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DOES ECONOMIC FREEDOM DETERMINE THE CONTROL OF CORRUPTION?

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Abstract
The article aims to examine whether or not the economic freedom (EFI) matters for the control of corruption (COR). The relationship between variables of interest is explored in three panels. The first overall panel contains 113 countries; the second contains 36 developed countries, while the third panel contains 77developing countries in the time span ranging from 2002 to 2016. The findings of linear dynamic panel data estimators confirm the positive impact that is found to be higher in terms of developed countries. Granger causality test indicates a bidirectional relationship between EFI and COR in overall sample as well as in the case of both, developed and developing countries. ARDL framework reports a significant positive relationship between variables of interest in both, short- and the long-term. Therefore, the overall conclusion indicates that policy makers need to enable and create legal and institutional basis for securing economic freedom in order to improve the control of corruption.

Keywords: *ARDL approach, Causality, Control of corruption, Economic freedom*
JEL Classification: *K29,O11,O29*

Introduction

Economic freedom is one of the most commonly used concepts, both by economic experts and by the governments of countries all over the world. It can be defined as the freedom to engage in the economic activity on personal choice each individual. Apart from the options of the personal choice, the positive effects are manifested through voluntary exchange, freedom to compete in markets, and protection of person and property.

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Yet without establishing institutions and policies, that would allow and protect property rights, voluntary exchange and individuals, it is highly unlikely that the economy is enjoying the benefits of true economic freedom. Both theory and praxis agree that economic freedom leads to economic growth of the country.

But when it comes to highlighting the link between economic freedom and the control of corruption it is important to emphasize that both are multidimensional phenomena. Moreover, there are only few studies that occupy with this matter. This interaction is particularly interesting in case of developing countries. According to Karabegovic et al. (2003), countries with "the greatest economic freedom operate with a minimal level of government intervention, relying upon markets to answer the basic economic questions". Each time governments substitute taxes, expenditures, and regulations for personal choice, they reduce economic freedom. In times like this some people may be willing to give money to public employees in order to achieve some personal goals and thus establish the corrupt behavior. Unfortunately, this bribery won't be directed to the productive areas, but to those where opportunity for rent is the greatest.

The mediating role of government on the relationship analyzed in Graeff and Mehlko (2003) is of great importance. Hence, from a theoretical point of view it will be unlikely to expect the automatic link between these economic terms of interest (Graeff and Mehlko, 2003). In addition, authors indicate that government's restrictions attract civil servants to take bribes. Even in the case of free economy, one can be attracted to use methods against law in order to increase competitiveness.

Recent literature recognizes different types of corruption. The division criteria are in general based on the traditions and norms of the country, whether the country is developed or not etc. Taking previous paragraphs into account, the question on the sign of the relationship between economic freedom and corruption still remains open. Therefore, the motivation of this study is to attempt to answer this question by providing empirical evidenceon the matter.

This article examines the nature of interplay between the economic freedom (EFI) and control of corruption (COR), by using panel data econometrics. The significance of this work is multiple. From a scientific aspect, the paper examines the persistence/absence of deviations from the interaction between economic freedoms and control of corruption in cases of developed and developing countries, simultaneously analyzing the effects in the short- and long-term. Contribution to the literature is reflected in the attempt to clarify the contradictory results of previous research on the relationship between these two categories, by comparing the impact in the long- and short-term, using ARDL framework. If we talk about policy implications of this work, the results aim to show the importance of enabling and creating legal and institutional basis for securing free market and equal economic freedom of all participants as the basis for better control of corruption.

The rest of the paper proceeds as follows. In Section II authors summarize the literature on the relationship between the control of corruption and economic freedom. Section III gives a detailed description of the data, variables as well as methodology. Section IV summarizes the results of the empirical research on the matter. Finally, we conclude in Section V.

1. Literature Review

To provide a brief summary on the empirical evidence on the link between control of corruption and economic freedom, it is important to emphasize that the compassionate government can play an important role in the negative effect of economic freedom on corruption. However, if the government acts in the opposite way, the negative direction running from corruption to economic freedom is expected. Thus, most of the studies to date agree that economic freedom tends to reduce the corruption (Carden and Verdon, 2010; Chafuen and Guzmàn, 2000; Shen and Williamson, 2005). Apart from these findings, it is important to emphasize some conflicting results. For instance, Billger and Goel (2009) suggest that economic freedom does not reduce the corruption, and it can even have a positive impact. These findings suggest that countries in general react differently to economic freedom which is strongly determined by their level of development. However,

the role of government in the reduction of corruption is well established in the literature (Lambsdorff, 2007).

Although there are some studies suggesting that corruption isn't necessary a bad thing, most authors agree with Mironov (2005),Fahad (2016), Audi and Ali (2017) and Anoruo and Braha (2005) conclusions, in which they state that, corruption might improve efficiency only in the case when the private costs associated with regulation outweigh the social benefits, but often corruption leads to negative social costs. Hence, the control of corruption tends to stimulate the environmental policy in addition to its strong stimulatory role on economic growth (Pandit and Laband, 2009).

By using a series of panel GMM estimators, Yamarik and Redmon (2017) found strong evidence that corruption lowers economic freedom, but little evidence that freedom reduces corruption. On the other hand, in case of U.S. economy Apergiset al. (2012) show a negative impact of human capital, income as well as economic freedom on corruption. The necessity to control for the macroeconomic role of human capital in financial developmentis indicated by Satrovic (2017) in the case of Turkey. Apart from this result, income inequality is found to have a significant positive impact.Furthermore, a cross-country panel study done by Sahaet al. (2009) showed that economic freedom first and then democracy is vital for reducing corruption.

Chafuen and Guzman (2000) were pioneers in providing empirical evidence on the negative relationship between economic freedom and corruption. Paldam (2002) supports the results of Chafuen and Guzman (2000) while controlling for the impact of education, income and income inequality. As an intriguing conclusion, Paldam (2002) indicates that: “the economic transition from poor to rich strongly reduces corruption, while periods of high inflation increase corruption”.

To conclude the literature review section, we will present briefly the dimensions of economic freedom that tend to affect the corruption. For instance, Lambsdorff (2007) shows the negative impact between competition and corruption. Corruption also tends to negatively influence small business where entrepreneurs need to pay bribes in order to deal

with public officials (Svensson, 2003). At last, Acemoglu and Verdier (1998) suggest that if the ruling system tends to protect the property rights, reduce in corruption can be expected, whereas the weak ruling system can stimulate the corruption.

So why do these studies differ? One possible explanation is that both economic freedom and corruption are multidimensional and so it is essential to review which element of economic freedom impacts corruption and versus. Also it's important to see whether this link is intensified by the level of development of the country or not. The confirmation of this claim can be found in the research of Graeff and Mehlko (2003) stating that the corruption is strongly influenced by the ease of finishing up tasks in poor countries while the legal structure plays a key determinant of corruption in rich countries.

2. Data, Variables and Methodology

2.1. Data and Variables

In order to investigate the relationship between economic freedom and the control of corruption, there was a need to select appropriate proxy variables. One of the most challenging tasks in this article was to find appropriate proxy variable of economic freedom. Heckelman (2000), Dawson (2003) and Ozcanet al. (2017) indicate that the Index of Economic Freedom (***EFI***) published by The Heritage Foundation, is appropriate proxy variable of economic freedom. Therefore, this variable is accepted in this article as well.

On the other hand there was a need to select appropriate proxy variable of the control of corruption. Several authors as well as different organizations in the world are making a great effort to measure corruption (Aidt, 2009). For this purpose different indicators based on the results of survey responses are constructed. Aidt (2009) indicates that the three most popular indicators of corruption are perception index constructed by Transparency International; the corruption index from the International Country Risk Guide; and the control of corruption indicator from the World Bank. Control of corruption: percentile rank is considered appropriate in this article. The value of this rank ranges between 0 (the lowest rank) and 1 (the highest rank).

Appendix 1 summarizes the countries of interest. The World Bank Indicators (2017) and The Heritage Foundation served to collect the panel data at the annual basis. Panel data are used and collected since these are more informative and enable to control for individual heterogeneity. The authors attempt to include the last available data, hence the data availability was the main criteria while creating a database. UN country classification is used to distinguish between developed and developing countries.

2.2. Methodology

The econometric methodology applied in this article follows four steps. First, the panel unit root is tested for the variables. Furthermore, panel regression model is formed and estimated using linear static and dynamic panel data estimators (Satrovic, 2018a).Granger causality test based on panel data is used to explore the potential causal relationship between variables of interest while we employ ARDL approach to present the relationships in the short- and long-term (Satrovic, 2018b).

The stationary properties have been tested using Fisher-type unit root test in this article. This test estimates p-values for every single individual (cross-section basis) in order to examine the stationary properties in the overall sample of individuals (panel basis). Models will be initially estimated using linear static panel data estimators. Hausman test will be used to decide between fixed and random effects (Satrovic, 2018a; Somun-Kapetanovic, et al. 2016).

To incorporate dynamics into the model, model equation can be written as an AR (1) model in general form in the following (Satrovic, 2018a):

$$y_{it} = \alpha_t + (v+1)y_{it-1} + \beta x_{it} + u_i + \varepsilon_{it} \quad (1)$$

where $y_{it}$is the outcome, y_{it-1} is the lagged value of the outcome, x_{it} represents a vector of regressors, u_i is individual effect, ε_{it} − error term while α_t represents the period specific intercept terms to capture changes common to all countries (Somun-Kapetanovic, et al. 2016).

The coefficients in equation (1) can be derived using Arellano-Bover two-step GMM estimator. Potential bias due to the endogeneity of some of the regressorsand potential dynamics will be controlled. Diagnostic tests include: Sargan test of overall validity of instruments and the test of second order autocorrelation (Satrovic, 2018a).

Moreover, the impacts in the short- and long-run will be examined using ARDL approach. ARDL is considered appropriate since it controls for the relationship in the long run disregarding the order of integration of variables (Pesaran et al., 1999). Attaoui et al. (2017) and Satrovic (2018b) formalize the model as following (Eq. 2):

$$\Delta Y_{1,it} = \alpha_{li} + \gamma_{li} Y_{1,it-1} + \sum_{l=2}^{k} \gamma_{li} X_{1,it-1} + \sum_{j=1}^{p-1} \delta_{lij} \Delta Y_{1,it-j} + \sum_{j=0}^{q-1} \sum_{l=2}^{k} \delta_{lij} \Delta X_{1,it-j} + \varepsilon_{1,it} \quad (2)$$

where Y is the outcome and X is the regressor. Error term is denoted by ε_{it} while Δ represents the first difference operator.

Lastly, the focus of this research is to provide evidence on the potential causal relationship between COR and EFI while using annual panel data and panel causality techniques. For this purpose Dumitrescu-Hurlin (DH) test is used. Lopez and Weber (2017) formalize the regression to test for the causality in panel data as follows (Eq. 3):

$$y_{i,t} = \alpha_i + \sum_{k=1}^{K} \beta_{ik} y_{i,t-k} + \sum_{k=1}^{K} \mu_{ik} x_{i,t-k} + \varepsilon_{i,t} \quad (3)$$

where $x_{i,t}$ and $y_{i,t}$ are the observations of two stationary variables for individual i in period t. Coefficients are allowed to differ across individuals. The necessary precondition is to operate with balanced panel and to have K equal for every i.

3. Results of the Research

The empirical research part first summarizes the most important measures of the descriptive statistics. The results are presented in the Table 1:

Table 1: Descriptive Statistics

	All countries		Developed countries		Developing countries	
Statistics	COR	EFI	COR	EFI	COR	EFI
mean	53.708	62.137	82.717	70.125	40.137	58.399
sd	29.025	10.669	14.818	7.073	23.572	9.993
max	100.000	90.100	100.000	83.100	98.990	90.100
min	0.000	21.400	40.404	48.700	0.000	21.400
skewness	0.007	-0.176	-0.671	-0.284	0.459	0.107
kurtosis	1.798	3.659	2.195	2.634	2.496	5.034

Source: Authors

Average economic freedom index equals 62.137 for 113 observed countries. The highest reported value of EFI equals 90.1 while the lowest equals 21.4. Higher average economic freedom index is reported for developed countries compared to developing. When it comes to control of corruption, average percentile rank equals 53.708 for the overall sample. The highest COR value reported is 100 while the lowest equals 0. Higher average COR is reported for developed (82.717) compared to developing countries (40.137). The units of measurement of the variables ease interpretation. Therefore, there is no need for transformation.

Table 2: Fisher-Type Unit Root Test

	All countries			**Developed countries**			**Developing countries**		
		Statistic	p-value		Statistic	p-value		Statistic	p-value
COR	P	611.0184	0.0000	P	202.3252	0.0000	P	417.9012	0.0000

EFI	Z	-14.5847	0.0000	Z	-8.2184	0.0000	Z	-12.1529	0.0000
	L*	-14.7575	0.0000	L*	-8.6017	0.0000	L*	-12.2284	0.0000
	Pm	18.1097	0.0000	Pm	10.8604	0.0000	Pm	15.0372	0.0000
	P	692.2458	0.0000	P	236.3039	0.0000	P	455.0426	0.0000
	Z	-16.1125	0.0000	Z	-9.4918	0.0000	Z	-13.0788	0.0000
	L*	-16.9729	0.0000	L*	-10.3583	0.0000	L*	-13.5606	0.0000
	Pm	21.9304	0.0000	Pm	13.6920	0.0000	Pm	17.1535	0.0000

Source: Authors

The results of unit root test are reported in Table 2. It is clear from the results that the null hypothesis on unit root is rejected for all variables in terms of 113 observed countries as well as for developed and developing countries (for 1% level of significance).

Since Fisher unit root tests confirm the rejection of the null hypothesis on the existence of unit root for all variables in terms of 113 observed countries as well as for developed and developing countries (for 1% level of significance), a panel regression model is formed and estimated. Results of Hausman test suggest fixed effects. Coefficients with economic freedom index (Table 3) are reported to be significant and positive. The strongest impact is reported for developing countries.

Table 3: Linear Static Panel Data Estimators

VARIABLES	(1)	(2)	(3)
	All countries - FE	Developed countries - FE	Developing countries - FE
EFI	0.403***	0.3384***	0.4295***
	(0.0448)	(0.0549)	(0.0582)
Constant	28.65***	58.9875***	15.0529***
	(2.783)	(3.8558)	(3.4044)

Hausmantest	1040.52	540	53.87
p value	0.0000	0.0000	0.0000
Observations	1695	540	1155

*Note: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1*

Source: Authors

However, the robustness tests indicate that the assumptions on no-autocorrelation and homoscedasticity are not satisfied. In addition, the dynamic trend is expected in the observed variables. Therefore, system GMM two step estimator is suggested to deal with the aforementioned estimation issues. Table 4 summarizes the obtained results. Results of system GMM two step estimator indicate a significant positive impact of EFI on COR for overall sample. The obtained coefficients are much smaller comparing to the results of linear static panel data estimators. Therefore, the presence of potential dynamics and endogeneity that is not controlled tends to overestimate the impact of EFI on COR. The strongest impact is reported in terms of developed countries.

Table 4: Linear Dynamic Panel Data Estimators

VARIABLES	(1) All countries - GMM	(2) Developed countries - GMM	(3) Developing countries - GMM
L1.COR	0.809***	0.8696***	0.8070***
	(0.00524)	(0.0160)	(0.0150)
EFI	0.0289***	0.1331***	0.0368***
	(0.00730)	(0.0205)	(0.0103)
Constant	8.820***	1.6660	10.0323***

	(0.458)	(1.3552)	(0.5551)
Observations	1582	504	1078
Sargan test p value	0.5053	1.000	0.9821
AR(II) p value	0.4201	0.2810	0.1963

*Note: Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1*

Source: Authors

Wald statistics tests are employed to explore whether or not causality links exist between the variables. Table 5 summarizes the obtained results.

The bidirectional causal relationship between economic freedom and control of corruption is reported for the 113 observed countries as well as for developed and developing, implying that economic freedom tends to foster the control of corruption. Moreover, the obtained results indicate that control of corruption tends to increase economic freedom in the observed panel of countries. This is due to the fact that proper government regulations would lead to proper anti-corruption policy especially in the countries with greater economic freedom (Pieroni and d'Agostino, 2013).

Table 5: DH Granger Non-Causality Test Results

	Dependent variable	Independent variable	W-bar	Z-bar	Z-bar tilde	Decision
All countries	COR	EFI	8.5845	23.2352 (0.0000)*	3.8104 (0.0001)*	EFI Granger causes COR.
	EFI	COR	8.7149	24.8012 (0.0000)*	3.9490 (0.0001)*	COR Granger causes EFI.
Developed countries	COR	EFI	4.4389	7.3168 (0.0000)*	2.8196 (0.0048)*	EFI Granger causes COR.
	EFI	COR	4.9878	8.9635	3.6930	COR Granger causes

				(0.0000)*	(0.0002)*	EFI.
Developing countries	COR	EFI	9.5654	23.5195 (0.0000)*	4.0061 (0.0001)*	EFI Granger causes COR.
	EFI	COR	9.5448	23.4459 (0.0000)*	3.9881 (0.0001)*	COR Granger causes EFI.

Note: - p value*

Source: Authors

Table 6: ARDL Approach

			Coef.	**St. Error**	**z**	**P>z**	**95% Conf. Interval**	
	ECT							
		EFI	0.076	0.044	1.750	0.080	-0.009	0.162
All countries	SR							
		ECT	-0.408	0.024	-17.000	0.000	-0.455	-0.361
		EFI D1.	0.129	0.058	2.210	0.027	0.014	0.243
		_cons	20.715	1.836	11.280	0.000	17.117	24.313
	ECT							
		EFI	0.150	0.051	2.960	0.003	0.051	0.249
Developed countries	SR							
		ECT	-0.414	0.044	-9.420	0.000	-0.500	-0.328
		EFI D1.	0.132	0.075	1.770	0.077	-0.014	0.279
		_cons	30.756	3.728	8.250	0.000	23.448	38.063
	ECT							

		EFI	0.116	0.070	1.660	0.097	0.021	0.211
Developing countries	SR							
		ECT	-0.401	0.030	-13.330	0.000	-0.460	-0.342
		EFI D1.	0.152	0.079	1.920	0.054	-0.003	0.307
		_cons	19.846	2.061	9.630	0.000	15.805	23.886

Source: Authors

Moreover, we have used ARDL framework to estimate the long- and short-term relationship between economic terms of interest. Table 6 summarizesthe obtained results. The error correction is significant. Hence, the analyzed process is found to converge in the long-run. The study reveals a positive and significant relationship between EFI and COR in the long-as well as short-term(for a 10% level of significance).

The obtained results suggest greater responsiveness to the change in economic freedom in terms of developed countries in the long-term. However, control of corruption in developing countries is found to be more responsive to the changes in economic freedom compared to developed countries. A positive relationship is suggested by Graeff and Mehlkop (2003).

Conclusion

Empirical research, up-to-date, that analyzes the relationship between variables of interest highlights the positive impact of economic freedom on control of corruption. Therefore, the economic freedom is expected to foster the control of corruption. However, recent studies did not analyze in detail the long- and short-term relationship between economic terms of interest. This is why this study aims to fill in this gap in literature. The relevance of economic freedom on control of corruption is explored in three panels. The first overall panel contains 113 countries; the second contains 36 developed countries, while the third panel contains 77 developing countries over the period 2002-2016.

Models are initially estimated using linear static panel data estimators. Results of Hausman test suggest fixed effects. Coefficients with economic freedom index are reported to be significant and positive. The strongest impact is reported for developing countries. However, the robustness tests indicate that the assumptions on no-autocorrelation and homoscedasticity are not satisfied. In addition, the dynamic trend is expected in the observed variables. Therefore, system GMM two step estimator is suggested to deal with the aforementioned estimation issues. Results of system GMM two step estimator indicate a significant positive impact of EFI on COR for overall sample. The obtained coefficients are much smaller comparing to the results of linear static panel data estimators. Therefore, the presence of potential dynamics and endogeneity that is not controlled tends to overestimate the impact of EFI on COR. The strongest impact is reported in terms of developed countries.

Granger causality test indicates the bidirectional causal relationship between economic freedom and control of corruption for the 113 observed countries as well as for developed and developing, implying that economic freedom tends to foster the control of corruption. Moreover, the obtained results indicate that control of corruption tends to increase economic freedom in the observed panel of countries. Moreover, we have used ARDL framework to estimate the long- and short-term relationship between economic terms of interest. The error correction is significant (for 1% level of significance). The study reveals a positive and significant relationship between EFI and COR in the long-as well as short-term(for a 10% level of significance).

The policy implications of the general results of this article point out that economic freedom appeared as the policy variable for accelerating control of corruption in both, developed and developing countries. In order to increase the control of corruption, policymakers must create incentives for economic freedom in terms of property rights, government integrity, judicial effectiveness, tax burden, government spending, fiscal health, business, labor, monetary, trade, investment and financial freedom. The necessity also arises from the facts that that economic freedom tends to accelerate the control of corruption in both, short- and long-term.

Recommendations for future research include:

- expanding the sample of research countries
- elaborating individual indicators presented in Index of Economic Freedom in order to investigate the effect of each category on the suppression of corruption
- detailed analysis of the change of scores and ranking of the corruption index.

Presented expanding of research would conclude better information for government policies, both for developed and developing countries.

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Appendix 1: Countries in the sample

Albania	Cuba	Ireland*
Algeria	Cyprus*	Italy*
Argentina	Czech Rep.*	Jamaica
Australia*	Denmark*	Japan*
Austria*	Ecuador	Jordan
Azerbaijan	Egypt	Kazakhstan
Bahrain	Estonia*	Kenya
Bangladesh	Ethiopia	Kuwait
Belarus	Fiji	Kyrgyz Rep.
Belgium*	Finland*	Lao PDR
Bolivia	France*	Latvia*
Bosnia and Her.	Georgia	Lithuania*
Botswana	Germany*	Luxembourg*
Brazil	Ghana	Macedonia
Bulgaria*	Greece*	Malaysia
Cambodia	Guyana	Mali
Cameroon	Haiti	Malta*
Canada*	Honduras	Mexico
Chad	Hong Kong	Moldova
Chile	Hungary*	Mongolia
China	Iceland*	Morocco
Colombia	India	Mozambique
Costa Rica	Indonesia	Namibia
Croatia*	Iran	Nepal

Netherlands*	Russian Fed.	Turkey
New Zealand*	Saudi Arabia	Uganda
Nicaragua	Senegal	Ukraine
Nigeria	Singapore	United Arab Emirates
Norway*	Slovak Rep.*	United Kingdom*
Oman	Slovenia*	United States*
Pakistan	Spain*	Uruguay
Panama	Sri Lanka	Uzbekistan
Paraguay	Sweden*	Venezuela, RB
Peru	Switzerland*	Vietnam
Philippines	Tanzania	Zambia
Poland*	Thailand	Zimbabwe
Portugal*	Trinidad and Tobago	
Qatar	Tunisia	
Romania*		

Note: * denotes developed countries. The rest are developing countries.