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The impact of corruption on Environmental, Social and Corporate Governance (ESG) based on European Union countries.

ANNA PLUSKOTA
University of Lodz, Faculty of Economics and Sociology,
Department of Corporate Finance, Poland
Anna.pluskota@uni.lodz.pl
orcid.org/0000-0002-2566-3420

Abstract

Motivation: The impact of corruption on core ESG measures for EU countries has not yet been studied. There are few analyses in the literature on the relationship between corruption and ESG from a macro level, and only such analyses allow an indication of the costs of corruption and the effects of fighting it at the country level.
Aim: The study aims to ocean the impact of corruption on ESG measures: CO2 emissions, life expectancy, and economic growth in the EU. Calculating the cost of corruption is key to properly assessing the effectiveness of anti-corruption projects.
Results: The effect of corruption on ESG measures was shown to be heterogeneous. A non-linear relationship between corruption and CO2 and economic growth was shown, while the relationship between corruption and life expectancy was linear. The impact of corruption on ESG should be considered from the point of view of the ESG component variable in question, rather than based on synthetic ESG measures.

Keywords: corruption; ESG; climate change
JEL: Q10, D73, F43

1. Introduction

All the research of the last decade shows unequivocally that the world is facing the catastrophic impact of climate change on humanity. Action to reduce climate change is most meaningful when real action is taken by large institutions and states. Microscale actions by local activists or committed managers are also important, but their scale is negligible compared to the activities and real changes undertaken by countries or consortia of countries, such as the European Union. Linking ESG (environmental, social responsibility, and corporate governance) to state governance policies is currently an important issue facing policymakers. However, their decisions can be distorted by corruption.

The topic of the impact of corruption on ESG at the macroeconomic scale is currently poorly studied in the literature. This is an obvious research gap, and this article attempts to fill it for a European Union country. The research available in the literature is limited only to the analysis of the collective ESG index in connection with the corruption measure, e.g. Marzouiki et al. (2023) or Wei et al (2023). Taking into account the fact that ESG consists of a number of parameters regarding environmental protection, social responsibility and corporate governance, the conclusions drawn from the impact analysis of corruption on the overall ESG indicator may be too general to understand the essence of the matter. This article is an attempt to fill this research gap.

The aim of this study is to ocean the impact of corruption on selected ESG measures in the European Union (EU). This objective was achieved by analyzing macroeconomic data from 1996 to 2020 for all EU countries. Using GMM models, the sub-hypotheses were positively verified, allowing the main hypothesis of corruption-reducing ESG in the EU to be positively validated.

The article presents a literature review based on which the research gap was defined. Then, research hypotheses were formulated and verified on the basis of the data presented in the third part, and the results of the analysis were presented in the fourth part. The last part of the article contains conclusions from the study, where, in relation to the existing findings in the literature, new conclusions formulated on the basis of the entire article are presented. A heterogeneous relationship between corruption and ESG was shown. Corruption affected the individual ESG measures CO2 emissions, life expectancy, and economic growth differently. The conclusion is that the impact of corruption on ESG should be considered from the point of view of the individual measures that make up ESG, rather than by a synthetic measure of ESG.

2. Literature review

An analysis of the current literature shows that there is a lack of studies that empirically analyze the impact of corruption on individual ESG measures in EU countries. The macroeconomic scale of the issue has so far been neglected, while numerous studies on the micro-scale can be pointed out. The relationship between corruption and ESG at the macro scale has strong theoretical arguments. Policymakers responsible for ESG changes in the economy may be bribed to introduce a range of changes that only benefit the powerful pro-business lobby. Bureaucrats can also be bribed to audit the implementation of the ESG law in individual companies and demonstrate the implementation of the law to a greater extent than is actually the case. One can point to the results of empirical studies available in the literature that confirm the impact of corruption on ESG at the micro and macro levels.

A study by Hoang (2022) argues that political corruption affects ESG disclosure by companies. Using data on US-listed companies, it was shown that highly polluting companies benefit from local corruption and are not interested in disclosing ESG-themed information about their operations.

Varvarigos (2023) concludes from his research that corruption fuels environmental degradation and significantly hinders the implementation of laws to limit the use of environmentally damaging technology. Varvarigos, in the indicated article, proved the existence of a relationship between economic growth and culture and corruption and environmental pollution. Low income is associated with high corruption and high environmental pollution, so creating a culture that reduces corruption and environmental degradation will result in increased income. Varvarigos points out that this approach is not obvious, but there are indirect channels for corruption and environmental pollution to affect incomes, which is also an important approach to the economy ultimately resulting in increased incomes.

When analyzing individual ESG factors, one can point to research confirming the impact of corruption on CO2 emissions in post-Soviet countries (Bae et al., 2017). Bae et al (2017) showed a linear relationship between corruption and CO2 emissions and determined that the impact was not dominant. Problems with the enforcement of legislation in post-Soviet countries and the problem with the creation of climate change mitigation legislation were identified. On the other hand, Haseeb and Azam (2021) showed that for countries with high CO2 pollution, the level of corruption is a major contributor (along with tourism) to CO2 emissions. Sadig et al (2023) analyzed the impact of corruption on CO2 emissions in the BRICS-1 countries (Brazil, Russia, India, and China) in the context of the long-run Kuznets curve. They showed a positive effect of corruption control on long-term CO2 emissions reduction.

Holmberg and Rothstein (2011) showed in a study of 120 countries worldwide a significant linear effect of corruption on life expectancy, child and maternal mortality, and subjective feelings of health. The relationship unambiguously concluded that reducing corruption significantly increases life expectancy. Achim et al (2020), based on an empirical study, showed a significant effect of corruption on the level of physical and mental health in a country. Remeikienė et al (2020) analyzed the links between corruption and quality of life in the European Union. The research indicated that corruption was linked to quality of life and in order to reduce it, the focus should be on the quality of life represented by education, the healthcare system, and the overall economic situation of the country.

The impact of corruption on economic growth is the component of ESG that is very well studied in the literature. Linear and negative impacts of corruption on economic growth have been shown by Heckelman and Powell (2010) or Wright and Craigwell (2013). The concept of non-linear effects of corruption on economic growth has also been presented in the literature. Dzhumashev (2014) argues for the appropriateness of a linear relationship between the variables in question by the fact that corruption can have a dual effect on the economy: positive and negative. Due to this duality and the fact that a fading phenomenon loses its impact, it is difficult to find the same effect on the economy in the case of a high level of corruption and a negligible level of corruption. The concept of the negative impact of corruption is quite natural, as corruption generates additional costs for economic activity and lowers the rate of return on investment. In contrast, Dzhumashev (2014) has shown that low-, middle- or high-income countries can benefit from reduced corruption regardless of the level of development of the economy.

The above-mentioned studies available in the literature indicate that there is a correlation between corruption and ESG, but there is a perceived lack of research on measuring the effects of corruption on ESG and research on EU countries only. It is not known by how much ESG measures will change when corruption is reduced by 1 unit. However, this knowledge is crucial for decision-makers to make decisions on anti-corruption laws. Legislators want to know what effect a reduction in corruption of a certain degree is expected to have on the economy in order to make the right decision about whether to introduce anti-corruption reform. It may turn out that some anti-corruption projects are more expensive than the benefits that will arise in the economy from their introduction.

2.1. Hypotheses

Given the strong arguments described for the macroeconomic impact of corruption on ESG, this issue will be empirically investigated. It is possible to formulate a main research hypothesis:

MH: Corruption impacts heterogeneously on ESG in European Union economies.

Based on the research hypothesis formulated above, three auxiliary hypotheses were formulated, aimed at empirical verification of the main hypothesis. Given the research objective formulated in the introduction to assess the impact of corruption on ESG in the EU, the impact of corruption on ESG factors should be analysed in detail. It is possible to verify the overall impact of corruption on the synthetic ESG indicator, but in this case, the impact on the individual ESG components (environmental, social responsibility, and corporate governance) will not be examined, which may vary (significant positive impact, significant negative impact, no impact). Consequently, selected measures of individual ESG components were examined. The following ESG factors were selected for the study:

1. environmental measure is CO2 emissions;
2. the measure of social responsibility is life expectancy;
3. the measure of corporate governance is economic growth.

The supporting hypotheses correspond to the selected measures of the individual ESG factors and are formulated as follows:

— SH1: Corruption reduces CO2 emissions in the EU.
— SH2: Corruption reduces life expectancy in the EU.
— SH3: Corruption reduces economic growth in the EU.

The main hypothesis was verified by confirming all auxiliary hypotheses. If any of the auxiliary hypotheses were rejected, the main hypothesis was also rejected.

3. Methods and data

The study was based on basic descriptive statistics, Pearson's correlation coefficient and an econometric model built using Arellando and Bond's second difference GMM system. Pearson correlation was calculated for the correlation of the corruption index with the other variables analyzed in the study. Due to the analysis using non-linear functions of corruption, three functions were constructed for each explanatory variable in the model, two functions allow the validity of the non-linear modelling to be verified and these are the quadratic function and the logarithmic function, while the third function is the linear function. Based on the relevant statistics, a decision will be made as to which of these three models best describes the variable in question. The general form of the model is as follows:

$$A_{i,t}=\alpha_{i,t}+\beta_{i,t}A_{i,t-1}+\gamma_{i,t}B_{i,t}+CC_{i,t}+CC_{i,t}^{2}+\mu_{i,t} \quad (1)$$
$$A_{i,t}=\alpha_{i,t}+\beta_{i,t}A_{i,t-1}+\gamma_{i,t}B_{i,t}+CC_{i,t}+lnCC_{i,t}+\mu_{i,t} \quad (2)$$

A — explained variable in the model: CO2 emissions, life expectancy or economic growth;
α , β , γ — coefficients;
B — control variables;
CC — corruption;
µ —is the error that may be explained as follows:

$$\mu_{i,t}=\delta_{i,t}+\gamma_{i,t}+\varepsilon_{i,t} \quad (3)$$

where:
δ — is the country-specific random effects;
γ — is the random effects assigned to the period;
ε — is a random component with basic properties.
The study was carried out using the differential GMM estimator of Arellando and Bond (1991). This estimator was chosen for its properties: higher estimator efficiency relative to the UMM estimator and good asympotic properties (Goczek, 2012, p. 57). The validity of the constructed model was verified using a 2nd degree autocorrelation test (p-value should be equal to or greater than 0.1), as well as the Sar-gan test (p-value should be as large as possible).
Data was extracted from the World Bank database for the period 1996 to 2020 on the 27 EU countries. The study considered the following variables explained in the econometric model:
— CO2 (source: World Bank) - CO2 emissions (metric tons per capita). This is a measure of environmental pollution that represents the 'Environment' in the ESG;
— Life (source: World Bank) - Life expectancy at birth, total (years). This is a measure of life expectancy at birth that represents 'Social Responsibility' in ESG;
— Growth (source: World Bank) – % change in GDP (years). This is a measure of the increasing production of goods and services over time, which represents 'Corporate Governance' in ESG.
The study is based on detailed variables describing and included in the ESG, which is the originality of this study. The following control variables were included in the study:
— FDI (source: World Bank) - Foreign direct investment, net inflows (% of GDP);
— Trade (source: World Bank) – Trade (% of GDP);
— Population - Population growth (annual %);
— Consumption - General government final consumption expenditure (annual % growth);
— Inflation – Inflation, consumer prices (annual %);
— School - School enrollment, secondary (% gross).
A measure of corruption is the Corruption Control Index published by the World Bank. The index originally takes values from -2.5 to 2.5, but in the study the index values were scaled to fall between 0 and 5. A value of 2.5 was added to the original values so that no records were lost when logarithmising the index values. Thus, in the study, a corruption index value close to 0 indicates a country completely engulfed in corruption, while countries with an index value close to 5 are almost corruption-free.

4. Results

At the outset of the empirical analysis, the values of the variables were examined using descriptive statistics and Pearson correlations. The empirical values are shown in Table 1 and indicate that the EU countries are significantly differentiated in economic and social terms. In each of the analyzed variables, large differences between the minimum and maximum values can be demonstrated, e.g. the level of inflation ranged from -4.4% to 1058.4%, such a high level of inflation was recorded in Bulgaria in 1996. No statistically significant correlation was shown for the variable economic growth and FDI, which was expected because EU countries that do not face corruption problems, e.g. Sweden, Denmark, Germany, have such a low level of corruption that it shows no correlation. Corruption in these countries has been at a stable low level for decades and does not fluctuate significantly. It can be said that the level of corruption in these countries has stabilised at a natural, unchanging level according to the conditions in the country. The nano-natural level of corruption was indicated by Mungiu-Pippidi(2013), among others.

Table 2 shows the GMM estimation results for the CO2 models. It can be shown that FDI, Consumption and Inflation have a statistically significant positive effect on CO2, so the higher these indicators have values, the more CO2 emissions countries record. The positive impact of corruption on CO2 has also been shown by the Leitão (2021) and Ridzuan et al. (2019). In contrast, Trade and Population contribute to lower CO2 emissions. The models are autoregressive, so it can be indicated that higher levels of CO2 emissions contribute to higher emissions in the future. A reduction in corruption for a significant level of corruption (index level between 0 and 2.5) is associated with an increase in CO2 emissions, while for countries without a significant level of corruption, a reduction in corruption is associated with a reduction in CO2 emissions (see the costs of corruption in Table 5). The logarithmic model does not have an AR condition (2), as the p-value is less than 0.1, so it cannot be inferred from it. It is possible to infer from models with a quadratic function and a linear function, of which the quadratic function has the best Sargan statistic values. The costs of corruption will be calculated on the basis of the CO2 model with a quadratic function of corruption.

Table 3 shows the life expectancy models. Life expectancy is positively affected by population size and the value of previous life expectancy. In contrast, life expectancy is constrained by economic growth, comsumption, inflation. It can be assumed that inference is possible on the basis of all models because the ip-value for AR(2) are above 0.1 or have a value of 0.1, while the Sargan value is the highest for the linear model. It is worth noting that the Sargan values are relatively low. The costs of corruption will be calculated based on a CO2 model with a linear function of corruption. The reduction in corruption in this case supports an increase in life expectancy. The positive impact of corruption on life expectancy has also been shown by the Ahmad et al. (2021).

Table 4 shows the economic growth models. The value of the logarithm of GDP from the initial period is included in the analysis. According to the convergence effect, the value of the parameter for this model should be negative, and this is the case here. Countries with a higher initial level of GDP p.c. have a lower capacity to achieve economic growth than countries with a low level of GDP p.c., which have the potential to grow their economy faster by imitating more developed countries (catch-up effect). Economic growth is negatively affected by FDI and School. The remaining control variables did not have a statistically significant effect on economic growth, but were left in the model because their removal was associated with a very significant deterioration in the fit of the overall model. Inference is possible from all models in Table 4. The model for the logarithmic function of corruption has the largest p-value for the Sargan test and it is on this basis that the costs of corruption will be calculated. The negative impact of corruption on economic growth has also been demonstrated by the Mo (2001), Gründler, Potrafke (2019).

Based on the indicated best functions for CO_2, life expectancy and economic growth models, the value of the cost of corruption was calculated. The results of the calculations are shown in Table 5 and indicate that countries that reduce corruption by 1 unit from level 1 to level 2 will see an increase in CO_2 emissions of 2.4 %, while a reduction in corruption from level 2 to level 3 of the corruption index will be associated with a smaller increase in CO_2 emissions, of exactly 1.2 %. Reducing corruption by 1 unit will be associated with a 0.2% increase in life expectancy, and this increase is the same regardless of the level of corruption: countries reducing corruption from level 1 to 2 will have the same effect as countries reducing corruption from level 3 to 4. In the case of the economic growth model, it can be shown that reducing corruption from level 1 to 2 will be associated with an increase in economic growth of as much as 2.4%, while reducing corruption from level 3 to 4 will only increase economic growth by 0.3%.

The added value of the study is the estimation of models for EU countries and the indication of the cost value, which is important in deciding on the costs and benefits of implementing anti-corruption policies.

5. Conclusion

On the basis of the empirical study carried out, all sub-hypotheses were verified. The first sub-hypothesis indicated a positive relationship between reduced corruption and increased CO_2 emissions, which was confirmed. Richer countries generally have lower levels of corruption and lower levels of CO_2 emissions. In contrast, poorer countries were shown to have higher levels of corruption, lower levels of income and higher levels of CO_2 emissions, which is consistent with studies reported in the literature (Varvarigos, 2023). A non-linear relationship between CO_2 and corruption was shown. Sub-hypothesis two indicated a negative relationship between corruption and life expectancy, which was also positively verified. A linear relationship between corruption and life expectancy was shown: lower levels of corruption increase life expectancy. The third sub-hypothesis indicated a negative relationship between corruption and economic growth, which was also confirmed. A reduction in corruption is associated with an increase in economic growth.

The main hypothesis, which indicated a heterogeneous impact of corruption on ESG measures in EU countries, should be positively verified. This heterogeneity is twofold in this case. Firstly, the impact of corruption on individual ESG measures was shown using different functions, which has consequences for the interpretation of the results. For the CO_2 and growth model, corruption was in the form of a non-linear function, while for the life expectancy models, corruption was included in the model as a linear function. It should also be pointed out that the direction of the relationship between corruption and the selected ESG measures itself is consistent with the results obtained so far in the literature.

Secondly, it can be pointed out that reducing corruption in poorer countries results in higher CO2 emissions which is a negative effect in an ESG context, only after a certain level of freedom from corruption and income can a positive effect of reducing corruption on CO2 be indicated. In contrast, reducing corruption increases life expectancy and economic growth. Thus, the cumulative effects on ESG from reducing corruption are both negative and positive.

In conclusion, it should be pointed out that the impact of corruption on individual ESG measures is heterogeneous. In order to properly assess the impact of an anti-corruption project in a given EU country, the impact of corruption on individual ESG components needs to be considered. When attempts are made to show a correlation between the level of corruption and a synthetic ESG measure for a given country, the result obtained is a priori inaccurate, as corruption affects the ESG components differently: environmental, social responsibility and corporate governance.

The work aimed to assess the impact of corruption on ESG, as indicated above. However, it should be noted that the work is based on a survey using a corruption indicator. Corruption is a difficult phenomenon to measure, and most reliable indicators are created on the basis of surveys. It has been assumed in the literature that it is possible to carry out reliable research using the World Bank's Corruption Control Index. However, due to the very nature of corruption, the results of all surveys, including the survey presented here, should be treated with some caution.

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Note: the results of this study were presented in another form, such as a abstract at a conference Conference of Finance Chairs 2023

Appendix

Table 1.
Descriptive statistics and Pearson correlation for EU countries in 1996-2020

Specification	Mean	Standard deviation	Mini	Max	Pearson correlation
CO2	7.548	3.482	2.927	25.610	0.471***
Life	77.785	3.492	68.777	83.832	0.537***
Growth	2.603	3.850	-14.839	24.370	-0.031
FDI	10.539	36.256	-117.419	449.081	0.039
Trade	116.010	62.526	37.496	388.120	0.129***
Population	0.207	0.831	-4.257	3.931	0.521***
Consumption	1.952	3.778	-29.789	42.720	0.067**
Inflation	4.920	40.755	-4.478	1058.374	-0.115***
School	106.475	16.643	75.123	163.935	0.560***
CC	3.489	0.796	1.850	4.959	1.000

Significance levels for the parameters are given in the table: *** - p <0.01, ** - p <0.05, * - p <0.1.
Source: Own preparation based on World Bank data

Table 2.
CO2 models for EU countries in 1996-2020

Specification	Square function	Logarithmic function	Linear function
CO2emissio(-1)	1.165***	1.165***	1.191***
const	-8.525***	-4.144***	-0.772**
FDI	0.003**	0.003**	0.004***
Trade	-0.006***	-0.006***	-0.007***
Population	-0.639***	-0.630***	-0.595***
Consumption	0.220***	0.218***	0.254***
Inflation	0.115***	0.122***	0.074*
CC	4.264***	-4.359***	-0.235*
CC^2	-0.622***	-	-
lnCC	-	33.400***	-
AR (2) p-value	0.103	0.099	0.123
Test Sargan	0.155	0.152	0.069

Significance levels for the parameters are given in the table: *** - p <0.01, ** - p <0.05, * - p <0.1.
Source: Own preparation based on World Bank data

Table 3.
Life expectancy models for EU countries in 1996-2020

Specification	Square function	Logarithmic function	Linear function
Life(-1)	0.618***	0.619***	0.613***
const	27.778***	29.503***	31.171***
Growth	-0.141***	-0.143***	-0.149***
Population	0.890***	0.904***	0.938***
Consumption	-0.185***	-0.188***	-0.192***
Inflation	-0.141***	-0.138***	-0.151***
CC	1.894***	-1.160*	0.218***
CC^2	-0.230**	-	-
lnCC	-	11.205**	-
AR (2) p-value	0.100	0.099	0.117
Test Sargan	0.045	0.044	0.074

Significance levels for the parameters are given in the table: *** - p <0.01, ** - p <0.05, * - p <0.1.
Source: Own preparation based on World Bank data

Table 4.
Growth models for EU countries in 1996-2020

Specification	Square function	Logarithmic function	Linear function
Growth (-1)	0.290***	0.289***	0.292***
const	7.772*	10.930***	12.850***
LOGGDP	-1.138***	-1.105***	-1.001***
FDI~	-0.010*	-0.011*	-0.007
Trade	0.002	0.002	0.003
Inflation ~	0.025	0.033	0.016
School	-0.012*	-0.011*	-0.011
CC	4.051*	-3.753*	0.129
CC^2	-0.535*	-	-
lnCC	-	31.605*	-
AR (2) p-value	0.719	0.701	0.841
Test Sargan	0.288	0.301	0.211

Significance levels for the parameters are given in the table: *** - p <0.01, ** - p <0.05, * - p <0.1.
Source: Own preparation based on World Bank data

Table 5.
The cost of corruption for EU countries in 1996-2020

Corruption level	CO_2 - f. square	Life - f.linear	Growth -f.logarithmic
2	2.399	0.218	2.447
3	1.156	0.218	1.378
4	-0.086	0.218	0.309
5	-1.330	0.218	-0.759

Significance levels for the parameters are given in the table: *** - p <0.01, ** - p <0.05, * - p <0.1.
Source: Own preparation based on World Bank data

Regression explaining the formation of new companies in 2019

Linear regress	Number of obs=725 F(14, 710)=9.93 Prob>F=0.0000 R-squared=0.2637 Root MSE=.00226					
y	Coef.	Robust std. err.	t	P>t	95% conf. interval	
c35						
2	−.0008048	.0003243	−2.48	0.013	−.0014415	−.0001681
3	−.000472	.0003824	−1.23	0.218	−.0012228	.0002788
c81						
2	−.0007444	.0003635	−2.05	0.041	−.0014581	−.0000307
3	−.0011447	.0004325	−2.65	0.008	−.0019938	−.0002955
c84						
2	.0003851	.0003973	0.97	0.333	−.0003948	.0011651
3	.0012682	.0004567	2.78	0.006	.0003715	.0021649
c87						
2	−.0003348	.0003585	−0.93	0.351	−.0010388	.0003691
3	−.0009033	.0004128	−2.19	0.029	−.0017136	−.0000929
lgu_type						
2	−.0005796	.0003245	−1.79	0.074	−.0012167	.0000574
3	−.0006173	.0002879	−2.14	0.032	−.0011826	−.000052
4	.0000924	.0004652	0.20	0.843	−.000821	.0010058
tot_rev_pc	1.02e-06	2.07e-07	4.94	0.000	6.17e-07	1.43e-06
new_coop2018	.0002941	.0001849	1.59	0.112	−.0000688	.0006571
pop_post_prod2018	−.0001209	.0000185	−6.55	0.000	−.0001572	−.0000847
_cons	.011713	.0010018	11.69	0.000	.0097461	.0136798

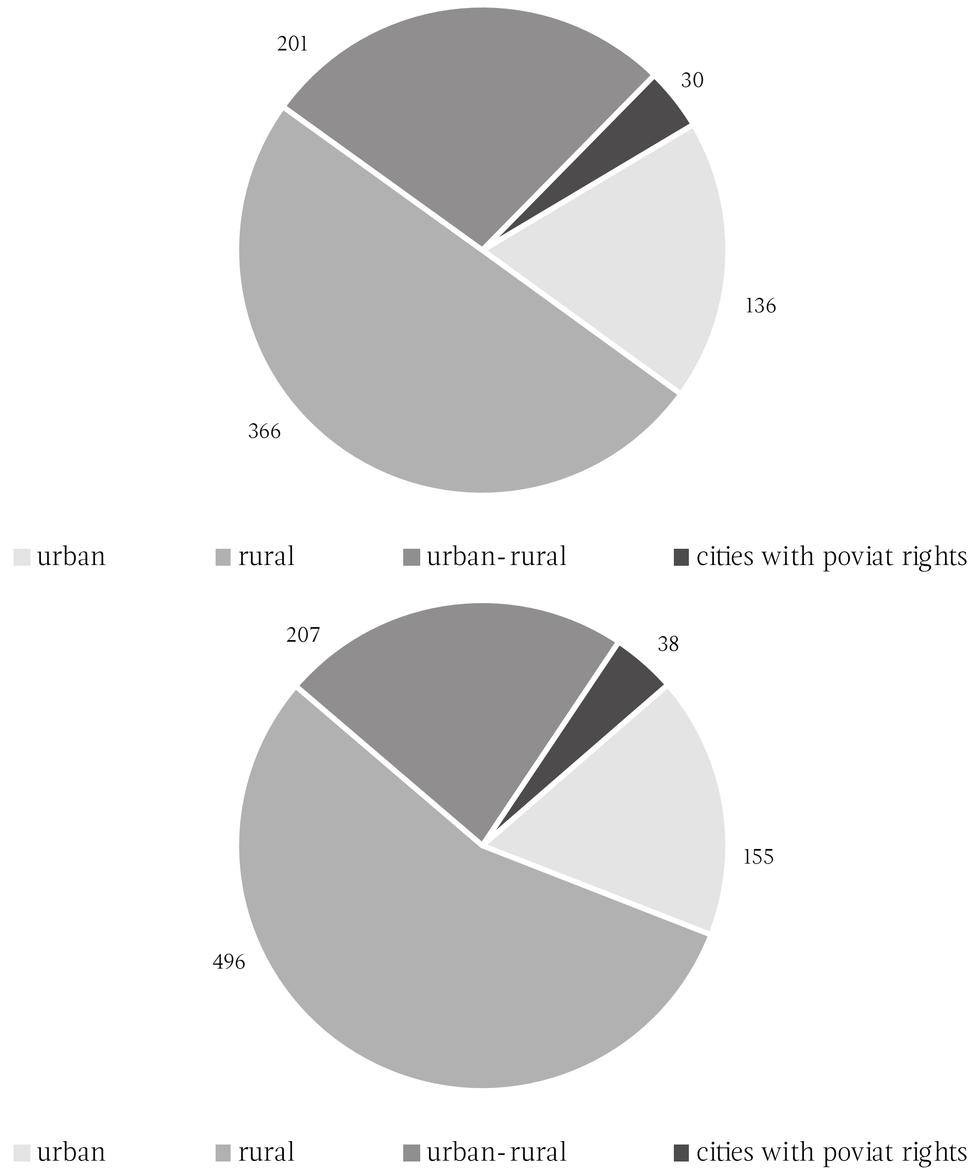
Notes:

1 — reference, positive answer in the survey; 2 — negative answer in the survey; 3 — don't know answer in the survey.

lgu_type: 1 — reference, municipal commune; 2 — rural commune; 3 — urban-rural commune; 4 — city with poviat rights.

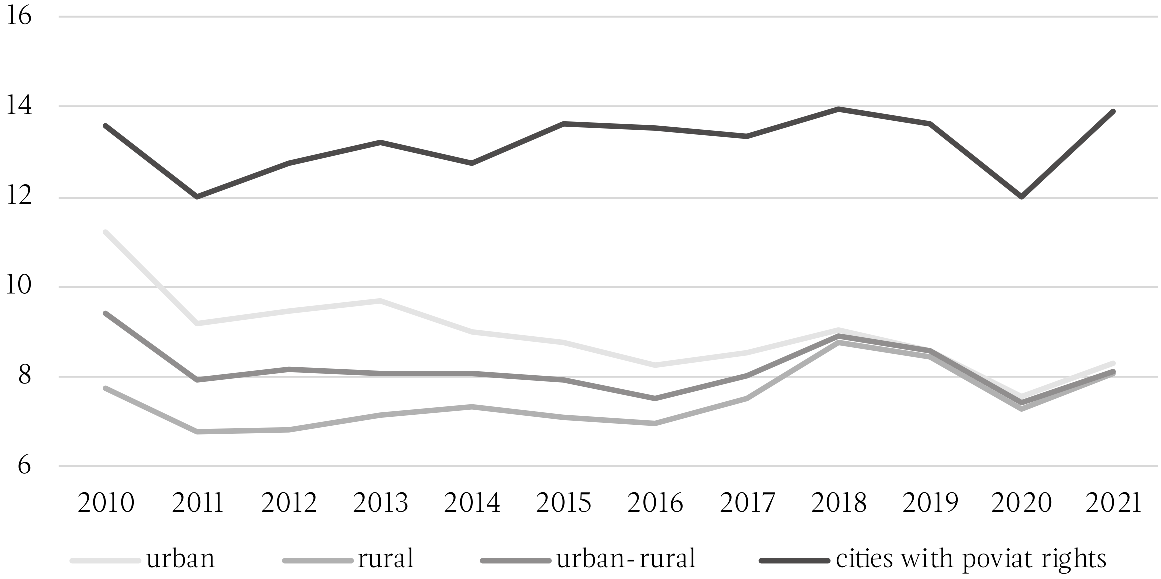
Source: Own preparation.

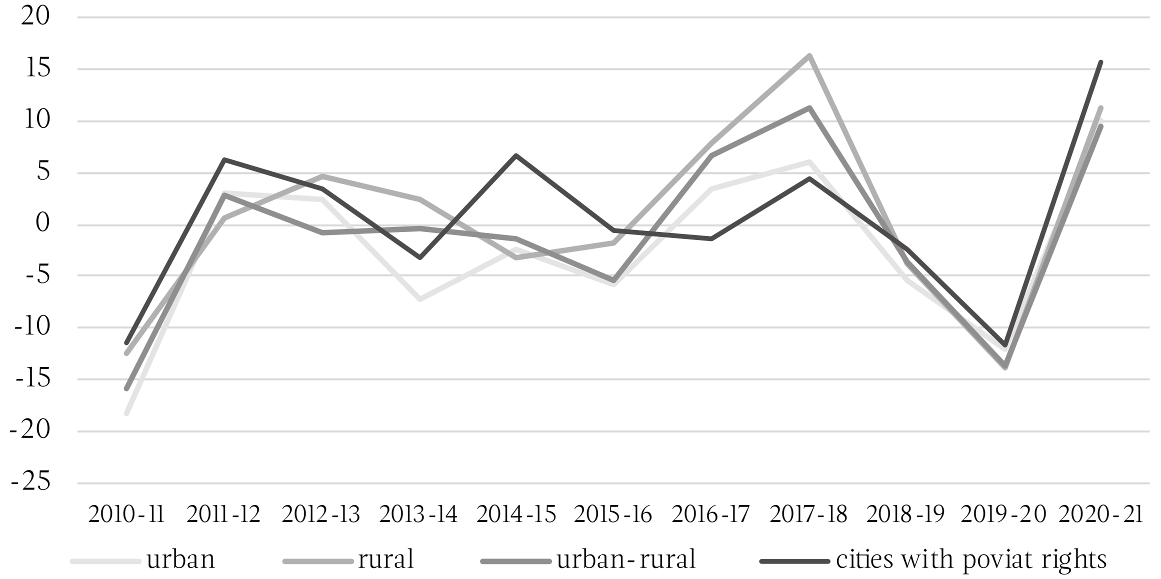
Chart 1.
Research sample in 2015 (top) and 2019 (down) (%)



Source: Own preparation.

Chart 2.
New firms registered per 1000 inhabitants (top) and dynamics of new firms registered per 1000 inhabitants (down) between 2010 and 2021 (inclusive) by communes categories





Source: Own preparation based on Local Data Bank.