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Paulina Bąk

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Paulina Bąk

Faculty of Economic Sciences, University of Warsaw, Warsaw, Poland,
corresponding author: paulinabbak@gmail.com

Economic analysis of corruption at the company level

Abstract

Corruption is a factor that affects a company severely either directly or indirectly. It may have a positive or negative impact on the economic situation of the company. This article verifies the hypothesis about the corporate perception of corruption as an obstacle to business performance. It also identifies which factors do have a substantial effect on the perception of corruption by companies. The study was carried out using the logit model. The data used were obtained from the Business Environment and Enterprise Performance Survey (BEEPS) database for 2016.

Keywords

corruption | companies | extortion

JEL Codes

G34, G38

1 Introduction

Corruption is a factor that affects a company severely either directly or indirectly. It may be a positive or negative impact on the economic situation of the company. According to the 2018 Global Economic Crime and Fraud Survey, 49% of respondents admit that their company has been the victim of bribery and this percentage was 36% in 2016. According to Didier Lavion, the problem is not the emergence of corruption, but the employees' answer to the question whether they fear that corruption may be affecting their organisation. The largest percentage of companies facing corruption risks happens in Africa, where as many as 62% of respondents answered yes to the question whether their organisation has a bribery problem. This percentage is 47% for Eastern Europe, for Western Europe – 45% and 46% for Asia. Additionally, 52% of respondents indicate 'internal actors' as the main perpetrators of corruption and this figure is 40% for 'external actors'.

Incidences of corruption are also recorded in Poland. As many as 200 investigations were conducted according to a report by the Central Anticorruption Bureau (CBA) in 2016. When compared, there were 225 investigations in 2015 and 181 in 2014. In 2016, 281 trial preparations were initiated. One example of

such a trial is the incident of a private medical company from Silesia, which tried to obtain a private, beneficial contract from the National Health Fund. To clinch the deal, the amount of PLN 515,000 as bribery was to be handed to a member of the Council of the National Health Fund. Finally, the CBA (Centralne Biuro Antykorupcyjne) detained four people involved in the bribery in this case.

Later in the investigation, it was additionally found that the company's representatives, in exchange for winning the tender, offered financial benefits to the director of the Independent Public Clinical Hospital No. 5 of the Medical University of Silesia in Katowice (CBA, 2016).

Corruption is an important problem in the field of economic science that requires careful analysis. First, I will explore how corruption has changed between 2012 and 2016. Additionally, the chart of the CPI index, i.e. the Corruption Perception Index, will be presented. It is a global index of the perceived levels of public sector corruption, which uses a scale from 0 (highly corrupt) to 100 (not corrupt). The index is prepared by Transparency International (Figure 1).

The above maps show how the CPI index changed between 2013 and 2016. Red represents the highest levels of corruption in the country, while yellow – the lowest

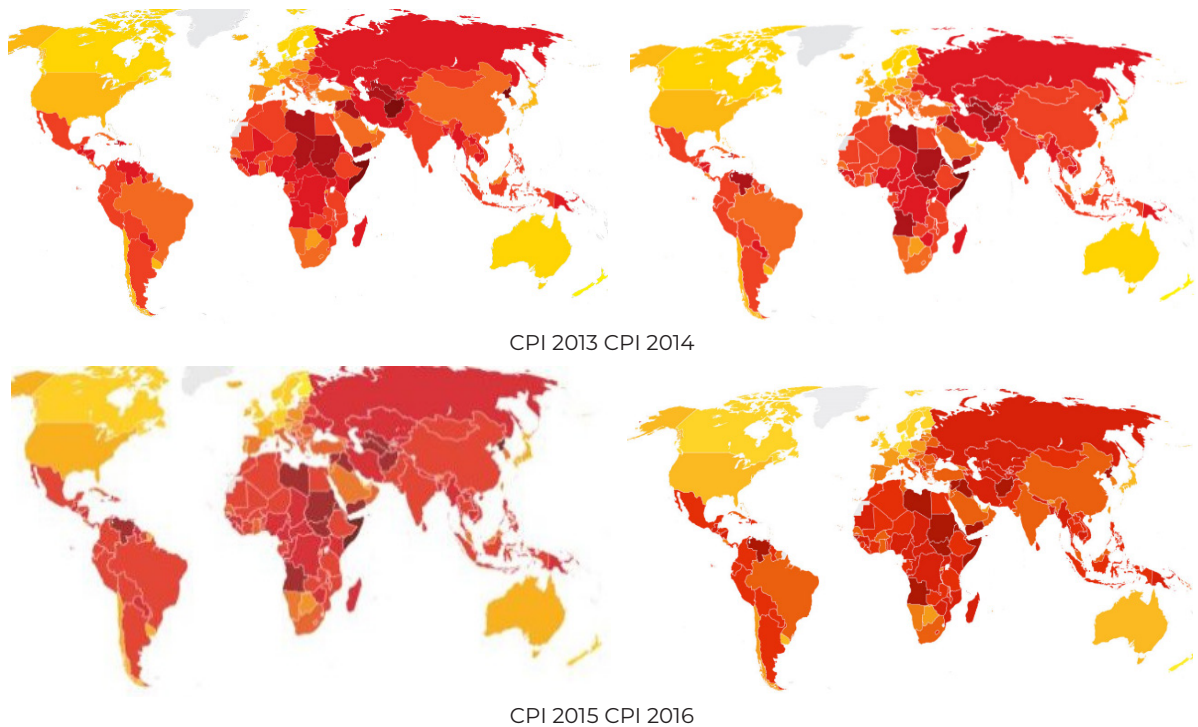


Fig. 1. CPI index between 2013 and 2016. *Source:* Transparency International.¹

levels. When analysing the maps, it is observed that the red colour definitely dominates. The most corrupt regions are Africa, South America and Asia. Slight changes are observed in the fight against corruption in China and India. In these two countries, the level of the CPI index had been rising but fell considerably in 2016. Despite this drop, China still occupies a high place in global corruption rankings. Additionally, China openly admits to the problem of corruption within its borders and implements anti-corruption programs to help mitigate the risk of bribery. Despite such severe corruption issues, China is still attractive to entrepreneurs, and the Chinese trade market is one of the most dynamically growing markets globally. Russia is another important leader of corruption rankings. According to the Russian INDEM report, the inhabitants of Russia spend almost USD 12 billion annually on bribes, while companies pay USD 33 billion in kickbacks every year. According to expert analysis, corruption should be lower in regions where the inhabitants are richer and where government officials earn more. But, this theory does not hold true for Russia. The lowest level of corruption is noted in the north-western area, which cannot be classified as wealthy; on the contrary, it is associated with towns without prospects. The most corrupt areas are the Caucasus and rich Siberia, which are territories with

the main deposits of oil, gas and other raw materials and the extraction is extremely profitable. Worldwide, government leaders are aware of the presence of corruption risk and declare that they will take suitable action to address it. Unfortunately, these are empty promises and such declarations are made to meet the needs of the public and the banks.

Figure 2 shows the relationship between corruption and economic growth. The CPI index (horizontal axis) was used for the analysis, where 1 is indicative of high corruption, and 10 – low corruption. The vertical axis shows the indicator of social welfare, where the lowest values mean the least developed economy, and the higher values – a developed country. A positive correlation can be observed between the two indicators. Higher economic growth translates into a higher CPI, i.e. a lower level of corruption in the country. The figure reveals that Africa, which is the least developed, remains the world's most corrupt region. A similar situation is observed in Asia, but slightly better. Among the countries without a corruption problem are Germany, Japan, Singapore, Norway, i.e. the top-ranking countries in the category of highly developed countries in the world.

Based up the literature, we can say that the corruption has a negative impact on the effectiveness of the economic system and social welfare. The corruption tax differs from other taxes paid to the

¹ www.transparency.org (access 04/05/2019).

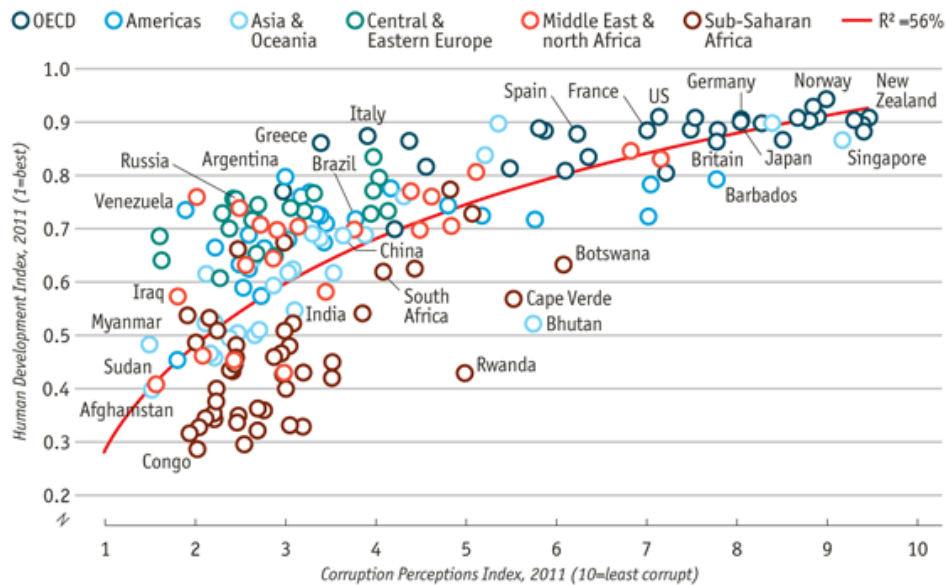


Fig. 2. Correlation between corruption and economic growth. *Source: The Economist* based on Transparency International, UN.²

state. In the event of bribery, the payer cannot be sure that the service they pay for will be delivered. The corruption contract is oral; therefore the person accepting the payment may refuse to perform the service after taking the money. It may also happen that the performance of the service will not be within their capabilities resulting in inferior services. Moreover, in the worst-case scenario, the contractor may demand further payments for the service not yet performed, claiming that they are necessary to complete the job (The Economics 2011)

Officials may differentiate the amount of corporate corruption tax. One of the methods used is to divide companies into the categories namely that are more inclined to pay bribes and that less inclined to do so. The willingness and ability to pay the tax depends on the cash resources at the disposal of companies. Some of them do not face barriers in paying the required amount, while others may not be in such a good financial position. Another method is the division of the industries based on their operations and their effectiveness. Therefore, businesses may view corruption as an obstacle to doing business in varying degrees.

The objective of this article is to investigate whether companies perceive corruption as an obstacle to business. I will attempt to analyse what factors have a significant impact on the negative perception of

corruption by companies. The study was carried out using the logit model. The data were obtained from the Business Environment and Enterprise Performance Survey (BEEPS) database for 2016.

The structure of the article has been constructed to meet the purpose of this study. The article consists of three sections. The first section presents the definition of the term 'corruption' and a statistical analysis of the problem along with examples of bribery cases around the world. The second section offers a review of the literature devoted to research on corruption at the microeconomic and macroeconomic scales. The third section describes the empirical study and its results, as well as the conclusions.

2 The definition of corruption

The Dictionary of the Polish Language provides one of the simplest definitions of corruption, which states that it is 'accepting bribes by government officials or officers' (Akademia Języka Polskiego, 2007). A slightly broader description can be found in the Encyclopaedia, which defines that 'corruption is bribery, accepting or demanding a financial or personal gain by a person who performs a public function in exchange for fulfilling a duty or violating the law' (Bieńko, 2007).

A similar view is expressed by the Italian journalist Carlo Alberto Brioschi, who believes that corruption is the behaviour of a person who holds

² <https://www.economist.com/graphic-detail/2011/12/02/corrosive-corruption> (accessed 07/16/2020).

a public office, consisting in accepting money, gifts and other tangible and intangible benefits in return for rendering a favour or making a decision in favour of the beneficiary (Brioschi, 2017). The definition is given in the journalist's book in which he outlines the history of corruption and concludes that the problem of bribery has existed since the existence of public offices. Therefore, the question arises whether state institutions should be liquidated or their influence on the activities of companies should be strongly limited.

The word corruption has a broad sense that is not just related to bribery. The author of the book *Prawne kryminologiczne i kryminalistyczne aspekty łapówkarstwa* [Legal criminological and forensic aspects of bribery], Tadeusz Chrustkowski, argues for a broad definition of corruption including, e.g. nepotism and blackmail (Chrustowski, 1985).

The corruption problem is not a new phenomenon and has existed for thousands of years. Analysing the etymology of the word 'corruption', it is learnt that it comes from the Latin term *corruptio* which means corruption, bribery. Certain corruption crimes have always plagued societies, such as bribery in customs offices during the ancient Roman era. Nowadays, there are many other manifestations and forms of corruption.

The definition of corruption differs across the disciplines of economics and psychology. According to Andvig, corruption is a violation of the principle of fair play in the society in order to achieve a personal gain (Andvig, 2006). The concept defined in this way is most often used in psychological or social sciences. In the field of economics, the most frequently used definition of the World Bank is that it is an abuse of public office to pursue private needs. Additionally, the World Bank has complemented the definition by a special division of corruption into administrative and political fraud (Pradhan 2000)

Political corruption happens at the stage of drafting new laws itself. Government officials, as well as those in power, who have been authorised to work on new laws, engage in this practice to meet their own needs or the needs of businesses in return for bribes. Unlike political corruption, administrative corruption occurs when legal regulations already exist and must be violated to achieve one's goals. In this case, companies are willing to pay the corruption tax to increase their prosperity, but, this is a waste at the level of society.

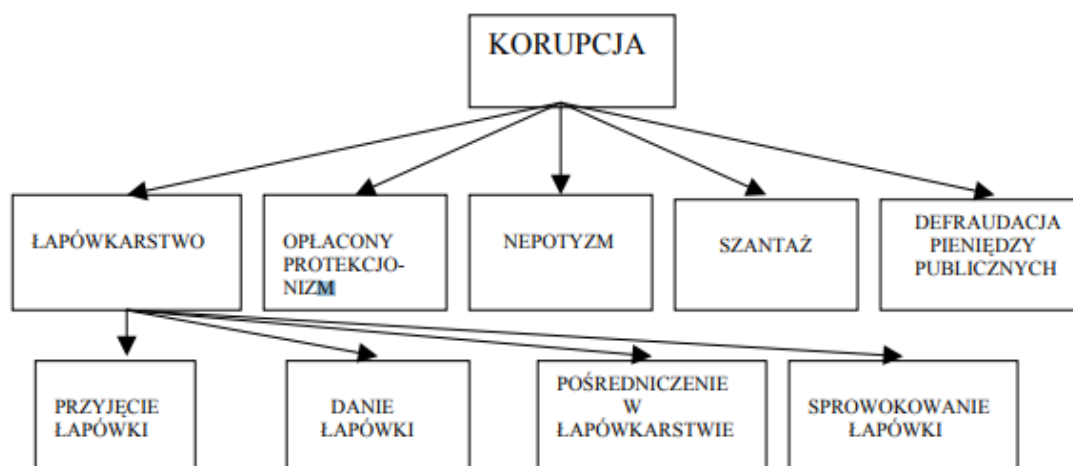
3 A review of the literature on corruption research

3.1 Microeconomic research on corruption

Numerous studies on corruption can be found in the literature. But, in most cases, the analysis focuses on the effects of corruption rather than the factors that significantly influence the emergence of the problem. Understanding the mechanism of corruption, as well as the circumstances in which such offences are committed, can help in establishing an effective anti-corruption and state development policy.

The first paper to investigate the determinism of corruption at the company level was the Hellman and Schankerman study in the year 2000. Here, empirical data were obtained from the BEEPS database and then estimated using an econometric model. The authors conclude that in order for the market reform to be successful, state capture must be limited (Hellman et al., 2000). Another study by Hellman and Kaufman from 2004 shows that there is an inverse relationship between trust in the state and the level of corruption. Company directors are more likely to resort to paying bribes when they have less faith in the national government's decisions. Such firms avoid the courts and pay no taxes, except for the corruption tax (Hellman and Kaufmann, 2004).

It can be definitively concluded that corruption is treated as a tax by the eyes of companies. Such a financial claim is associated with the need for secrecy as well as with uncertainty as to whether one of the parties is going to fulfil the terms of the contract. A study by Shleifer and Vishny from 1993 identified a new type of corruption, namely corruption coupled with theft. Their article discusses a study on the assessment of incidences of corruption determined by contractual compliance. The first correlation that they investigate is the mutual fulfilment of the agreement, i.e. when one party pays the bribe and the other party meets the stipulated requirements. The second correlation is the failure of bribe acceptor to implement the contract terms. Moreover, they may demand further payments for the rendered services in this situation. For discussions and analyses, two groups of countries, the West and the former USSR, were juxtaposed. In Western countries, both sides of the corruption show benefit at the price of social welfare. In the states of the former USSR, only the



CORRUPTION, BRIBERY, PAID PROTECTIONISM, NEPOTISM, BLACKMAIL, MISAPPROPRIATION OF PUBLIC FUNDS, ACCEPTING A BRIBE, OFFERING A BRIBE, PARTICIPATION IN BRIBERY, INCITEMENT OF A BRIBE

Fig. 3. Classification of types of corruption. Source: Chrustowski T, *Prawne, kryminologiczne i kryminalistyczne aspekty łapówkarstwa* [Legal, criminological and forensic aspects of bribery], Legal Publishing House, Warsaw 1985.

government official gains profit from the contract at the expense of the prosperity of society and the company (Shleifer and Vishny, 1993).

Corruption has negative effects on business investment. A 2007 study by Fisman and Svensson proved that an increase in the corruption tax translates into a reduction of firm growth. Surprisingly, the tax increase results in a lesser slowdown of development (difference of three percentage points). Additionally, they observed that the role of corruption along with a decrease in the importance of taxes when new control variables were taken into account (Fisman and Svensson, 2007).

Hellman and Johnson show the relationship between secure property rights and the level of investment. More secure laws result in a higher level of investment, which means less corruption in corporate policy. Furthermore, the authors demonstrated that corruption negatively affects secure relations between states and businesses. The bribery problem causes a stream of monetary extortion and is marked by high uncertainty (Hellman, 2003).

Research done by Braguinsky and Mityakov showed the importance of foreign capital share for a firm's levels of transparency. They describe this issue with the example of the revenues and market value of company vehicles in a Russian company with foreign capital. According to their findings, foreign-capital companies are more transparent than companies with only domestic capital (Braguinsky and Mityakov, 2015).

A significant factor contributing to the emergence of corruption is also poor education and high inequality in the country. This was proved by the research conducted among the population by Hunt and Laszlo in 2012 (Hunt, 2012). Further, another study by Hunt from 2007 supplemented these results with other determinants such as misfortune in life, loneliness and poor health. Individuals with these characteristics are more prone to bribery. Research shows that officials may differentiate corruption tax prices depending on the taxpayer's qualities (Hunt, 2007). On the company level, they are also diversified allowing bribe-acceptors to differentiate prices. This is corroborated by Svensson's research in 1999, who concludes that civil servants act as monopolistic price discriminators based on quantitative research (Svensson, 1999).

However, not all economists do consider that corruption is harmful for prosperity and productivity. On the contrary, it may turn out to have a positive impact on economic growth. For example, bribery may offer the possibility to bypass the hurdles of pointless regulations. According to these economists, in a situation where policies are inadequate, offences such as bribery can be beneficial and contribute to economic development. Corruption helps economic actors to deal with incompetent governments that do not care for the welfare of companies and consumers.

The analysis carried out by Andrzej Cieřlik and Łukasz Goczek focussed on perceived corruption in

companies based in post-communist countries. The authors showed that corruption is more pronounced in companies with domestic capital and those producing for the domestic market. Another facilitating factor is the time spent privately with government officials, as well as the number of state audits in the firm. The analysis covered the period from 1999 to 2010 (Cieślak and Goczek, 2015).

The above-mentioned studies employed econometric models for the analysis of survey data. Some researchers choose the zero-one variable as the dependent variable, which is the answer to the question whether the respondent has encountered bribery. The selected econometric models are either logit or probit. The next step is to analyse the financial data using the least squares method (LSM).

3.2 Macroeconomic research on corruption

Corruption has negative consequences for the economic development of a country. This hypothesis was supported by Łukasz Goczek and Andrzej Cieślak, who analysed the relationship between corruption and economic growth in transition countries.

They used Mauro's theoretical model of economic growth and the econometric model. Additionally, panel data from 29 countries in 1993–2013 were used. As a result of the analysis, the authors concluded that there is a relationship between corruption and economic growth. The increase in bribery results in the inhibition of economic development (Cieślak and Goczek, 2016).

On a macroeconomic scale, corruption also affects the level of investment in a country. A decline in investment leads to a lower level of GDP per capita, which means that the economy starts to grow more slowly or, in the worst case, stops growing. According to Te Velde, in more corrupt countries, investors refuse to enter the market. If we treat bribes as another tax, entrepreneurs do not want to pay additional fees as their goal is to maximise profit. Moreover, the important fact is that the corruption contract is extremely uncertain. Companies may pay bribes but may receive nothing in return. This is a risk that investors would prefer to minimise (Te Velde and Morrissey, 2001). Eric Ambukita conducted an analysis of the impact of corruption on the investments in a country. He concluded that higher levels of corruption discourage foreign investors. The study is related

to African countries, which are the most corrupt countries in the world (Ambukita 2012).

In a 1997 Tanzi and Davoodi came to different conclusions. The economists observed that corruption causes lower economic growth but contributes to higher public investment. This could also be due to slower economic growth, which also has an impact on public investment. Least squares estimation with the use of an econometric model was used for that analysis (Tanzi and Davoodi, 1998).

4 Research methods

The logit model has been used in this study. The explained binary variable identifies companies based on the answer to the question of whether corruption is an obstacle to doing business. The probability that a bribery problem will arise in a company is represented by one of two values:

0 – it is not an obstacle

1 – it is an obstacle

The probability depends on many company-specific characteristics and other explanatory variables.

In the following analysis, the explained variable takes one of the two values 0 or 1, i.e. it is not measured continuously. Further, the use of simple regression would be incorrect in this case. Because of this reason, we decided to use regression for the binary dependent variable, the logit model.

The dependent variable is discrete and takes only two values. Moreover, the variable takes only the value 0 or 1 in our study to indicate the absence or presence of obstacles. Thus, the model can be expressed as the following formula:

$$\Pr(y_i = 1) = F(\theta, X_i) \quad (1)$$

In other words, the probability of choosing a specific alternative is a function of the observed characteristics of X_i and the set of q parameters. In the beginning, it was assumed that Function 1 is linear, which produced a linear probability model with the following properties:

$$\begin{aligned} \Pr(y_i = 1) &= X_i \beta \\ \Pr(y_i = 0) &= 1 - X_i \beta \end{aligned} \quad (2)$$

The vector of β parameters reflects the influence of each variable on the likelihood of one of the two possible situations. The advantage is that it can be estimated using the LSM method.

$$y_i = X_i \beta + \varepsilon \quad (3)$$

Unfortunately, it also has some drawbacks. As equation (3) does not guarantee that the fitted value of the $X_i \beta$ model, it is interpreted as the probability of the occurrence of the situation taking the value of 1, lies between zero and one. Second, because the response variable takes only two values 0 and 1, the random term has a binomial distribution and is equal to $\varepsilon = -X_i \beta$ or $\varepsilon = 1 - X_i \beta$. Therefore, it can be shown that the conditional variance is: $\text{var}(\varepsilon|X) = X_i \beta (1 - X_i \beta)$. Since $X_i \beta$ may have different values, it cannot be sure that the variance in the linear probability model will be non-negative. Moreover, the random term is heteroscedastic. Considering these undesirable features of the linear model, two other probability functions are used in econometric practice. The adoption of the normal distribution leads us to the probit model:

$$\Pr(y_i = 1) = \int_{-\infty}^{X_i \beta} \phi(t) dt = \Phi(X_i \beta) \quad (4)$$

When expressed as the logistic distribution with the logit model:

$$\Pr(y_i = 1) = \frac{e^{X_i \beta}}{1 + e^{X_i \beta}} = \Lambda(X_i \beta) \quad (5)$$

Since both functions are probability functions, their values are limited by 0 and 1. Both distributions are symmetrical about zero. What makes them different is the variance. For the normal distribution, it is 1, for logistic - $\pi^2/3$. Both distributions are very similar to each other, the difference being that the logistic distribution has thicker tails. The probability function for a single observation is described by the equation:

$$\Pr(y_i | x_i) = \begin{cases} \Lambda(x_i \beta) & \text{dla } y_i = 1 \\ 1 - \Lambda(x_i \beta) & \text{dla } y_i = 0 \end{cases}$$

where:

$$\Lambda(x_i \beta) = \frac{e^{x_i \beta}}{1 + e^{x_i \beta}}$$

and the expected value is:

$$E(y_i | x_i) = 1 \cdot \Lambda(x_i \beta) + 0 \cdot (1 - \Lambda(x_i \beta)) = \Lambda(x_i \beta)$$

(Mycielski 2010)

5 Statistical data

The study used data on how companies perceive corruption. The source of information is the questionnaire *Business Environment and Enterprise Performance Survey* (BEEPS). The survey was done in 2016 and covered 16,566 companies from 32 countries. The data provides information on whether corruption is an obstacle in running a business and knowledge about the characteristics of the firm. The authenticity of the collected data is high as the data collection has been authorised and approved among others by the World Bank. However, it should be taken into account that when answering the question of whether corruption is an obstacle, the respondents may use understatement when they have any fears or concerns.

Figure 4 shows the percentage of companies' perception of corruption in the context of doing business. It can be observed that the vast majority of respondents take the position that the problem of bribery is an obstacle in and for a business. Furthermore, the answers were grouped into two categories, i.e. not an obstacle and an obstacle. The list of variables (explained and explanatory) with a description is shown in Table 1.

Further, zero-one variables were also used in the model. The first group is related to the sector in which the company operates. The sectors are as follows: Food products, Textiles, Clothing, Chemicals, Plastics and rubber, Mineral products, Metals and raw materials, Metal products, Machines and devices, Electronics, Construction, Wholesale, Retail, Hotels and Restaurants, Transport, IT and other services.

The next group is related to the country where the company is based. The list of the countries comprises Bulgaria, Albania, Croatia, Belarus, Georgia, Tajikistan, Turkey, Ukraine, Uzbekistan, Russia, Romania, Kazakhstan, Bosnia and Herzegovina, Azerbaijan, Macedonia, Armenia, Kyrgyzstan, Estonia, Czech Republic, Italy, Latvia, Lithuania, Slovakia, Slovenia, Serbia, Cyprus, Greece, Moldova, Mongolia, Montenegro, Poland and Kosovo.

The next group describes the size of the town where the company is located: small location (town

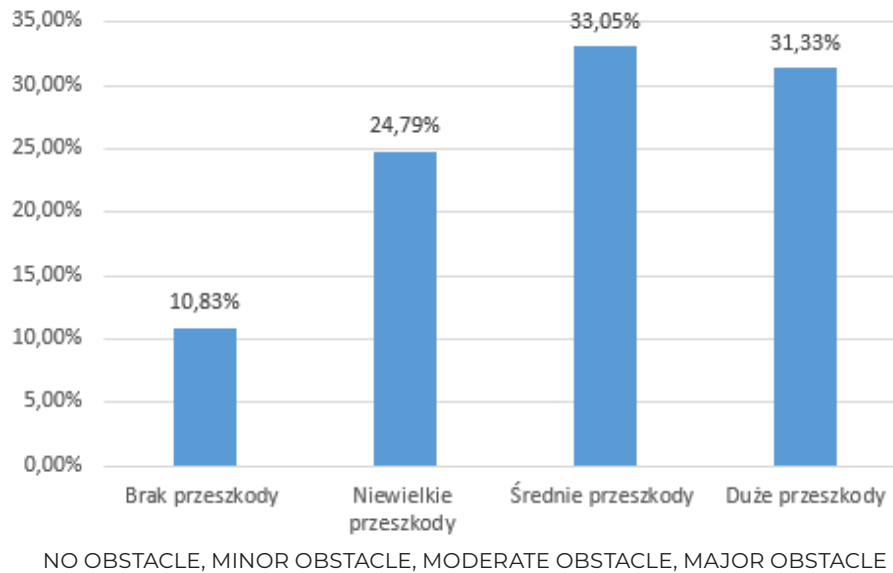


Fig. 4. Perception of corruption by companies. *Source:* BEEPS database.

Tab. 1. Explanatory and explained continuous variables

Name	Variable
Corruption	Corresponds to the percentage of the answer to the question 'Is corruption an obstacle to business?'
Years on the market	The company's existence on the market in years
Employment	number of employees
Sta_capital	State ownership in capital (%)
For_capital	Foreign ownership in capital (%)
state production	Percentage of production sold domestically
Time_officials	Time spent on contacting government officials (% of work time)
Audits	Number of state audits
Efficiency	The ratio of sales to employees
Thefts	Losses caused by theft (% of revenues)
Investments	The level of investments in the country as% of GDP
GDP per capita	GDP per capita calculated in %

Source: Bąk 2020.

inhabited by less than 50,000 people), medium (town with a population of 50,000 to 1 million people), and large (town with over 1 million people). The last group of zero-one variables relates to the size of the company: small (the number of people employed in the company is less than 20), medium (the number of employees ranges from 20 to 99) and large (the company employs over 100 people).

The CPI index, i.e. the Corruption Perceptions Index published by Transparency International, was

used for the zero-one macroeconomic variables. The scale ranges from 0 (very high corruption) to 100 (no corruption). The other variable is the OECD, which takes value 0 if the country does not belong to the organisation and 1 if it does.

Tables 2 and 3 show the statistics of the explained and explanatory variable used in the study. Descriptions of zero-one statistics for countries and industry sectors are provided in the appendices.

Tab. 2. Statistics of microeconomic variables

Variable	Number of observations	SD	Min.	Max.
Corruption	15.904	0.4832	0	1
Years on the market	16.566	12.0624	0	178
Employment	15.039	1.3708	0	9.21034
Sta_capital	16.566	0.0751	0	0.99
For_capital	16.566	0.1959	0	1
State_prod	16.566	0.2607	0	1
Time_officials	16.566	0.2016	0	1
Audits	8.496	5.3148	1	150
Efficiency	15.039	3.5798	0	8.269244
Thefts	16.566	0.0253	0	1
small_loc	16.566	0.4401	0	1
medium_loc	16.566	0.4942	0	1
large_loc	16.566	0.3153	0	1
small_company	16.566	0.4990	0	1
medium_company	16.566	0.4772	0	1
large_company	16.566	0.3213	0	1

Source: BEEPS database.

Tab. 3. Statistics of macroeconomic variables

Variable	Number of observations	SD	Min.	Max.
CPI	16.566	11.6013	21	70
Investments	15.457	4.7292	4.2	31.1
GDP per capita	16.566	3174.36	796	30829.5
OECD	16.566	0.500	0	1

Source: Niziołek, Boczkowska 2020.

6 Results

This section presents the results of the model estimation. The individual estimated factors were analysed and interpreted.

Table 4 demonstrates the total estimation of the parameters of the explanatory variables. According to the logit model, the interpretation of the coefficients consists only in looking at the sign and drawing conclusions about the positive or negative impact of the variable on the probability of occurrence of obstacles caused by corruption in the company. Further, the area under the R curve signals that the model has some ability to discriminate between success (corruption as an obstacle) and failure (no obstacles caused by corruption) for this regression. Moreover, the test of the correctness of the functional form requires that the null hypothesis about the correctness of the functional form of the model be rejected. According to the F-statistic, all variables combined are significant. For binary dependent variable models, we can define the pseudo R^2 . It is a measure of the contribution of the variance of the fitted values to the total variance of the latent variable. Formulated by McKelvey and Zavoina, the pseudo R^2 describes the percentage of explanation that we would obtain in the model for the hidden variable if it were directly observable. Unfortunately, a strict and intuitive interpretation of the above pseudo R^2 is impossible.

After estimating only the variables, which turned out to be significant, the test for the correctness of the functional form does not lead to a rejection of the null hypothesis. Based on the R curve, it can be concluded that the model moderately discriminates between success and failure. After estimating only the significant variables, it is found out that the variable for years on the market turned out to be less significant (significance level 0.05), but it is still significant for the study.

In the table 6, it is found that all variables are significant based on the t -statistic at the significance threshold of 0.01. After calculating the p -value of the F -statistic, we can reject the hypothesis that the variables are jointly irrelevant (significance level 0.01). The area under the ROC curve for the estimation is around 0.6, i.e. the model moderately discriminates between success and failure.

By interpreting the estimated coefficients, it can be concluded that corruption is an obstacle in companies that spend more time on private contact with government officials. State audits are also an important element, being one of the causes of the damage caused by corruption. Based on these observations, it can be inferred that companies located in countries with extensive bureaucracy complain about the difficulties caused by corruption. Firms with

Tab. 4. Regression outcomes for microeconomic variables

Corruption	Coeff.	Z	P> z
	(Std. Err.)		
Years on the market	0.0089*** (0.0027)	3.29	0.001
Employment	-0.0268 (0.0219)	-1.23	0.22
Sta_capital	-1.1087** (0.4776)	-2.32	0.02
For_capital	-0.1921 (0.1430)	-1.34	0.179
State_prod	0.0211 (0.1075)	0.2	0.845
Time_officials	0.3673*** (0.1249)	2.94	0.003
Audits	0.0089 (0.0047)	1.88	0.06
Efficiency	0.0216*** (0.0075)	2.86	0.004
Thefts	3.4493*** (1.1172)	3.09	0.002
small_loc	-0.1215 (0.0819)	-1.48	0.138
medium_loc	-0.3331*** (0.0848)	-3.93	0
large_loc	-0.3411*** (0.1159)	-2.94	0.003
small_company	-0.0388 (0.0968)	-0.4	0.689
medium_company	-0.0402 (0.0920)	-0.44	0.662
_cons	0.6286** (0.2513)	2.5	0.012
Country Effect	TAK		
Industry effect	TAK		
Number of observations	7486		
F-Statistic	948.15		
Pseudo R ²	0.0940		
p-value	0.0000		

The symbol * means the significance of the variable at the level of 0.1, ** significance of the variable at the level of 0.05 and *** significance of the variable at the level of 0.01. Source: based on BEEPS data.

Tab. 5. Regression outcomes only for significant variables

Corruption	Coeff.	z	P> z
	(Std. Err.)		
Years on the market	0.0062*** (0.0019)	3.33	0.001
Sta_capital	-1.2882*** (0.3850)	-3.35	0.001
Time_officials	0.5488*** (0.0914)	6.01	0.000
Efficiency	0.0232*** (0.0053)	4.35	0.000
Thefts	2.8411*** (0.7840)	3.36	0.000
medium_loc	-0.1124** (0.0522)	-2.15	0.031
large_loc	0.5336 (0.0767)	0.70	0.487
_cons	0.5986*** (0.1652)	3.62	0.000
Country effect	TAK		
Industry effect	TAK		
Number of observations	14470		
F-Statistic	1831.32		
p-value	0.0000		
pseudo R ²	0.0954		

The symbol ** means the significance of the variable at the 0.05 level and *** the significance of the variable at the 0.01 level.

Source: based on BEEPS data.

more state capital deal with fewer corruption issues. Like in Goczek's study, it can be seen that state-owned companies are less exposed to the unfavourable effects of corruption.

Referring to the research by Braguinsky and Mityakov on the share of foreign capital in the company, it can be observed that it is not a significant variable in the above model. Although it is not significant, it has a positive effect on eliminating corruption in a company.

The 'years on the market' variable turned out to be significant in this study. The longer a company exists and operates on the market, the greater difficulties caused by corruption in the management of the company employees experience. Perhaps it is related

Tab. 6. Estimation outcomes for macroeconomic variables

Corruption	Coeff.	z	P> z
	(Std. Err.)		
CPI	-0.6106*** (0.0760)	-8.03	0.000
Investments	1.0797*** (0.1118)	9.66	0.000
GDP per capita	0.0023*** (0.0003)	7.75	0.000
OECD	-8.3657*** (1.1951)	-7.00	0.000
_cons	13.6031*** (1.7468)	7.79	0.000
Country effect	TAK		
Industry effect	TAK		
Number of observations	14.830		
F-Statistic	1664.09		
Pseudo R ²	0.0843		
p-value	0.0000		

The *** symbol means the significance of the variable at the 0.01 level.

Source: based on BEEPS data.

to greater awareness of employees and the growing risk of bribery.

The study considered the effect of the country, which showed little variation in corporate perceptions of corruption. The countries that we looked at are in Asia and Europe and in zones where the CPI is quite high, therefore almost all country variables turned out to be significant at the 0.01 significance level.

When analysing the effect of the industry based on the operation of a given company, sectors such as textiles, chemicals, mineral products and construction turned out to be significant variables. The last of the listed industries is the most significant (significance level 0.01) because it is most strongly associated with the activities of the shadow economy.

The variables describing the size of the company's location turned out to be more significant, but they did not have a large impact on perceived corruption. The situation is similar in the case of the variables relating to the company's size and of the employment variable. Intuitively, it might seem that as the business grows,

corruption may become an obstacle. However, the above model proves that this intuitive assumption is wrong and that other factors contribute to the bribery problem.

When analysing macroeconomic variables, it can be observed that belonging to an organisation that fights corruption reduces the likelihood of its occurrence. The CPI also has the same effect, which is of course logical. These two factors have a strong influence on bribery vulnerabilities. Another important variable is the level of investment. More investment can eliminate corruption. It should also be remembered that the both variables interact with each other, that is, higher bribery rates reduce the level of investment and a higher level of investment may reduce the degree of bribery. Economic development, i.e. GDP per capita, also matters and it can lead to more fraud in the state.

7 Conclusions

We used survey data from the BEEPS database for 2016 in our analysis. The answer to the question 'is corruption an obstacle in running a business?' was adopted as the dependent variable, which takes the values 0, if it is not, and 1 – if it is. It has been shown that the most important factors are in-house audits and personal time spent with government officials. So, a solution to the problem would be to draw up more clear and restrictive regulations that will reduce the need for contact with officials.

This article gives an overview of the literature on the perception of corruption at the company level. Most of the research conducted so far has focussed more on the effects of bribery rather than its determinants. Further, the surveys on the perception of corruption were based on the opinions of the general population. Some of the studies which were based on the opinion of companies concluded that corruption can be beneficial for a small group of firms.

Companies with partly state-owned capital do not suffer any problems because of corruption. The conclusion is that state-owned companies are less vulnerable to the negative effects of bribery. The same is true for foreign capital also.

It has been shown that the size of the company and its location have no significant impact on the negative effects of bribery. The years of existence in the market are more important. The longer a company

exists on the market, the more corruption awareness grows. Hence, employees feel the negative effects of corruption.

Moreover, the study shows little variation in perceptions of state corruption. The type of sector in which a company operates is turned out to be more influential. The areas where the effects of bribery are most pernicious include construction, sales, mining and chemicals, i.e. the sectors closest to the shadow economy.

Further, in our study, the time spent on personal contacts with government officials and the number of state inspections significantly intensified the negative effects of corruption. Referring to the Schleifer's study, we may say that corruption bears the hallmarks of company harassment (Schleifer and Vishny, 1993). Constant and frequent audits prevent companies from growing. The time that can be used to plan company development is spent on getting licenses, concessions, etc. with people who want to receive a corruption tax for doing so.

It was shown, similar to Te Veld's research, that investments can reduce the level of corruption in the state (Te Velde and Morrissey, 2001). A lower level of GDP per capita encourages corruption offences, as shown in the study by Goczek (Cieślak and Goczek, 2016).

Based on this observation, special attention should be paid to the interactions between government officials and businesses. Their contacts with company directors and the number of inspections should be strictly limited to a minimum. It is important to create appropriate laws and regulations that meet this. Institutions that detect corruption and punishing people involved in it can also be helpful.

Moreover, our analysis takes into account the effect of the country and the type industry in which a firm operates. There is little variation in the perception of corruption by companies depending on which country they are based in. Much greater differences can be observed when the division of industry sectors are considered. In our case, the construction industry suffers most from bribery and is associated with the activities of the shadow economy.

This analysis also uses macroeconomic variables, which show that the level of investment is significant and can help in combating the problem of corruption. Based on previous research, we know that corruption and investment are interrelated. An affiliation with an international group is also important. The study

analysed the organisations based on the membership of the OECD, which is found to be significant. Corruption is less likely to occur in countries that belong to the organisation and it poses no major obstacles to those businesses. Moreover, the OECD is armed with the arsenal of instruments to fight corruption; therefore belonging to it is extremely important.

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Appendix

Tab. A1. Comparison of the estimation results of the logit and probit models

Variable	logit	probit
Years on the market	0.00876502	0.00530975
Employment	-0.00008314	-0.00004948
Sta_capital	-1.133988	-0.62454681
For_capital	-0.197049	-0.1253618
State_prod	0.02541215	0.01607862
Time_officials	0.36951254	0.22890388
Audits	0.00907696	0.00543676
Efficiency	0.02150128	0.01288578
Thefts	3.4365243	1.8378906
Other	0.03748113	0.02313259
Food products	-0.14439709	-0.0845678
Textiles	0.3521586	0.21495443
Clothing	0.11952786	0.07476893
Chemicals	0.52001581	0.31532122
Plastics and rubber	-0.03725552	-0.01415368
Mineral products	0.32495071	0.19949212
Metals and raw materials	-0.0577727	-0.02944644
Metal products	0.02482283	0.01903884
Machines and devices	0.13714882	0.08354676
Electronics	0.2596035	0.15581276
Construction	0.3544781	0.22319262
Wholesale	0.20622816	0.13128126
Retail	-0.0664786	-0.03453299
Hotels and restaurants	-0.1737417	-0.09251344
IT	0.33941652	0.2147104
small_loc	-0.12165995	-0.07618389
medium_loc	-0.33236935	-0.2025015
large_loc	-0.33919617	-0.20681956
small_company	-0.0014848	0.00030351
medium_company	-0.02023952	-0.01255519
medium_company	-0.02023952	-0.01255519
Bulgaria	-1.1978914	-0.73944942
Albania	-1.1592144	-0.71822055
Croatia	-1.1413132	-0.70407362
Belarus	-2.0420131	-1.2431616

Variable	logit	probit
Georgia	-2.6648174	-1.5931303
Tajikistan	-1.4865773	-0.9180442
Turkey	-1.2972634	-0.80528348
Ukraine	-0.40252307	-0.24803484
Uzbekistan	-3.5135959	-2.0308543
Russia	-0.88202438	-0.54765707
Romania	-0.13433538	-0.08237083
Kazakhstan	-1.2451245	-0.76820525
Bosnia_and_Herzegovina_Ha	-1.0461743	-0.6461674
Azerbaijan	-3.0499892	-1.792391
Macedonia	-1.8585547	-1.1448237
Armenia	-1.8512206	-1.1417558
Kyrgyzstan	0.35124133	0.21087963
Estonia	-3.0235201	-1.8171122
Czech Republic	-1.1688309	-0.7194871
Italy	-2.2520163	-1.3720082
Latvia	-1.9601472	-1.2002027
Lithuania	-1.7678234	-1.0833992
Slovakia	-0.99406504	-0.6160503
Slovenia	-2.1529345	-1.304369
Serbia	-1.5845897	-0.97913306
Cyprus	-1.6468074	-1.0145575
Greece	0.46229253	0.26145001
Moldova	-1.0586318	-0.65745899
Mongolia	-1.665327	-1.025903
Montenegro	-2.827147	-1.6969201
Poland	-1.5308906	-0.939425
_cons	0.54153984	0.33342044

Source: BEEPS database.

The table reveals that the coefficients of the logit model are higher than those of the probit model. This is the rule for probabilities outside the 'tails' of the distribution. Unfortunately, when choosing a logit or probit model, there is no clear-cut test that would answer the question which model should be used. When making decisions, analysts are usually guided by the comfort of working with the given model. In the study, we decided to use the logit model.

Tab. A2. Model estimation for the industry effect

Corruption	Coeff.	z	P> z
	(Std. Err.)		
Other	0.0385 (0.1409)	0.270	0.785
Food products	-0.1382 (0.1439)	-0.960	0.337
Textiles	0.3672* (0.1912)	1.920	0.055
Clothing	0.1311 (0.1701)	0.770	0.441
Chemicals	0.5306*** (0.1964)	2.700	0.007
Plastics and rubber	-0.0306 (0.2059)	-0.150	0.882
Mineral products	0.3376** (0.1634)	2.070	0.039
Metals and raw materials	-0.0580 (0.3297)	-0.180	0.860
Metal products	0.0288 (0.1669)	0.170	0.863
Machines and devices	0.1393 (0.1485)	0.940	0.348
Electronics	0.2530 (0.2361)	1.070	0.284
Construction	0.3605*** (0.1373)	2.630	0.009
Wholesale	0.1995 (0.1263)	1.580	0.114
Retail	-0.0695 (0.1201)	-0.580	0.563
Hotels and restaurants	-0.1644 (0.1623)	-1.010	0.311
IT	0.3336 (0.2302)	1.450	0.147

The symbol * means the significance of the variable at the level of 0.1, ** significance of the variable at the

level of 0.05 and *** significance of the variable at the level of 0.01.

Source: BEEPS database.

Tab. A3. Model estimation for the country effect

Corruption	Coeff.	z	P> z
	(Std. Err.)		
Bulgaria	-1.2071*** (0.2338)	-5.160	0
Albania	-1.1592*** (0.2098)	-5.520	0
Croatia	-1.1568*** (0.2430)	-4.760	0
Belarus	-2.0415*** (0.2905)	-7.030	0
Georgia	-2.6626*** (0.3789)	-7.030	0
Tajikistan	-1.4810*** (0.2225)	-6.660	0
Turkey	-1.2983*** (0.1958)	-6.630	0
Ukraine	-0.3955** (0.1922)	-2.060	0.04
Uzbekistan	-3.5079*** (0.4045)	-8.670	0
Russia	-0.8858*** (0.1792)	-4.940	0
Romania	-0.1506 (0.2055)	-0.730	0.464
Kazakhstan	-1.2396*** (0.2477)	-5.000	0
Bosnia and Herzegovina	-1.0536*** (0.2142)	-4.920	0
Azerbaijan	-3.0388*** (0.2907)	-10.450	0
Macedonia	-1.8757*** (0.2192)	-8.560	0
Armenia	-1.8567*** (0.2236)	-8.300	0

Continued **Tab. A3.** Model estimation for the country effect

Corruption	Coeff.	z	P> z
Kyrgyzstan	0.3629 (0.2298)	1.580	0.114
Estonia	-3.0317*** (0.5035)	-6.020	0
Czech Republic	-1.1714*** (0.2448)	-4.790	0
Italy	-2.2347*** (0.2640)	-8.460	0
Latvia	-1.9786*** (0.2901)	-6.820	0
Lithuania	-1.7852*** (0.2866)	-6.230	0
Slovakia	-1.0013*** (0.2618)	-3.820	0
Slovenia	-2.1769*** (0.4199)	-5.180	0
Serbia	-1.5975*** (0.2292)	-6.970	0
Cyprus	-1.6615*** (0.3262)	-5.090	0
Greece	0.4579 (0.3170)	1.440	0.149
Moldova	-1.0548*** (0.2134)	-4.940	0
Mongolia	-1.6670*** (0.2219)	-7.510	0
Montenegro	-2.8361*** (0.3518)	-8.060	0
Poland	-1.5388*** (0.2477)	-6.210	0

The symbol * means the significance of the variable at the level of 0.1, ** significance of the variable at the level of 0.05 and *** significance of the variable at the level of 0.01.

Source: BEEPS database.

Tab. A4. Descriptive statistics for the country variables

Variable	Number of observations	Std. Dev.	Min.	Max.
Bulgaria	16.566	0.1318	0	1
Albania	16.566	0.1458	0	1
Croatia	16.566	0.1458	0	1
Belarus	16.566	0.1458	0	1
Georgia	16.566	0.1458	0	1
Tajikistan	16.566	0.1456	0	1
Turkey	16.566	0.2730	0	1
Ukraine	16.566	0.2384	0	1
Uzbekistan	16.566	0.1516	0	1
Russia	16.566	0.4357	0	1
Romania	16.566	0.1776	0	1
Kazakhstan	16.566	0.1868	0	1
Bosnia and Herzegovina	16.566	0.1458	0	1
Azerbaijan	16.566	0.1516	0	1
Macedonia	16.566	0.1458	0	1
Armenia	16.566	0.1458	0	1
Kyrgyzstan	16.566	0.1266	0	1
Estonia	16.566	0.1273	0	1
Czech Republic	16.566	0.1229	0	1
Italy	16.566	0.1355	0	1
Latvia	16.566	0.1410	0	1
Lithuania	16.566	0.1266	0	1
Slovakia	16.566	0.1262	0	1
Slovenia	16.566	0.1266	0	1
Serbia	16.566	0.1458	0	1
Cyprus	16.566	0.1458	0	1
Greece	16.566	0.1383	0	1
Moldova	16.566	0.1458	0	1
Mongolia	16.566	0.1458	0	1
Montenegro	16.566	0.0947	0	1
Poland	16.566	0.1779	0	1
Kosovo	16.566	0.1098	0	1

Source: BEEPS database.

Tab. A5. Descriptive statistics for the Business sector variables

Variable	Number of observations	Std. Dev.	Min.	Max.
Other	16.566	0.2715	0	1
Food products	16.566	0.2587	0	1
Textiles	16.566	0.1567	0	1
Clothing	16.566	0.1876	0	1
Chemicals	16.566	0.1516	0	1
Plastics and rubber	16.566	0.1428	0	1
Mineral products	16.566	0.1966	0	1
Metals and raw materials	16.566	0.0739	0	1
Metal products	16.566	0.2001	0	1
Machines and devices	16.566	0.2360	0	1
Electronics	16.566	0.1165	0	1
Construction	16.566	0.2810	0	1
Wholesale	16.566	0.3493	0	1
Retail	16.566	0.4215	0	1
Hotels and restaurants	16.566	0.2001	0	1
IT	16.566	0.1351	0	1

Source: BEEPS database.

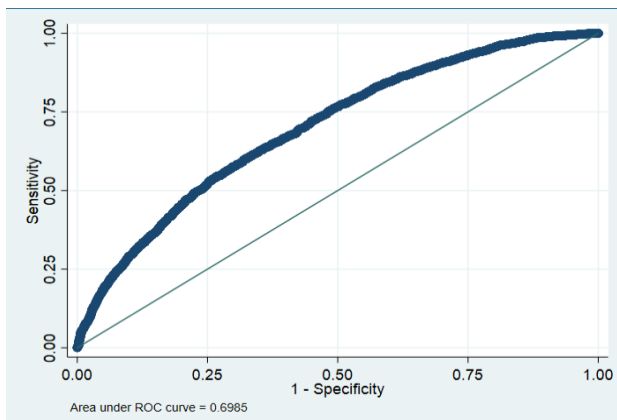


Fig. A1. ROC curves. Source: BEEPS database.

The accuracy of data classification depends on the degree by which the constructed model differentiates between successes and failures. The measure of accuracy is the area under the ROC curve. A field equal to 1 means that the model perfectly discriminates between success and failure and a value equal to 0.5 means no possibility of discrimination.

Tab. A6. Test for the correctness of the functional form

Logistic regression		Number of obs	=	7,486
		LR chi2(2)	=	949.44
		Prob > chi2	=	0.0000
Log likelihood = -4570.4954		Pseudo R2	=	0.0941

Korupcija	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
_hat	.9726808	.0438492	22.18	0.000	.8867379 1.058624
_hatsq	-.0334735	.0296578	-1.13	0.259	-.0916017 .0246547
_cons	.0099191	.02934	0.34	0.735	-.0475862 .0674244

Source: BEEPS database.

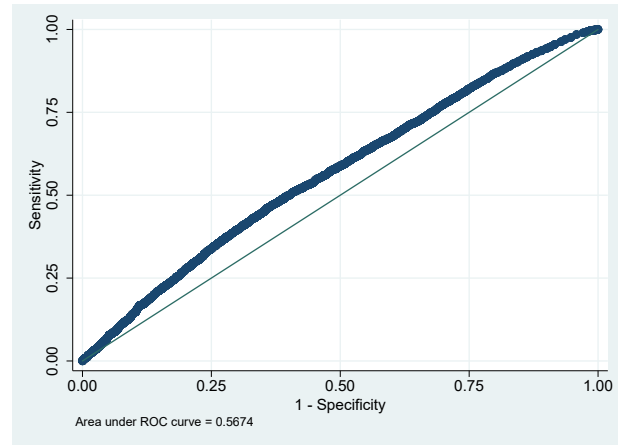


Fig. A2. ROC curve (only significant variables). Source: BEEPS database.

Tab. A7. Test for the correctness of the functional form (only significant variables)

Logistic regression		Number of obs	=	14,470
		LR chi2(2)	=	179.42
		Prob > chi2	=	0.0000
Log likelihood = -9512.1194		Pseudo R2	=	0.0093

Korupcija	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
_hat	.8357053	.0916649	9.12	0.000	.6560455 1.015365
_hatsq	-.2051257	.0702681	-2.92	0.004	-.3428487 -.0674027
_cons	-.0220368	.0426352	-0.52	0.605	-.1056003 .0615267

Source: BEEPS database.

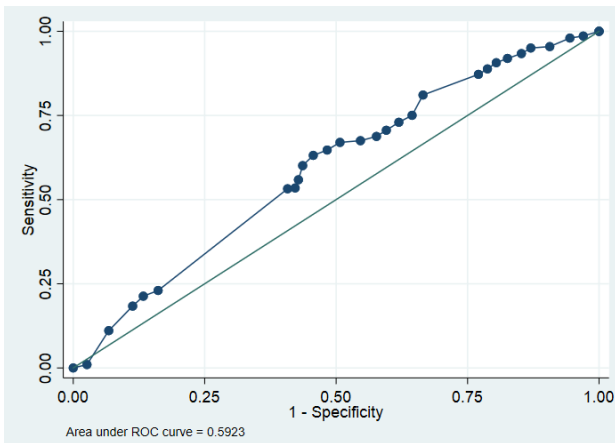


Fig. A3. ROC curve – only macroeconomic variables.
Source: Bąk 2020.

Tab. A8. Test for the correctness of the functional form – only macroeconomic variables

Logistic regression		Number of obs = 14,830		LR chi2(2) = 375.72	
Log likelihood = -9683.6662		Prob > chi2 = 0.0000		Pseudo R2 = 0.0190	
Korupcja	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
_hat	1.782958	.2116538	8.42	0.000	1.368125 2.197792
_hatsq	.5343356	.1385934	3.86	0.000	.2626976 .8059736
_cons	.1941715	.0591324	3.28	0.001	.0782742 .3100688

Source: Bąk 2020.