Bulletin of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca. Horticulture
Open Access

The Impact of Corruption on Health Outcomes Empirical Evidence on EU-27

Viorela Ligia VĂIDEAN[1*], Ionuț Constantin CUCEU[1], Decebal Remus FLORESCU[2]

[1] Faculty of Economics and Business Administration, "Babeș-Bolyai" University,T. 58-60 Mihali Street, Cluj-Napoca, Cluj, 400581, Romania
[2] Faculty of Political, Administrative and Communication Sciences, "Babeș-Bolyai" University, 71 General Traian Moșoiu Street, Cluj-Napoca, Cluj, 400132, Romania
** Corresponding author: V.L. Văidean e-mail: viorela.vaidean@econ.ubbcluj.ro*

RESEARCH ARTICLE

Abstract

In a world threatened by increasing perceived corruption, its effects upon the health of nations have been scarcely studied, in spite of the tremendous importance sustained health has held on the European agenda. The purpose of this paper is to determine the impact of corruption upon health outcomes within an environmental performant and urbanised setting. The determinants of health outcomes measured as wellbeing, life expectancy and under-5 child mortality rate are estimated on an unbalanced panel data set covering the 2005–2020-time interval for the 27 member states of the European Union. The resulting econometric models validate the significance of corruption, environmental performance and urbanisation upon health outcomes: subjectively perceived corruption hampers the development of nations' health while a clean environment with an increasing tendency of urbanisation has a positive impact upon the health outcomes of European nations. This study also sketches important policy implications for improving the health status of European countries.

Keywords: corruption; environmental performance; life expectancy; mortality; wellbeing.

Received: 13 September 2021
Accepted: 05 November 2021
Published: 15 November 2021

DOI:
15835/buasvmcn-hort:2021.0014

© 2021 Authors. The papers published in this journal are licensed under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License

INTRODUCTION

Throughout the world, especially considering the context of the ongoing COVID-19 pandemic, health and healthcare have gained a tremendous importance, being extremely sensitive topics both from a microeconomic and a macroeconomic point of view. "Health for all" has been set as an objective of the World Health Organisation (WHO, 1999) for more than two decades, with many targeted actions and well-established governmental policies. Corruption in itself has also gained importance as a research topic. While an objective evaluation of the undesired corruption phenomenon is hard to be attained, there exist several estimations of perceived corruption that have helped researchers model this phenomenon and its effects. This study has been triggered by some shameful real-life situations that have breached within the broadsheets and media of certain Eastern European countries, revealing some disastrous corruption related happenings that have occurred in the field of healthcare providers and healthcare policies, further bringing along undesired health outcomes for the population of affected countries. Despite threats corruption poses, its impact upon the health outcomes of countries has been rather scarcely studied, being a new research area. Very few papers deal with the effects of corruption upon mental health. Li and An (2020) study the effects of corruption on subjective wellbeing and determine there's a negative relationship between corruption and happiness. Sharma et al. (2021)

contribute to this limited strand of literature and find that corruption is an important determinant of mental health in developing countries.

There exist several research studies that deal with the negative effects of the corruption upon life expectancies and mortalities, as these are the mostly used physical health proxies in the literature. Dincer and Teoman (2019) validate that corruption increases infant mortality on the long run by constructing a corruption index for Turkey, covering a wide time interval. This impact of grand and petty corruption upon mortality rates is also validated by Sommer (2020). Moreover, Factor and Kang (2015) validate the indirect relationship between life expectancies and infant mortalities and corruption in any state as well, for a sample of 133 worldwide countries. Li et al. (2017) works on a panel dataset comprising 150 countries, from 1995-2012 and proves that corruption significantly increases mortality rates, including the under-five child mortality rate, and decreases life expectancies, similarly to Lio and Lee (2015) and Sharma (2020).

Then, extremely few papers deal both with the mental and physical health outcomes and the impact perceived corruption has upon them, none of which are based on close to date datasets. Achim et al. (2020) is such a paper, which also controls for economic prosperity and cultural influences on a sample of worldwide countries.

Our paper focuses on estimating the impact of subjectively perceived corruption upon mental and physical health outcomes, controlling for environmental performances and urbanisation, for the 27 member states of the European Union (EU-27). The originality of our paper resides in the challenging research topic it deals with, the regional and recent character of its dataset and the supplementary controls it validates through its multiple regression models. We try to fill the existing research gap on the effects corruption has in side fields such as that of health outcomes, particularly with a novelty character when it comes to its effects upon the wellbeing of people, using the most recent data available and new control variables, in order to draw policy implications for the European Union.

Having reviewed the main specialized research papers on this particular topic, we fundament the following working hypothesis:

(HI): Increased corruption is related to decreased health outcomes.

The remainder of this paper is organised as follows: Materials and methods, Results and discussions and some brief Conclusions in the end.

MATERIALS AND METHODS

The variables that are used as health proxies cover both dimensions of health: mental health (Wellbeing), estimated through a happiness index that uses a life ladder subjective approach, and two of the mostly used physical health variables: Life expectancy (Life_Expectancy) and Child mortality rate for the ages of under 5 (Child_Mortality). These health outcomes constitute the vector of endogenous variables of our research paper and are public data found in the World Happiness Report (2021) and the World Data Bank (2021).

The explanatory variable of main interest is Corruption, from the Corruption Perceptions Index report (CPI) published by Transparency International (2020). This index measures the yearly perceived corruption levels within the public sector, on a scale from 0 (extremely corrupt) to 100 points (corruption free) for worldwide countries. Moreover, this particular study uses countries' rankings for corruption, ranging from the lowest worldwide corruption level to the highest worldwide corruption level. Throughout EU-27, healthcare is managed as a mostly public domain, as the healthcare systems of European member states are either Beveridge or Bismarck systems, both financed through public means. Our main research objective, that is attained assessing the impact of corruption upon health outcomes, within an environment performant and urbanised context, using a linear regression approach. The other explanatory variables are the Environmental Performance Index (Yale University (2021)) and the proportion of urbanised population (World Data Bank, 2021), trying to establish which would bring beneficial health effects along.

The main descriptive statistics of all these variables for EU-27 throughout 2005-2020 are included in Table 1 while a summarised description of theirs is found in Appendix 1.

Table 1. Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Wellbeing	367	6.3393	0.8597	3.8437	8.0189
Life_Expectancy	378	78.7051	3.1105	70.8658	83.4317
Child_Mortality	405	4.8958	2.272	2.1	18.2
CPI	432	34.3263	22.0204	1	94
EPI	432	73.5567	7.9023	48.08	90.68
Urban	405	72.3245	12.6989	51.533	98.041

(Source: Authors' processings in Stata)

We may notice that Europeans are rather happy on average, as the mean values of Wellbeing is 6.33, from at most 10. Their average life expectancy is of almost 79 years, with a standard deviation of 3 years. Their ranking of Corruption situates the EU-27 as a whole as less corrupt that the general worldwide context, Europe hosting some of the less corrupt countries of the world, like Denmark, Finland, Sweden and the Netherlands. Nonetheless, EU-27 is an environment performant and mostly urbanised area.

Furthermore, Table 2 presents the correlation coefficients between the vector of mental and physical health outcomes (Wellbeing, Life_Expectancy, Child_Mortality) and the other exogenous variables (CPI, EPI and Urban). Corruption rankings have a negative relationship with health outcomes (the correlation coefficients between CPI on the one hand and Wellbeing and Life_Expectancy on the other are negative and strong, while the correlation coefficient between CPI and Child_Mortality is positive and strong). Basically, the less perceived corruption there is within a member state of the EU-27, the better its health outcomes are.

Table 2. Correlation coefficients for n =316

	Wellbeing	**Life_Expectancy**	**Child_mortality**	**CPI**	**EPI**	**Urban**
Wellbeing	1					
Life_Expectancy	0.6266	1				
Child_mortality	-0.5295	-0.6861	1			
CPI	-0.7851	-0.5006	0.5633	1		
EPI	0.465	0.6072	-0.6546	-0.4649	1	
Urban	0.5032	0.4579	-0.2746	-0.4852	0.2911	1

Source: Authors' processings in Stata

Our research paper uses a baseline multiple regression model as follows:

$$\textbf{Health\_outcomes}_{it} = \beta_0 + \beta_1 \textbf{CPI}_{it} + \beta_2 \textbf{EPI}_{it} + \beta_3 \textbf{Urban}_{it} + \varepsilon_{it} \quad \text{Eq (1)}$$

Eq (1) estimates the effects of subjectively perceived corruption upon various health outcomes, controlling for environmental performances and urbanisation, throughout EU-27, using the notations below:

$\text{Health\_outcomes}_{it}$ – proxy for the physical and mental health status of the population of country i in year t (*Wellbeing, Life expectancy, Under 5 mortality rate*);

β_0 - constant;

$\beta_{1,2,3}$ - linear effects' parameters;

CPI_{it} – perceived corruption index ranking of European country i , year t ;

EPI_{it} – environmental performance index of European country i , year t ;

Urban_{it} – the percentage of urbanised areas of country i , year t ;

ε_{it} - the residual.

Our research paper used a database comprised of the 27 European Union Member states, for the 2005-2020, organised as an unbalanced panel dataset, gathered from World Data Bank (2021), World Happiness Report (2021), Transparency International (2020) and Yale University (2021). A detailed description of our variables is comprised within Appendix 1. Eq (1) is built up step by step, through a sequential search method, the forward addition approach (as described by Hair et al. (2010)). Once the multiple Pooled OLS model is estimated, it is also approached through a fixed effects modelling (FEM) and a random effects modelling (REM) technique, keeping the optimal model, as pointed out by the Hausman test, whose results are found on the bottom Panel diagnosis line of each main results table (Tables 3-5).

RESULTS AND DISCUSSIONS

Our results are organized on a Main results subsection, followed by a Robustness checks subsection, both with interpretations.

Main results

Table 3 contains the results of the gradual estimation of Eq (1) considering Wellbeing as a mental health proxy. At first, Wellbeing is modelled as a function of CPI, using the Pooled OLS method for our dataset (model (1) OLS). The estimated coefficient for CPI is negative and significant at a 1% level, proving the negative effects corruption imprints upon the happiness of people from the EU (-0.0302, obtained through the simple regression model (1)). This negative and significant coefficient of CPI is kept throughout the following multiple regression models when

controls are added (model (2) and (3)) and the estimation technique is changed (model (4) FEM), strengthening the indirect relationship between corruption and health.

Nonetheless, environmental performance has a direct effect upon wellbeing, boosting it, as the estimated coefficient for EPI is positive and significant in models (2) and (3). Urbanisation, the last added control, has a positive and significant coefficient in model (3) OLS, showing that the more urbanised the population of a member states is, the better its mental health is. The Adjusted R^2 of models (1)-(3) increase up to the value of 64.08% in model (3) OLS, meaning the three explanatory variables included in Eq (1) explicit 64.08% from the variance in Wellbeing.

The bottom line of Table 3 contains the panel diagnosis tests. The Hausman test points towards the fixed effects model (4) as being optimal. Model (4) FEM keeps the signs of the previously considered variables and the significance of the estimated coefficient for CPI (-0.0147).

Table 3. The impact of corruption upon wellbeing in EU-27

Wellbeing	Simple regression (1) OLS	Multiple regression (2) OLS	Multiple regression (3) OLS	Multiple regression (4) FEM
Constant	7.3723***	6.3685***	5.5371***	4.7224***
CPI	- 0.0302***	- 0.0281***	- 0.0259***	- 0.0147***
EPI		0.0125***	0.0124***	0.0016
Urban			0.0101***	0.0271
R^2	0.6084	0.6185	0.644	within = 0.0851
Adjusted R^2	0.6074	0.6164	0.6408	between = 0.6126
Obs	367	367	342	overall = 0.555
				Panel diagnosis Prob>chi2 = 0.0055

Note: *,**,*** Statistically significant at 10%, 5% and 1% levels.

Table 4. contains the estimations of Life Expectancy as a physical health proxy, as a function of CPI (model (1) OLS), then EPI is added as an explanatory variable (model (2) OLS) and then Urban is also added (model (3) OLS), finally obtaining Eq (1). The estimated coefficient for corruption rankings is negative and significant at a 1% level within these models, so the higher the corruption ranking, thus perceived corruption level of a certain country is, the lower its life expectancies are. Model (1) by itself explicates 27.38% of the variance in Life expectancy through CPI.

EPI has a positive and significant coefficient in model (2) and in model (3) as well while Urban has a positive coefficient in model (3), showing that the higher the environmental performances and urbanisation levels of a European country are, the more improved its life expectancies are.

Model (4) FEM in Table 4 estimates Eq (1) with the FEM technique, as the Hausman test result points out. The signs of our explanatory variables are kept but unfortunately only EPI and Urban remain significant here.

Table 4. The impact of corruption upon life expectancy in EU-27

Life Expectancy	Simple regression (1) OLS	Multiple regression (2) OLS	Multiple regression (3) OLS	Multiple regression (4) FEM
constant	81.2558***	66.4909***	62.2136***	40.0302***
CPI	- 0.0742***	- 0.0412***	- 0.026***	- 0.0018
EPI		0.1844***	0.1787***	0.0769***
Urban			0.0578***	0.4575***
R^2	0.2757	0.4468	0.4892	within = 0.4529
Adjusted R^2	0.2738	0.4438	0.4851	between = 0.264
Obs	378	378	378	overall = 0.2568
				Panel diagnosis Prob>chi2 = 0.0000

Note: *,**,*** Statistically significant at 10%, 5% and 1% levels

Table 5 estimates child mortality rates of EU-27 member states as a function of perceived corruption rankings (model (1) OLS), then EPI is added (model (2) OLS) and urbanisation (in model (3) OLS). Child mortality is not reversely coded, that is why the signs of the estimated coefficients are exactly opposed to those from Tables 3 and 4. The positive coefficients of CPI show that the higher the corruption phenomena ranking in a certain European country is, the higher that countries under 5 mortality rates are, all significant at a 1% level (models (1)-(3)). Then EPI imprints a negative impact upon child mortality: the less environmental performance a certain country holds, the higher its child mortality rates are (models (2) and (3)). The coefficient for the weight of the population living in urban areas isn't significant in model (3). Still, the Adjusted R^2s of these models range between 32.02% and 50.4%.

The panel diagnosis tests point towards the FEM model as being optimal. The results of the Hausman test are found on the bottom line of Table 5. The coefficient of CPI is positive and 1% significant (0.0266), showing that the higher the corruption ranking thus level of corruption is, the higher the child mortality rate is. EPI and Urban have negative estimated coefficients (-0.0738 and -0.2493 respectively), showing their indirect relationship with child mortality rates: the higher the environmental performance and urbanisation of a certain European state are, the lower its mortality rates are.

Table 5. The impact of corruption upon children mortality in EU-27

Child_Mortality	Simple regression (1) OLS	Multiple regression (2) OLS	Multiple regression (3) OLS	Multiple regression (4) FEM
Constant	2.8862***	14.2769***	13.6769***	27.4582***
CPI	0.0585***	0.0327***	0.0348***	0.0266***
EPI		- 0.1424***	- 0.1434***	- 0.0738***
Urban			0.0083	- 0.2493***
R^2	0.3219	0.506	0.5076	within = 0.2669
Adjusted R^2	0.3202	0.5035	0.504	between = 0.1921
Obs	405	405	405	overall = 0.1752
			Panel diagnosis	Prob>chi2 = 0.0000

Note: *,**,*** Statistically significant at 10%, 5% and 1% levels.

Summing up, our main results prove the indirect relationship between corruption and health outcomes, validating our *(H1).* Indeed, although the literature is scarce on the effects of corruption on mental health, the negative and significant coefficients for corruption rankings from Table (3) are validated by the similar findings of Li and An (2020), Achim et al. (2020) and Sharma et al. (2021). There exist more papers on the negative effects corruption has upon physical health outcomes, so our results from Table 4 are similar to the previous findings of Factor and Kang (2015), Li et al. (2017), Sommer (2019) and Sharma (2020), while our results from Table 5 are similar to the ones validates by Li et al. (2017) and Sharma (2020). The undesirable effects of corruption upon health indicators should represent an exclamation mark for policy makers, as well as individuals. Corruption represents a less studied and validated health determinant, as its action mechanisms are not directly noticeable, so the specialized literature on this topic is rather new. Still, our estimations validate its negative effect upon health outcomes, both for physical and mental health proxies. Governmental policies that target the reduction of financial and economic crimes would further come with associated health improvements, too. Furthermore, policy makers should have in mind that an environmental performant and urbanised territory may also bring health benefits along, so the packages of policies they design would always be environmentally friendly and targeting the development of areas.

Robustness checks

Our research includes a series of robustness checks, in order to support our main results. The first dimension we analyse is that of replacing the previously studied health outcomes with infant mortality rates, as another endogenous variable, supplementary to the vector of health outcomes of EU-27. Having an explanatory power of 50.53%, the Pooled OLS model of Infant mortality rates as a function of CPI, EPI and Urban validates the signs of their coefficients and the significance of CPI and EPI, at a 1% level (Eq (1)). Results may become available on demand.

Another dimension of our robustness checks considered the inclusion on supplementary control variables within the already estimated models no. (3) from Tables 3-5. As such, when the Unemployment rate has been added, the signs and significances of the initial explanatory variables have been kept.

We've also extracted some random subsamples from our initial sample of observations, randomly keeping 20% of our dataset and re-estimated Eq (1) on the reduced subsamples. Although the significance of EPI and Urban haven't always been kept, the negative effects of corruption upon health outcomes have always been validated.

All these results may become available on demand, as they re-emphasize our main findings.

CONCLUSIONS

The objective of this research is to get an up-to-date examination of the effects perceived corruption has upon the health outcomes of the member states of the European Union. Indeed, we've proved that corruption brings along a negative impact upon the mental and physical health of people, although we haven't researched the exact channels and mechanisms this negative impact is imprinted through, this being the purpose of some future studies of ours. Another limit of our study is given by its sample size. We've restricted our research to the European Union member states, but for the future, worldwide countries would be added and interesting continental results might be obtained. Nonetheless, our study is somewhat limited by its methodology, as multiple regression analysis is the only multivariate data analysis technique performed. As a future research direction, we intend to employ cluster analysis of our data, too.

Our paper draws the attention on corruption as a less obvious determinant of health outcomes, in order for micro and macroeconomic policies to be adjusted according to this particular finding. Moreover, as expected, a performant environment has positive effects upon health outcomes, just like urbanization does. European decision makers should pay attention to all determinants of health outcomes, even to the less obvious ones, in order to be able to ensure the best attainable health outcomes for their people, heathy healthcare systems and environments. Our results are important throughout the present international context, when worldwide nations strive to maximize the performance of their health and healthcare. These strong results are supported for developed nations, because according to the latest World Data Bank classifications, all European member states are ranked as developed countries. Future studies of ours would include wider samples, with developing countries as well. In those countries, the impact of corruption would probably have a higher magnitude upon health proxies, compared to that of developed countries. This research topic is generous and the potential within the area is vast.

Author Contributions: V.L.V. Conceived and designed the analysis; I.C.C. Collected the data; D.R.F. Contributed data or analysis tools; V.L.V. Performed the analysis; V.L.V., I.C.C., D.R.F. Wrote the paper.

Funding Source: This research was funded by a grant of the Romanian Ministry of Education and Research, CNCS—UEFISCDI, project number PN-III-P4-ID-PCE-2020-2174, titled "Intelligent analysis and prediction of the economic and financial crime in a cyber-dominated and interconnected business world".

Acknowledgments

We are very grateful to the "Intelligent analysis and prediction of the economic and financial crime in a cyber-dominated and interconnected business world" project, its entire team and particularly to its Project Manager, for all the support and advice given through our research career and for this research paper as well.

Conflicts of Interest

The authors declare that they do not have any conflict of interest.

REFERENCES

1. Achim M V, Văidean V L, Borlea S.N. Corruption and health outcomes within an economic and cultural framework. The European Journal of Health Economics. 2020; 21, 195 – 207. DOI:10.1007/s10198-019-01120-8.
2. Dincer O, Teoman O. Does corruption kill? Evidence from half a century infant mortality data. Soc Sci Med. 2019 Jul; 232:332-339. doi: 10.1016/j.socscimed.2019.05.017.
3. Factor R, Kang M. Corruption and population health outcomes: an analysis of data from 133 countries using structural equation modeling. International Journal of Public Health. 2015; 60(6), 633-41. doi: 10.1007/s00038-015-0687-6.
4. Hair J F, Black W C, Babin B J, Anderson R E. Multivariate Data Analysis. 7th edition. Pearson; 2010.
5. Li Q, An L. Corruption Takes Away Happiness: Evidence from a Cross-National Study. Journal of Happiness Studies. 2020; 21, 485–504. https://doi.org/10.1007/s10902-019-00092-z.

6. Li Q, An L, Xu J, Baliamoune-Lutz M. Corruption costs lives: evidence from a cross-country study. European Journal of Health Economics. 2017; 19(1), 153-165. doi: 10.1007/s10198-017-0872-z.
7. Lio M C, Lee M H. Corruption costs lives: a cross-country study using an IV approach. International Journal of Health Planning Management. 2016; 31(2), 175-90. doi: 10.1002/hpm.2305.
8. Sharma A. Does economic freedom improve health outcomes in sub-Saharan Africa? International Journal of Social Economics. 2020; 47(12), 1633-1649. https://doi.org/10.1108/IJSE-01-2020-0008
9. Sharma S, Singhal S, Tarp F. Corruption and mental health: Evidence from Vietnam, Journal of Economic Behaviour & Organization. 2021; 185, 125-137. https://doi.org/10.1016/j.jebo.2021.02.008.
10. Sommer J M. Corruption and Health expenditure: A Cross-National Analysis on Infant and Child Mortality. The Eur Journal of Development Research. 2020; 32, 690–717. https://doi.org/10.1057/s41287-019-00235-1.
11. Transparency International. Corruption Perceptions Index Report; 2020. www.transparency.org/cpi2020
12. World Bank. World Development Indicators. Washington; 2021. www.data.worldbank.org
13. World Happiness Report. The Sustainable Development Solutions Network for the United Nations; 2021. https://worldhappiness.report/ed/2021/
14. World Health Organization, Regional Office for Europe Copenhagen. Health21: the health for all policy framework for the WHO European Region. European Health for All Series, No. 6, ISSN 1012-7356, Denmark; 1999. https://www.euro.who.int/__data/assets/pdf_file/0010/98398/wa540ga199heeng.pdf
15. Yale University. Environmental Performance Index; 2021. www.epi.envirocenter.yale.edu

APPENDIX 1

Variables – description and source

Variables	Way of expressing and description	Units/scale	Sources
Health outcomes	*Mental health*		
	Happiness index (*Wellbeing*) The level of happiness is reflected through answers to the following question: "Please imagine a ladder, with steps numbered from 0 at the bottom to 10 at the top. The top of the ladder represents the best possible life for you, and the bottom of the ladder represents the worst possible life for you. On which step of the ladder would you say you personally feel you stand at this time?"	From 0 points, meaning the worst life possible to 10 points, meaning the most desirable life	World Happiness Report (2021)
	Physical health		
	Life expectancy *(Life_Expectancy)* reflects the average number of years an infant born in that country is expected to live if prevailing patterns of age-specific mortality rates at the time of birth in the country stay the same throughout the infant's life.	Years	World Bank (2021) World Development Indicators
	Child mortality rate (per 1,000 live births) *(Child_mortality)* is the probability per 1,000 that a newborn baby will die before reaching age five, if subject to age-specific mortality rates of the specified year.	Number of dead babies before reaching the age of 5, out of 1000 live births	
Corruption	Rankings of worldwide countries ranging from the lowest corruption level to the highest corruption level (*CPI*), where the level of corruption is measured by the Corruption Perceptions Index report, used to measure the perceived levels of public sector corruption.	CPI rankings	Transparency International (2020)
Environmental Performance	The Environmental Performance Index (*EPI*) provides a data-driven summary of the state of sustainability around the world. Using 32 performance indicators across 11 issue categories, the EPI ranks 180 countries on environmental health and ecosystem vitality.	EPI rankings	Yale University (2021)
Urbanisation	Urban population (*Urban*) refers to people living in urban areas as defined by national statistical offices. The data are collected and smoothed by United Nations Population Division.	% of total population	World Bank (2021) World Development Indicators