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Corruption and efficiency of public spending in states with various public management types

Abstract
Prevalence of corruption distorts main social and economic relations in the country. Influence of corruption on various economic systems and social sphere are the object of study for many scientists. However, connection between corruption and efficiency of public spending in states with various regimes has not been studied. The study's aim is to discover mutual dependency between corruption and efficiency of public spending in 165 countries for each regime type: «Fully free», «Flawed democracies», «Hybrid regime» and «Authoritarian», as well as figuring out the way parts of democracy influence estimations of occurrences of corruption and public spending efficiency.

The regression analysis has been applied in the study, carried out through the least squares method, which included corruption level and parts of democracy as factor features. It is established that for the model of group of countries with «Fully free» regime and «Flawed democracy» regime determination coefficients are the greatest (0.81 and 0.83), and such countries have the highest influence of corruption on efficiency of public spending. Simultaneously, the largest growth of estimation of public spending efficiency (0.912), caused by reducing corruption level, was in the authoritarian countries, the lowest growth of estimation of efficiency (0.771) was registered in fully free democratic countries. The study shows that public spending efficiency estimation, which corresponds to average corruption level (this is zero corruption level by expert scale), is higher (0.213) for fully free democracy countries, than the same estimation for less democratic countries.

Corruption level has stronger impact on the efficiency of public spending estimation than level of democracy in four groups of countries with various types of regimes, although for fully free countries it is influenced by voting process and pluralism significantly. Study's findings improve forecast of anticorruption policy results for public spending efficiency in the countries with various regimes. We consider that the prospects for further research in this area are to find out more about the link between corruption and the public spending efficiency.
Keywords: Public Spending; Public Expenses; Corruption; Public Services; Democracy; Authoritarian Regime; Political Regime; Public Goods; Budget
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Корупція та ефективність публічних видатків держав
із різними типами режимів публічного управління

Анотація. Поширеність корупції спотворює головні суспільні та економічні відносини в країні. Вплив корупції на різні економічні системи та соціальну сферу є предметом дослідження багатьох учених. Проте зв'язок корупції та ефективності публічних видатків у країнах з різними типами режимів не вивчений. Метою дослідження є з'ясування залежності корупції та ефективності публічних видатків для кожного типу режиму: цілком вільний, або ж повноцінна демократія («fully free»), недосконала демократія («flawed democracies»), гібридний режим («hybrid regime») й авторитарний режим («authoritarian»), а також з'ясування впливу складових демократії на оцінки явища корупції та ефективності публічних видатків.

У дослідженні було застосовано регресійний аналіз, здійснений методом найменших квадратів, де факторіальними ознаками є рівень корупції та складові демократії. Встановлено, що для моделі груп країн з типами режимів «повноцінна демократія» та «недосконала демократія» коефіцієнти детермінації є найбільшими (0,81 та 0,83), у цих країнах вплив корупції на ефективність публічних видатків є найбільшим. У той же час найбільший приріст оцінки ефективності публічних видатків (0,912), спричинений зменшенням рівня корупції, був саме в країнах з авторитарним режимом, а найменший приріст оцінки ефективності (0,771) був, навпаки, у країнах із повноцінною демократією. Дослідження засвідчило, що оцінка ефективності публічних видатків, що відповідає середньому рівню корупції, – за шкалою експертів це нульове значення корупції, є вищою (0,213) для країн з повноцінною демократією, ніж така ж оцінка в менш демократичних країнах.

Більший вплив на оцінку ефективності публічних видатків має рівень корупції, ніж рівень демократії, для усіх чотирьох груп країн із різними типами режимів, проте на країни з типом режиму «повноцінна демократія» значно впливають ще й виборчий процес і плюралізм.

Результати дослідження сприяють кращому прогнозуванню наслідків антикорупційної політики для ефективності публічних видатків у країнах з різними типами режимів.

Ключові слова: публічні блага; публічне управління; бюджет; корупція; суспільні послуги; демократія; авторитаризм; публічні видатки; політичний режим.

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Коррупция и эффективность общественных расходов стран
с различными типами режимов публичного управления

Аннотация. Распространенность коррупции искажает главные общественные и экономические отношения в стране. Влияние коррупции на различные экономические системы и социальную сферу является предметом исследования многих ученых. Однако связь коррупции и эффективности общественных расходов в странах с различными типами режимов публичного управления не изучена. Целью исследования является выяснение зависимости коррупции и эффективности общественных расходов для каждого типа режима: «полностью свободный», «несовершенная демократия», «гибридный режим» и «авторитарный», а также определение влияния составляющих демократии на оценки явления коррупции и эффективности общественных расходов.

В исследовании был использован регрессионный анализ, который осуществлен методом наименьших квадратов, где факториальными признаками являются уровень коррупции и составляющие демократии. Установлено, что для модели групп стран с типами режимов «полностью свободный» и «несовершенная демократия» коэффициенты детерминации являются самыми значимыми (0,81 и 0,83), а значит, в этих странах влияние коррупции на эффективность общественных расходов наибольшая. В то же время наибольший прирост оценки эффективности общественных расходов (0,912), вызванный уменьшением уровня коррупции, наблюдался именно в странах с авторитарным режимом, а наименьший прирост оценки эффективности (0,771) был, наоборот, в странах «полностью свободных».

Исследование показало, что оценка эффективности общественных расходов соответствует среднему уровню коррупции, – по шкале экспертов это нулевое значение коррупции, выше (0,213) для стран «полностью свободных», чем такая же оценка в менее демократических странах.

Большее влияние на оценку эффективности общественных расходов имеет уровень коррупции, чем уровень демократии, для всех четырех групп стран с разными типами режимов, однако для стран с типом режима «полностью свободный» значительное влияние также имеют избирательный процесс и плюрализм.

Результаты исследования способствуют лучшему прогнозированию последствий антикоррупционной политики для эффективности общественных расходов в странах с различными типами режимов.

Ключевые слова: общественные блага; публичное управление; бюджет; коррупция; публичнные услуги; демократия; авторитаризм; общественные расходы; политический режим.

1. Introduction and Problem Statement

Corruption is an integral part of public management system. It influences public finances directly, which are operating only through human action. Corruption's influence reveals itself in government expenditures, because costs spending priorities increase, so tight circle of beneficiaries is taking the corruption rent, which causes failure to provide public services to communities. The mentioned problem creates preconditions for negative estimations of tax expenditures by the government from population. Efficiency indices of public spending are actively used in financial science and in practical activity of research institutions nowadays, which are based on expert opinions studies, committing attitude to quality of government activity supported by the state budget. Also, there are important indices for estimating corruption scale, based on its perception in society. In such a way, systemic studies of abovementioned processes have shaped up extended databases, which enables to study the nature of corruption and its influence on public spending' efficiency. As estimations of both processes are based on expert research, it is important to consider influence of an environment used for said research. It is rational to use democracy indices as the most considerable figure which presents the society's state and ability for individuals to influence the public policy. We have not found any researches which would reveal the connection between public corruption estimations and public spending efficiency, taking into account various public management regimes' types.

2. Brief Literature Review

Scientific studies prove corruption's influence on economic relations in the country. A. Hodge, S. Shankar, P. Rao, and A. Duhs (2011), as well as F. Méndez and F. Sepúlveda (2006) proved general negative influence of corruption on economic growth, which decreases in economies with low level of control or management. The model developed by G. D'Agostino, J. P. Dunne, and L. Pieroni (2016) has been used to estimate 106 countries, and its results are the following: interaction between corruption and investments, as well as corruption and military expenses, have significant negative impact on economic growth. However, C. J. Huang (2016) did not confirm common opinion that corruption is bad for economic growth of thirteen countries of Asia and Pacific region. For example, the hypothesis regarding «greasing wheels» is supported for South Korea (the Republic of Korea). T. S. Aidt (2009) evaluates critically positive impact of «greasing wheels» for economy, eventually making conclusion that proof in favour of «greasing wheels» theory is weak, which signifies absence of correlation between new figure of actual experience of corrupt managers and GDP growth. Even if corruption has insignificant average impact on GDP per capita growth ratio, it is the source (possible) of non-sustainable development (Aidt, 2009). Hence, there is proof in scientific literature of corruption's link with economic system's performance efficiency. Scientists point out its positive outcomes for economic processes in particular cases, but its impact is mostly negative.

One of the explanations of corruption's negative impact on budget policy's efficiency is hiring problems in public sector, proven by scientists S. Mocetti and T. Orlando (2019) who found that hiring public sector employees from the human capital point of view gets worse if comparing to private sector in regions with higher corruption level and insufficient qualification level of corruption causes (based on Italian data). Small-time bribery is capable of decreasing accessibility of public services, as proven by D. Hall (2012). Another area of negative impact of corruption on budget expenses, as established by A. Monte and E. Papagni (2001), as well as R. Burguet (2017), is public procurements. Corruption's consequences influence government operation negatively. A. Sinha, M. Gupta, M. Shahbaz, and T. Sengupta (2019), as well as V. Koziuk

and O. Dluhopolskyi (2018) proved that corruption causes natural environment degradation and decreases efficiency of ecological policy. Hence, corruption negatively influences various angles of budget expenses' management, in particular, decreases offer of necessary public goods and increases their cost.

Corruption impact on figures of economic system changes accordingly to influence of certain social angles. N. Dutta and S. Roy (2016) made the conclusion that press freedom restricts corruption. Positive impact of media in hostile environment results in significantly lower corruption levels, which is proven by G. G. Schulze, B. S. Sjahrir, and N. Zakharov (2016). Studies of D. Acemoglu, S. Naidu, P. Restrepo, and J. Robinson (2019) prove general positive impact of democracy on economic growth. L. Peisakhin (2012) proves that information transparency under the public services acquisition impacts corruption's expansion negatively. Study by D. Donchev and U. Gergely (2014) demonstrates corruption's dependence of media freedom. K. C. Vadla-mannati and A. Cooray (2016) applied panel data of 132 countries for 1990-2011 period and described growth of corruption's perception under transparency distribution as the result of increase in revealed corruption cases in short-term perspective and lowering of corruption acceptance in long-term perspective. K. Gründler and N. Potrafke (2019) proved that corruption's impact on economic growth is especially distinguished in autocratic states, where it hinders growth through decreasing of direct foreign investments and inflation growth. Scientific studies support importance of democracy's level in a country and its components for the distribution of corruption itself, as well as economy's efficiency.

Scientific studies confirm negative influence of corruption on economic systems' efficiency, including public sector. Apart from that it has been established that corruption causes consequences for the most important aspects of budget spendings. Public finances mean that budget expenses' management (and corruption's impact on such process) depends on the level of democracy's development. Nevertheless, we have not found any studies which would analyze dependency of efficiency of providing public goods from corruption rate in the countries with various democracy types or public management regimes.

The presented study continues ideas from our previous article (B. S. Malyniak, O. M. Martyniuk, & O. P. Kyrylenko, 2019). The previous study revealed tight correlation dependency between corruption and budget expenses' efficiency; it has been established that growth of corruption estimation (its decrease) for a single unit in one-factor model causes margin increase of budget expenses' efficiency for 0.931 units, and in multiple regression model the growth is 0.807 units, respectively. Apart from that, using k-means clustering method with minimisation of Euclidian distances to group the countries, it has been established that corruption impact on budget expenses changes shape depending on democracy level in the countries. In particular, in the countries with the lowest levels of democracy reducing corruption per one unit leads to increased budget spending efficiency for 0.923 units, while in the countries with the highest democracy level the same reducing will cause spending's efficiency growth of 0.701 units. Despite the importance of previous results in understanding the link between public perception of corruption and cost-efficiency, such approach limits the application of the results to the view that leading international organizations apply other approaches to grouping the countries by types of public management regimes and thus consider mechanisms for solving social and economic problems that are optimal for those regimes. Additionally, the findings do not reveal the effects of democracy on the link between public perceptions of corruption and the depending of democracy level of public spending.

3. The purpose of the study is to figure out the dependency and efficiency of public spending for each type of public management regime in the countries of the world: «Fully free», «Flawed democracies», «Hybrid regime» and «Authoritarian», as well as to reveal impact of democracy index's components on public perceptions of corruption and efficiency of public spending.

4. Methodological Framework
In order to achieve the goal of research, the countries are divided as follows: «Fully free», «Flawed democracies», «Hybrid regime» and «Authoritarian», as defined by The Economist Intelligence Unit (EIU: Democracy Index 2018). Democracy index estimation is limited from 0 to 10. Information about corruption and efficiency of public spending are received from the World Bank database (WB: WGI 2018). Two sets of indicators were selected from this database - «Control of

Corruption» and «Government Effectiveness». The data of the first set reflect the perception of the extent to which public authority is used for private gain. The government effectiveness (effectiveness of public administration) reflects the efficiency of public expenditure to the maximum extent, since the relevant data is based on the public assessment of the public services' quality, government service, policy formulation and implementation. We shall underline that this activity is carried out at the expense of the national budget, so its estimation reflects the cost efficiency. The data set of the survey is presented by a large number of respondents from enterprises, citizens and experts in economics and national development. Estimation of corruption level and public management efficiency was conducted in the range from -2.5 (the lowest level of effectiveness, total corruption) to 2.5 (the highest level of effectiveness, absence of corruption).

Main research apparatus is regression analysis, conducted by the least squares method (or the ordinary least squares, OLS), which includes factorial figures of corruption level and democracy level:

$$y = \alpha_0 + \alpha_1 x + u , \qquad (1)$$

where:
x is a factor feature,
α_0 is the efficiency's estimation if a factor equals zero,
α_1 defines dynamics of public spending efficiency if a factor feature changes for 1 unit,
u is random value (normal random error).

Main estimations of the models' quality are determination coefficient R^2, p- and F-statistics.

In order to determine which of democracy's components have more significant impact at each group of countries, let us create a linear equation of multiple regression:

$$y = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \alpha_3 x_3 + \alpha_4 x_4 + \alpha_5 x_5 + \alpha_6 x_6 + u , \qquad (2)$$

where independent factors are:
x_1 - the Corruption level,
x_2 - Electoral process and pluralism,
x_3 - Functioning of government,
x_4 - Political participation,
x_5 - Political culture,
x_6 - Civil liberties,
u - random value (normal random error), which meets the conditions:

$$M(u_t) = 0, \; Var(u_t) = \sigma^2 \text{ for all } t, \; cov(x_t, u_t) = 0 \text{ and } cov(u_i, u_j) = 0 \text{ for } i \neq j.$$

We are able to determine which factors have larger impact on efficiency of public spending by analysing parameters, pair correlation coefficients, as well as partial and semi-partial correlation coefficients.

5. Results

Based on the division of countries into four groups according to the types of regime, which are combined on the basis of close integrated democracy's assessments, namely: electoral process and pluralism; civil liberties; government operation; political participation and political culture, we got the models of linear dependency (1) with sufficiently high determination coefficients (Table 1), indicating the possibility of obtaining reliable forecast estimates for the countries of each group.

For the countries with Fully free democracy, every additional unit of improvement in corruption leads to slower increase in public spending efficiency than in the countries with lower democracy, which is proven by the model, where $0.771 = \min(\beta_{11} = 0.771, \beta_{12} = 0.909, \beta_{13} = 0.778, \beta_{14} = 0.912)$. Not only basic political and civil liberties are respected in this group, but there is also usually quite high level of political culture that fosters democracy. Government operation is satisfactory and media is independent and diverse. There is an effective control and balance system, the judiciary is independent and judgments are enforced. There are only merely restricted problems in the functioning of democracies (EIU: Democracy Index 2018).

Table 1:
Results of linear dependency (1) of public spending efficiency from corruption level for the countries with various types of regime

Parameters of the model	Fully free	Flawed democracies	Hybrid regime	Authoritarian
Free element, β_0	0.213*	0.205***	– 0.097*	0.075*
Coefficient of corruption level, β_1	0.771***	0.909***	0.778***	0.912***
R^2	0.81	0.83	0.57	0.78
p	< 0.001	< 0.001	< 0.001	< 0.001
F	76.775	268.73	46.02	108.48
Observations	20	55	37	53

Notes: *significant at the 10% level, **significant at the 15% level, *** significant at the 1% level

Source: Calculated by authors based on The Worldwide Governance Indicators 2018 by WB

The countries with incomplete democracy (Flawed democracies) have significant deficiencies in other aspects of democracy, including governance problems, underdeveloped political culture, and low levels of political participation. However, free and fair elections take place in these countries and, even if there are problems (such as violations of media freedom), basic civil liberties are respected (EIU: Democracy Index 2018). The countries within this group feature high value of public spending efficiency, caused by improved corruption level (0.909) and simultaneous large value of free element coefficient (0.205). We are of opinion that this signifies high efficiency of measures, which are aimed at fighting corruption for estimating public spending efficiency.

At the same time, for the countries with Authoritarian mode, improving corruption estimates per one unit leads to an 18% increase in public spending estimates faster than in the Fully free countries. Political pluralism is absent or strictly limited. There are open dictatorships in many countries in this category, some formal institutions of democracy may exist, but they are of little importance. There is disregard for the abuse and violation of civil liberties. The media, as a rule, are state-owned or controlled by groups affiliated to the governing regime. There is a repression of government criticism and censorship is common (EIU: Democracy Index 2018). Such countries are presenting the lowest average corruption level (-0.78), as well as estimation of public spending efficiency (-0.78) (Table 2). The results of the study of countries with authoritarian regimes, namely, the highest level of dependence of public spending estimates on the improvement of the situation with corruption, can be explained, on the one hand, by the presence of greater potential for increasing the public spending efficiency and reduction of corruption, and on the other, by the high public expectation of reducing the phenomenon of corruption, which are reflected in estimates of public spending efficiency.

For Fully free regime countries estimate of the free element coefficient (β_0=0.213) signifies that if corruption level is somewhere in the middle (around zero), public perception regarding public spending efficiency is higher than with the same corruption level in more autocratical countries. High estimates of the efficiency of public expenditures are due, in our opinion, to the positive effects of citizens' influence on the government (as indicated by a higher level of freedom). At the same time, an increase in the expert review of corruption per unit, corresponding to a decrease in this phenomenon, leads to a lower increase in public expenditure efficiency (0.771) than in the less democratic countries.

The magnitude of the determination coefficient of the model constructed for the countries with Hybrid regime (R^2 = 0.57) indicates that the dependence of public spending efficiency in these countries is least explained by the level of corruption compared to the countries in other groups, their R^2 coefficients are higher and almost similar in value. It is characteristic of the countries with Hybrid regime that elections have significant violations, which often prevent them from being free and fair, government pressure on opposition parties and candidates can be significant. There is a tendency to spread corruption, and the rule of law and civil society are weak. Journalists are usually persecuted and subjected to pressure (EIU: Democracy Index 2018). In conditions of insufficient objective information and imperfect political competition, the society tends to explain low efficiency of public spending with some other reasons than corruption.

Analysing Figure 1, a sufficiently close linear dependence should be noted for the countries of all four types of regimes. However, for the countries with Fully free and Flawed democracies

Table 2:
Main figures of the countries in each type of regime

Countries		Estimations	Democracy index	Corruption	Efficiency
Fully free (20 countries)	Australia, Austria, Canada, Switzerland, Costa Rica, Germany, Denmark, Spain, Finland, United Kingdom, Ireland, Iceland, Luxembourg, Malta, Mauritius, Netherlands, Norway, New Zealand, Sweden, Uruguay	margins	8.02 - 9.84	0.36-2.34	0.31-2.08
		variability range	1.82	1.97	1.77
		average	8.82	1.71	1.53
		σ	0.54	0.57	0.49
Flawed democracies (55 countries)	Argentina, Belgium, Bulgaria, Brazil, Botswana, Chile, Colombia, Cape Verde, Cyprus, Czech Republic, Dominican Republic, Ecuador, Estonia, France, Ghana, Greece, Guyana, Hong Kong SAR (China), Croatia, Hungary, Indonesia, , India, Israel, Italy, Jamaica, Japan, Korea, Sri Lanka, Lesotho, Lithuania, Latvia, Mexico, Mongolia, Malaysia, Namibia, Panama, Peru, Philippines, Papua New, Guinea, Poland, Portugal, Paraguay, Romania, Senegal, Singapore, Serbia, Suriname, Slovak Republic, Slovenia, Timor-Leste, Trinidad and Tobago, Tunisia, Taiwan (China), United States, South Africa	margins	5.27-8.09	−1.02-2.16	−1.08-2.2
		variability range	2.83	3.18	3.28
		average	6.99	0.21	0.395
		σ	0.69	0.73	0.73
Hybridregime (37 countries)	Albania, Armenia, Benin, Burkina Faso, Bangladesh, Bosnia and Herzegovina, Bolivia, Bhutan, Côte d'Ivoire, Fiji, Georgia, Gambia, The, Guatemala, Honduras, Haiti, Iraq, Kenya, Kyrgyz Republic, Lebanon, Liberia, Morocco, Moldova, Madagascar, Macedonia, FYR, Mali, Malawi, Nigeria, Nepal, Pakistan, Sierra Leone, El Salvador, Thailand, Turkey, Tanzania, Uganda, Ukraine, Zambia	margins	2.62-6.43	−1.67-0.39	−1.36-1.02
		variability range	3.81	2.38	2.06
		average	5.06	−0.57	−0.61
		σ	0.85	0.45	0.44
Authoritarian (53 countries)	Afghanistan, Angola, United Arab Emirates, Azerbaijan, Burundi, Bahrain, Belarus, Central African Republic, China, Cameroon, Congo (Rep.), Comoros, Cuba, Djibouti, Algeria, Egypt, Eritrea, Ethiopia, Gabon, Guinea, Guinea-Bissau, Equatorial Guinea, Iran, Islamic Rep., Jordan, Kazakhstan, Cambodia, Kuwait, Lao PDR, Libya, Myanmar, Mozambique, Mauritania, Niger, Nicaragua, Oman, Korea (Dem. Rep.), Qatar, Russian Federation, Rwanda, Saudi Arabia, Sudan, Swaziland, Syrian Arab Republic, Chad, Togo, Tajikistan, Turkmenistan, Uzbekistan, Venezuela, Vietnam, Yemen, Congo (Dem. Rep.), Zimbabwe	margins	1.06-5.25	−1.61-1.07	−1.79-1.11
		variability range	4.19	2.9	2.68
		average	3.01	−0.78	−0.78
		σ	0.87	0.62	0.64

Source: Calculated by the authors

regimes, the dots are tightly centered around the corresponding direct regressions, while for the countries with Hybrid and Authoritarian regime variants are more scattered over the respective regression lines.

An analysis of the quantitative characteristics of each group of the countries allows asserting that the countries with the type of Fully free regime are almost similar in each factor, while the characteristics of the countries with Flawed democracies regime have the largest standard deviations in terms of corruption and efficiency. It should be noted that the countries with Hybrid regime are characterised by the least standard deviations for the level of corruption and efficiency, which suggests that the countries of this group are most similar in the aforementioned variables, however the dispersion of the level of democracy is one of the largest which means that these countries differ quite strongly in the democracy level. The Authoritarian countries are characterised by one of the largest dispersions of all the factors (Figure 2).

It is obvious that the average values of the main indicators of studied dependencies decrease as the level of democracy decreases. For the countries with Fully free regime with an average of 8.82, the average of 1.71 corresponds to the average of public spending 1.53 (Table 2). For the
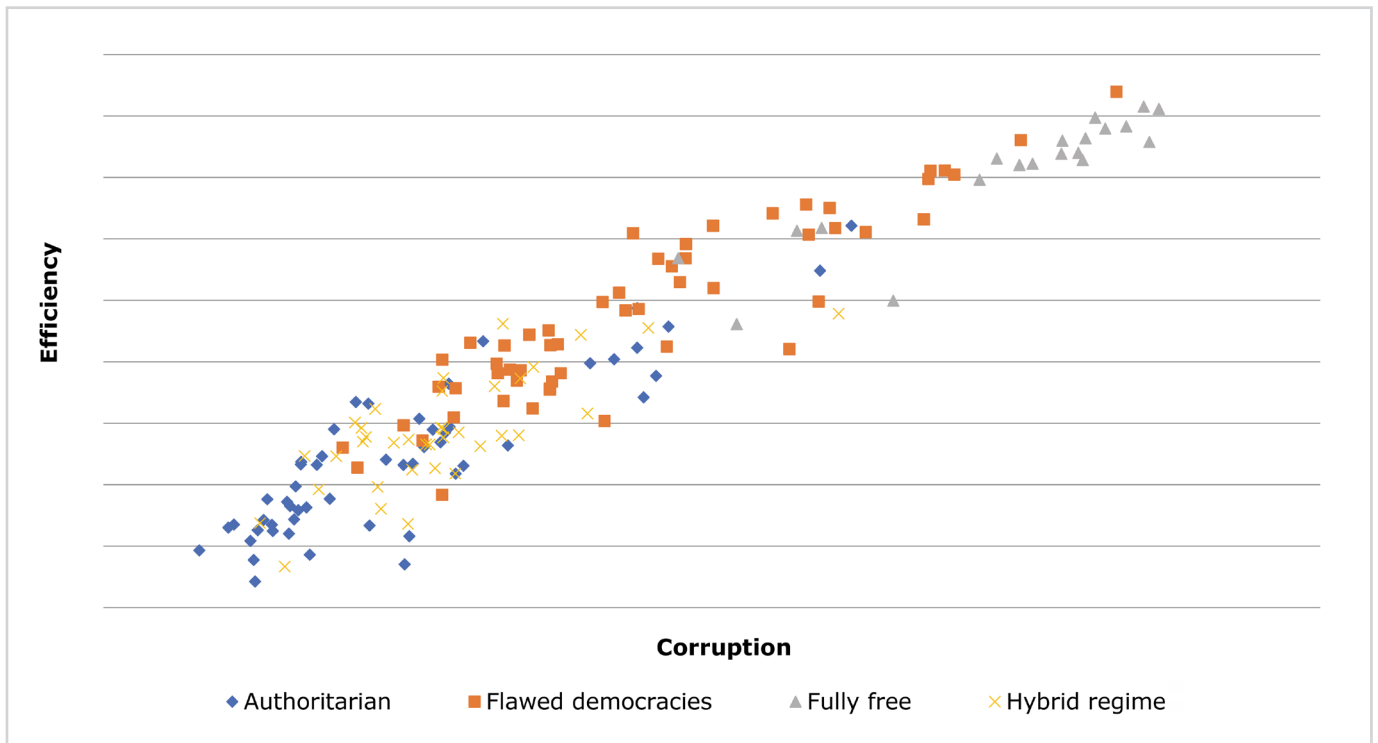
Figure 1:
Diagram of dissemination of public spending efficiency dependency from corruption level
(the countries with various types of regimes)
Source: Calculated by authors based on EIU:
Democracy Index 2018 and The Worldwide Governance Indicators 2018 by WB

countries with other types of regimes, these figures are as follows: for Flawed democracies - (6.99; 0.21; 0.395); Hybrid regime - (5.06; -0.57; -0.61); Authoritarian - (3.01; -0.78; -0.78) (Figure 2).
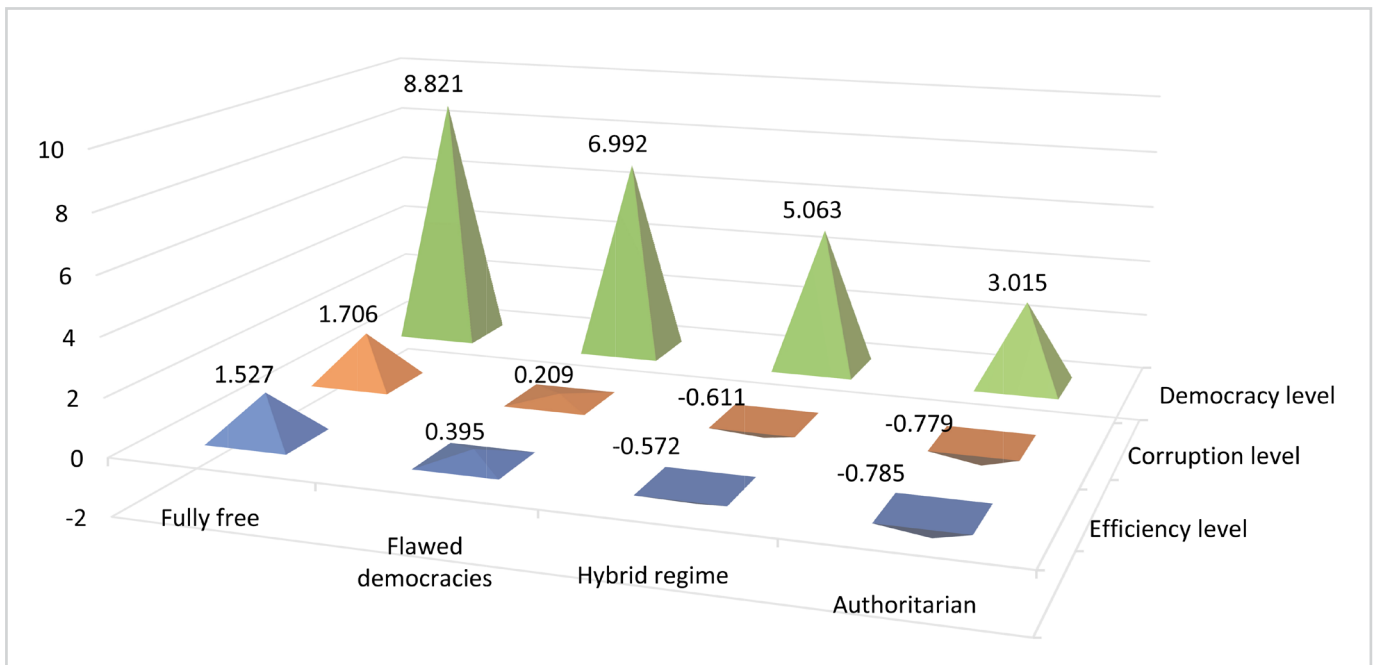

Figure 2:
Average values of corruption level figures and public spending efficiency
in the countries with various regime types
Source: Calculated by authors based on EIU:
Democracy Index 2018 and The Worldwide Governance Indicators 2018 by WB

Since the average values of the traits (parameters of the model) for each group are significantly different, let us evaluate the strength of the influence of which factors (corruption level or democracy level) is significant for the efficiency of public spending. Additionally, there is a necessity to test the hypothesis of such models' adequacy for each group of the countries (Table 3).

Table 3:
Results of multiple regression for the countries with various regime types

Parametres of the model	Fully free	Flawed democracies	Hybrid regime	Authoritarian
α_0 (free element)	−0.78	−0.783*	0.617**	−0.206
α_1 (corruption level)	0.672***	0.838***	0.748***	0.898***
α_2 (democracy level)	0.131	0.143**	0.11*	0.04
R^2	0.82	0.85	0.61	0.78
p	< 0.001	< 0.001	< 0.001	< 0.001
F	38.02	145.44	26.51	88.937
Observations	20	55	37	53

Notes: *significant at the 10% level, **significant at the 15% level, *** significant at the 1% level

Source: Calculated by authors based on The Worldwide Governance Indicators 2018 by WB

Since models, demonstrated above, have shown that public spending efficiency depends of democracy level, the question emerges: which democracy component's impact is more prominent. The Economist Intelligence Unit defines five main components of democracy level: electoral process and pluralism, functioning of government, political participation, political culture and civil liberties. We have defined the weight of each factor, using data for 165 countries regarding the mentioned five components of democracy level and analysing regression coefficients(β) and partial correlation coefficients (Table 4).

Electoral process and pluralism (0.32) and civil liberties (0.24) are the most important and statistically significant predictors for estimation of public spending efficiency. For other components: functioning of government, political participation, political culture, these figures are 0.23, 0.17 and 0.15, correspondingly. At the same time, partial correlation and semi-partial correlation are largest for electoral process and pluralism (0.99999 and 0.123). Thus, the impact of electoral process and pluralism is the greatest, although functioning of government has significant part in democracy building (0.9999 and 0.109), while civil liberties have lower values of mentioned estimations (0.9998 and 0.079). Analysing the estimates of multiple correlation models, as well as the coefficients of pair, partial, and semi-partial correlation, we may conclude that the level of corruption significantly affects the resulting variable for all groups of the countries.

However, for the countries with Fully free regime, public spending efficiency is also closely linked to electoral process and pluralism, government functioning and political participation (the highest

Table 4:
Results of multiple regression
by the components of democracy level for the countries with various regime types

Parametres of the model	Fully free	Flawed democracies	Hybrid regime	Authoritarian
α_0(free element)	6.27***	−0.34	0.09	−0.4
α_1(corruption)	0.99***	0.87***	0.75***	0.81***
α_2(electoral process and pluralism)	−0.68***	−0.0002	−0.09**	−0.09**
α_3(functioning of government)	−0.02	0.08*	0.07	0.06
α_4(political participation)	0.001	0.06	0.09**	0.06
α_5(political culture)	0.07	−0.04	−0.11**	−0.01
α_6(civil liberties)	−0.03	−0.02	0.03	0.03
R^2	0.92	0.85	0.76	0.82
p	< 0.001	< 0.001	< 0.001	< 0.001
F	24.51	45.78	15.44	34.69
Observations	20	55	37	53

Notes: *significant on 10% level, **significant on 15% level, *** significant on 1% level

Source: Calculated by authors based on The Worldwide Governance Indicators 2018 by WB

pair correlation coefficients are 0.89; 0.64; 0.72, respectively). At the same time, the coefficients of partial and semi-partial correlation are the highest for electoral process and pluralism (-0.71), which makes it possible to conclude that for the countries with Fully free mode it is the opportunity to participate in elections, and, in fact, to form authorities, is decisive, which in turn allows them to control this power and thus influence the corruption level in the countries.

For the countries with Flawed democracies regime, none of the determinants of democracy are statistically significant, but the pair correlation coefficient (0.65) partially identifies the functioning of government among the five constituents of democracy. For the countries with Hybrid regime, electoral process and pluralism, political participation and political culture are statistically significant (the coefficients are 0.67; 0.77; 0.53, respectively). It should be noted that the analytical division of The Economist (EIU) included Ukraine into this group. Events during recent years support the significance of the democracy's components: violations of voting process in 2004 caused the Orange Revolution, exclusion of the citizens from political activity in 2013 caused discontent, which led to the Revolution of Dignity. Similar processes happened in Georgia, which falls to the same group of countries.

For the countries with Authoritarian regime, electoral process and pluralism are statistically significant, however, based on an analysis of the paired correlation coefficients' matrix, a close link between public spending and government performance can be observed (0.79). The paradox of the models obtained is that with the increase in the level of electoral process evaluation and pluralism, the efficiency of public spending diminishes, because the relevant model parameters are negative.

However, since the values of the relevant model parameters of all four types of regimes are small, it can be argued that their impact on public spending is insignificant, with the exception of the electoral process and pluralism in the countries with Fully free regime type. That is why, in the countries of this type of regime, the integrity of the electoral process is essential for increasing the assessment of public spending efficiency.

Analysing the coefficients of the factor variables of each of the models, it is possible to note the greatest impact of the corruption level on public spending, wherein the estimation data being unbiased, effective and capable. It should also be noted that the model quality is high enough exactly for groups with high levels of democracy, which indicates that, despite the significant impact of corruption on the efficiency of budget spending for different types of democracy, this impact is significant only in the highly democratic countries. Obviously, the opportunity to influence the processes in the society, for example through the electoral process, in turn contributes to reducing the corruption phenomenon.

6. Conclusions

For each regime type, high quality econometric models have been constructed. For the models of the countries with Fully free and Flawed democracies regimes, the determination coefficients are the highest (0.81 and 0.83). Having also examined the significance and sustainability of estimates, we can conclude that it is in the countries with these types of regimes that the impact of corruption on public spending performance is the greatest. The analysis of the models built for the countries with different types of regimes showed that the highest increase in public spending efficiency score (0.912) caused by decrease in corruption was in the countries with Authoritarian type of regime and the smallest increase in efficiency estimate (0.771) was in the countries with Fully free mode. At the same time, the assessment of public spending efficiency within average corruption level in the rating scale (-2.5 to 2.5) is higher (0.213) for the countries with the highest Fully free democracy level than the same estimate in the less democratic countries.

Comparing the power of the impact of the corruption level on the resulting trait - the efficiency of public spending with the strength of the impact on this indicator of the level of democracy made it possible to conclude that the most important factor we have is the level of corruption for all four groups of countries with various democracy types. However, for the countries with Fully free regime, the electoral process and pluralism also affect the assessment of public spending efficiency.

We are of opinion that the prospects for further research in this area are to find out more about the link between corruption and the public spending efficiency. Experiments may be used to simulate the behaviour of economic agents, as well as corruption under the delivery of public services. This will enable us to examine the nature of the corruption's impact on the public spending efficiency.

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