87.575***	24.9997	86.9016***	18.2775***	87.0521***	56.5971***
AROP	-1.4176***	6.2933***				
$AROP^2$		-0.225***				
AROPmale			-1.4539***	7.5820***		
$AROPmale^2$				-0.2821***		
AROPfemale					-1.3208***	2.2168
$AROPfemale^2$						-0.0969*
Poverty Threshold value	n/a	13.98%	n/a	13.43%	n/a	11.43%
R^2	0.1544	0.2110	0.1400	0.2413	0.1591	0.1724
Adjusted R^2	0.1504	0.2036	0.1360	0.2342	0.1552	0.1646
Observations	216	216	216	216	216	216

Source: Authors' processings in Stata

The linear fit is reflected through Equation (1). As such, for a 1 unit increase in AROP (poverty proxy), the corruption measured by CPI will decrease with 1.4176 units, ceteris paribus (model 1). For a 1 unit increase in AROPmale (poverty measurement of total male population), the corruption measured by CPI will decrease with 1.4539 units, ceteris paribus (model 2). For a 1 unit increase in AROPfemale (poverty measurement of total female population), the corruption measured by CPI will decrease with 1.3208 units, ceteris paribus (model 3). Furthermore, all coefficients are significant below the 1% level.

When it comes to the parametric regression (Equation (2), second set of estimations in models (1-3)), we validate 3 poverty threshold values. For model (1), CPI and AROP increases to a threshold of 13.98%, then the higher the level of AROP, the lower the level of CPI. Beyond this threshold, the values tend to decrease abruptly to the maximum level of AROP (25.4%). In model (2), CPI and AROPmale increase to a threshold of 13.43%, then the higher the level of AROPmale, the lower the level of CPI. Once the threshold is reached, the values decrease rapidly, reaching the maximum AROPmale level of 25.1%. And for model (3), CPI and AROPfemale increase to a threshold of 11.43%, then the higher the level of AROPfemale, the lower the level of CPI. Beyond this threshold, the values tend to decrease abruptly to the maximum level of AROPfemale (26.3%) (see Figure no. 1 for graphical representations).

According to the results presented in Table no. 3, all models improve their coefficient of determination when the parametric fit is used, which increases the explanatory power of the models. In other words, the Adjusted R^2 of estimating CPI is improved from 15.04% to 20.36% in model (1), from 13.6% to 23.42% in model (2) and from 15.52% to 16.46% in model (3).

To continue, Table no. 4 estimates the effect of poverty rates by age substructures upon CPI scores of EU-27 member states, using the linear fit (Equation (1), the first set of estimations) and the parametric fit (Equation (2), the second set of estimations). According to the estimations from model (4), for a 1 unit increase in AROPunder (poverty measurement of population aged under 18 years old), the corruption measured by CPI will decrease with 1.1151 units, ceteris paribus. In model (5), for a 1 unit increase in AROPover (poverty measurement of population aged between 18 and 24 years old), the corruption measured by CPI will increase with 0.7065 units, ceteris paribus. Further, in model (6), for a 1 unit increase in AROPadult (poverty measurement of population aged between 25 and 49 years old), the corruption measured by CPI will decrease with 1.2748 units, ceteris paribus. In model (7), for a 1 unit increase in AROPmidAge (poverty measurement of population aged between 50 and 64 years old), the corruption measured by CPI will decrease with 1.6051 units, ceteris paribus. Lastly, for a 1 unit increase in AROPsenior (poverty measurement of population aged over 64 years old), the corruption measured by CPI will decrease with 0.3758 units, ceteris paribus (model (8)). Moreover, all coefficients are significant below the 1% level.

When it comes to the parametric regression estimates in models (4-8), using Equation (2), we find 5 poverty threshold values, but only 3 of them have significant coefficients. The sixth model has its all coefficients significant below the level of 1%, where CPI and AROPadult increases to a threshold of 11.67% and, after that threshold, the higher the level of AROPadult, the lower the level of CPI, until AROPadult reaches abruptly its maximum level of 23.9%. For the seventh model, the graph represents a line rather than a U-shaped curve, the variables' values decreasing to a threshold of 25.65%, even though the maximum level of AROPmidAge is at 24.6%. For the eighth model, CPI and AROPsenior decrease to a threshold of 33.26%, then the higher the level of AROPsenior, the higher the level of CPI. Beyond this threshold, the values increase to a maximum level of 52.3%.

Table no. 4 Corruption (CPI), EU-27, as a function of poverty (by age substructures)

	(4)		**(5)**		**(6)**		**(7)**		**(8)**	
CPI	**Simple regression**	**Parametric regression**	**Simple regression**	**Parametric regression**	**Simple regression**	**Parametric regression**	**Simple regression**	**Parametric regression**	**Simple regression**	**Parametric regression**
constant	84.8669 ***	81.813 ***	49.1973 ***	56.3456 ***	81.9874 ***	42.3987 ***	88.0329 ***	102.2732 ***	71.1131 ***	82.1201 ***
AROPunder	-1.1151 ***	-0.7853								
AROPunder ^{2}		-0.0081								
AROPover			0.7065 ***	-0.0216						
AROPover ^{2}				0.0167						
AROPadult					-1.2748 ***	4.3154 ***				
AROPadult ^{2}						-0.1848 ***				
AROPmidAge							-1.6051 ***	-3.7299 ***		

AROPmidAge 2								0.0727*		
AROPsenior									-0.3758 ***	-1.497 ***
AROPsenior ^{2}										0.0225 ***
Poverty Threshold value	n/a	-48.47%	n/a	0.64%	n/a	11.67%	n/a	25.65%	n/a	33.26%
R^2	0.2123	0.2129	0.116	0.1204	0.1099	0.1631	0.2283	0.2387	0.0665	0.0990
Adjusted R^2	0.2086	0.2055	0.1118	0.1122	0.1057	0.1553	0.2247	0.2316	0.0621	0.0905
Observations	216	216	216	216	216	216	216	216	216	216

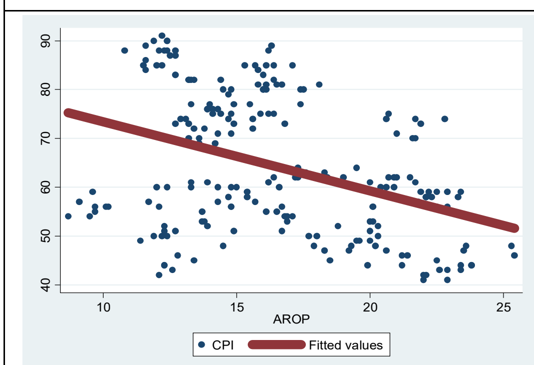
Source: Authors' processings in Stata

Additionally, one favorable aspect is the fact that almost every coefficient of determination improves their explanatory power in models (5)-(8). The Adjusted R^2 when estimating the impact of poverty upon CPI has increased from 11.18% to 11.22% (5th model), from 10.57% to 15.53% (6th model), from 22.47% to 23.16% (7th model) and from 6.21% to 9.05% (8th model). Thus, the parametric approach in Equation (2) brings a better fit to the data.

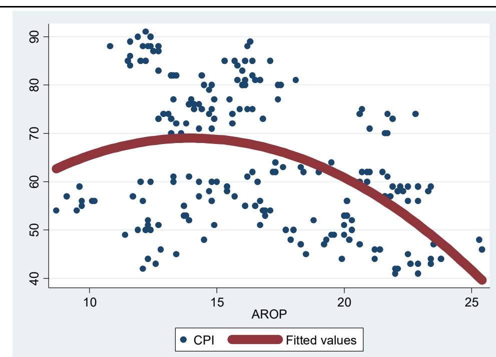
The linear fit of Equation (1) and the parametric approach of Equation (2) is graphically represented in Figure no. 1, as depicted in Stata linear fit models (on the left side of Figure no. 1) versus quadratic models (on the right side of Figure no. 1).

Figure no. 1 Plots of poverty against CPI

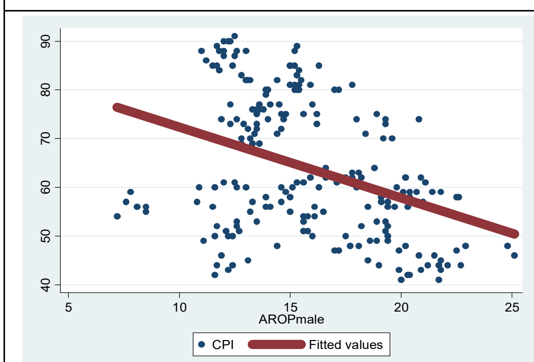
CPI = f(AROP)



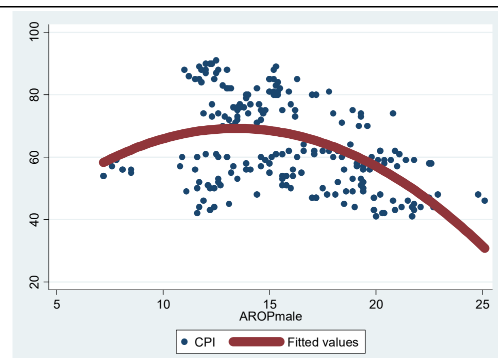
CPI = f(AROP, AROP ^{2})



CPI = f(AROPmale, AROPmale ^{2})

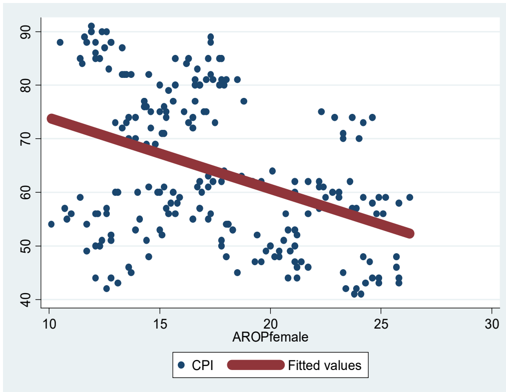


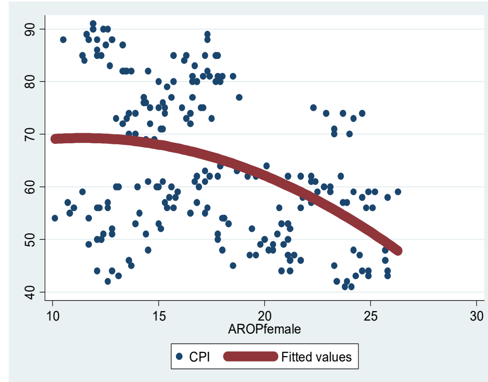
CPI = f(AROPmale, AROPmale ^{2})



CPI = f(AROPfemale)

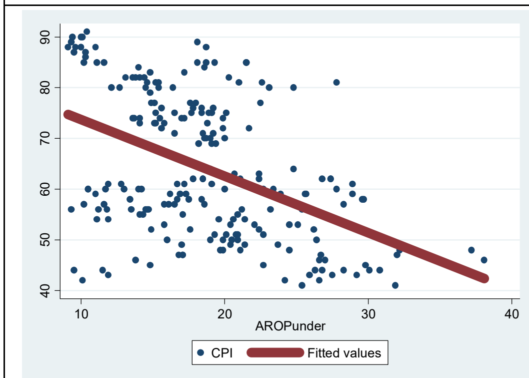
CPI = f(AROPfemale, AROPfemale ^{2})

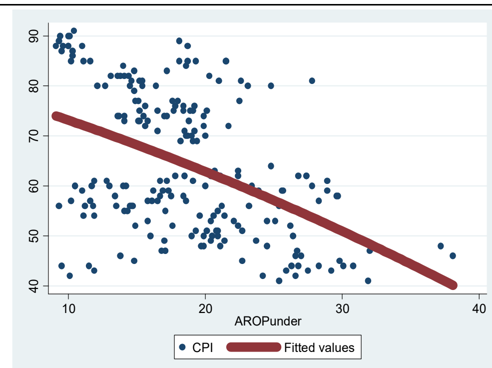




CPI = f(AROPunder)

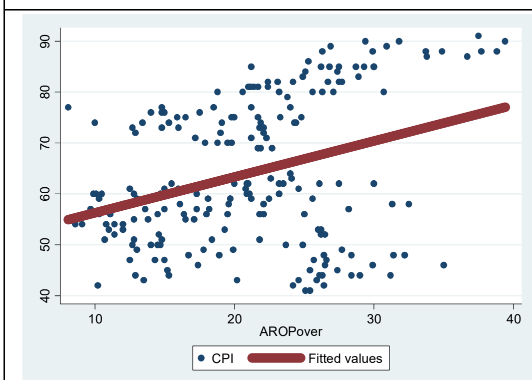
CPI = f(AROPunder, AROPunder ^{2})

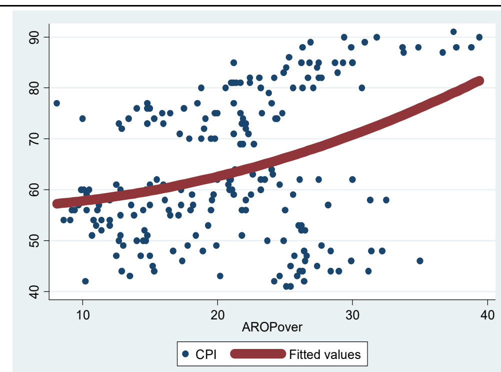




CPI = f(AROPover)

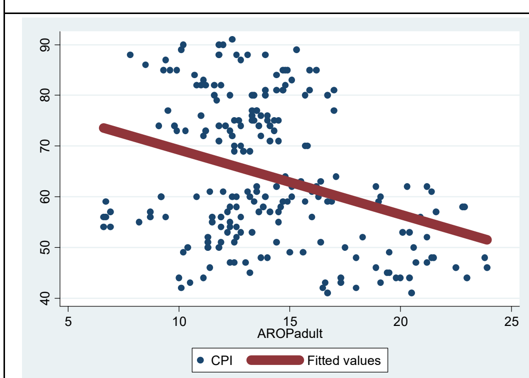
CPI = f(AROPover, AROPover ^{2})

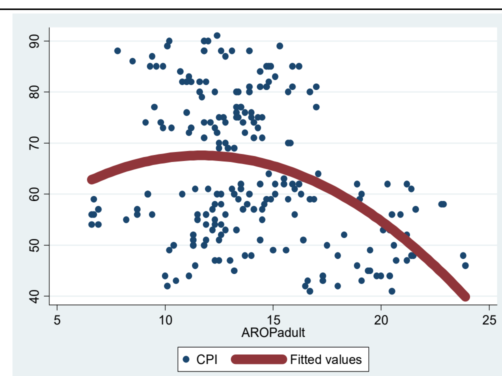




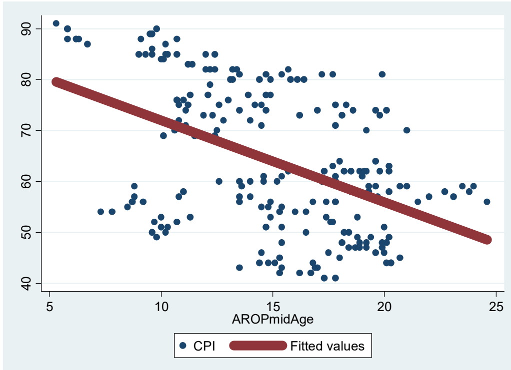
CPI = f(AROPadult)

CPI = f(AROPadult, AROPadult ^{2})

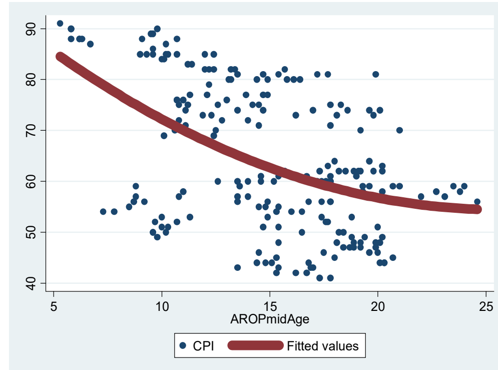




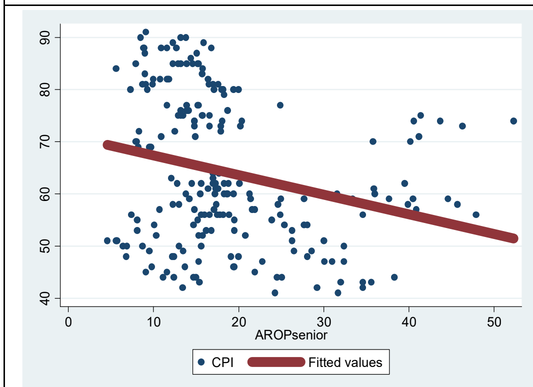
CPI = f(AROPmidAge)



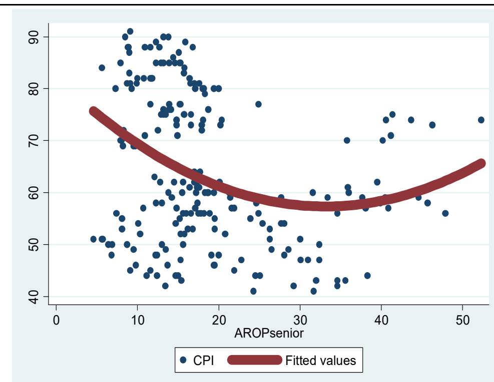
CPI = f(AROPmidAge, AROPmidAge ^{2})



CPI = f(AROPsenior)



CPI = f(AROPsenior, AROPsenior ^{2})



Source: Authors' processings in Stata

To support the validity of the previously obtained main results, we perform some robustness checks by verifying another variable, denoted PovN, which acts as another proxy for poverty and estimating Equations (1) and (2) in Table no. 5, model (9). PovN is found to be indirectly correlated with the CPI, for a simple regression, meaning that for a 1 unit increase in PovN, the variable CPI will decrease with 1.2285 units, ceteris paribus. Another observation is the coefficients of determination in model (9) improve their explanatory power, increasing from 13.24% to 18.09%, when the parametric approach to data is used. We estimate a poverty threshold at the level of 14.03%, and the model has significant coefficients. Thus CPI and PovN increase to that threshold and, after that, the higher the level of PovN, the lower the level of CPI, until PovN reaches abruptly its maximum level of 25.3%.

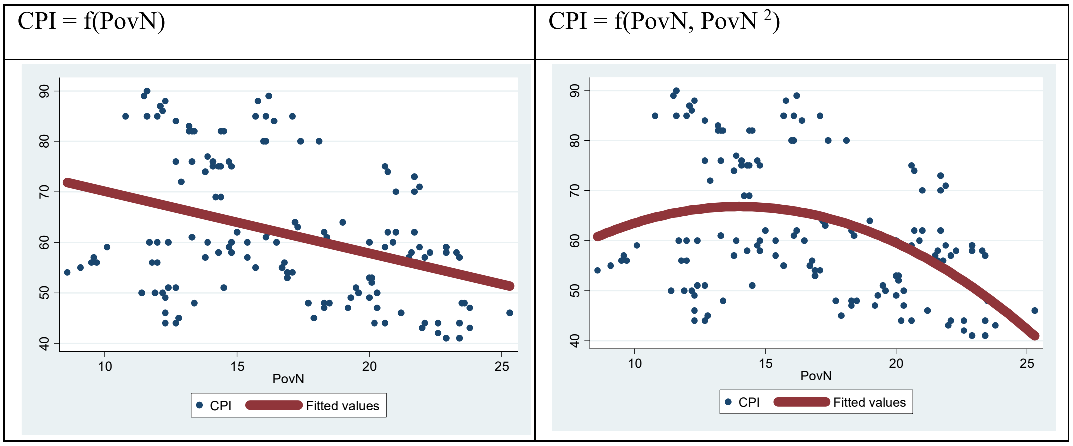
Table no. 5 Corruption (CPI), EU-27, as a function of national poverty rates

CPI	*(9)*	
	Simple regression OLS	**Parametric regression OLS**
constant	82.4325 ***	26.6753
PovN	-1.2285 ***	5.7205 **
PovN ^{2}		-0.2038 ***
Poverty Threshold value	n/a	14.03%
R^2	0.1388	0.1926
Adjusted R^2	0.1324	0.1809
Observations	141	141

Source: Authors' processings in Stata

Looking at the values obtained in Table no. 5, we may notice that the signs of the coefficients are the same as for AROP, AROPmale, AROPfemale and AROPadult (both simple and parametric regression), confirming that our estimations are robust. Figure no. 2 graphically represents the linear fit through Equation (1) on its left and the parametric fit through Equation (2) on its right.

Figure no. 2 Plot of corruption as a function of nationally reported poverty rates



Source: Authors' processings in Stata

5. Conclusions

Summing up, our results support the idea that increased cleanliness from corruption is related to decreased poverty rates. We find a U-shaped relationship only between 3 variables that measure the poverty (AROPover, AROPmidAge, AROPsenior) and corruption (CPI). For the rest of the variables, an inverted U-shape relationship is validated. According to our findings, we notice that poor people aged over 50 years old and between 18-24 years old, who are considered unexperienced employees, are likely to be more corrupt, if their poorness levels tend to increase.

We highlight different values of the poverty thresholds for subcategories of poverty rates of EU-27 member states. The parametric approach to our dataset, through a second degree polynomial, proves itself to bring a better fit to our dataset. This approach is original in itself, being the first of its kind, to our knowledge.

Our findings are important for policy-makers from different countries, in order to evaluate how poverty reduction could act as a corruption contraction tool as well, besides the positive economic and social effects the reduction of poverty would bring. These findings are important in the international context as well, because worldwide nations target the reduction to eradication of poverty levels.

The limits of our paper refer to the simplicity of the methodological approach, although for the future we intend to contract this by including supplementary control variables. Nonetheless, we intend to extend the sample.

6. References

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