Research Article

# The Impact of Media Freedom on Corruption: A Cross-Country Panel Analysis
# ผลกระทบของเสรีภาพสื่อต่อการทุจริต: การวิเคราะห์ระหว่างประเทศโดยใช้ข้อมูลพาแนล

**Tanrapan Tanavichcha**[1]

*Article History*
Received: July 2, 2023
Revised: September 19, 2023
Accepted: September 29, 2023

**Abstract**

The objective of this study is to investigate the impact of press freedom on corruption and also analyze how internet freedom affects corruption. The empirical analysis involved an unbalanced panel of 118 countries from 1998 to 2017, thus covering a period of 20 years for press freedom and corruption and an unbalanced panel of 46 countries from 2011 to 2020 covering a period of 10 years for the analysis of internet access and corruption. The results show that press freedom and its legal and political influences have statistically significant negative effect on corruption. A free press reduces corruption. However, in the empirical analysis involving internet freedom on corruption, the study finds no significant effect on corruption. Furthermore, it finds that countries with high exports of natural resources tend to increase corruption, the factors of economic growth and political rights can reduce corruption. The results are consistent in both parts of press and internet media.

***Keywords:*** *Media, Corruption Perception Index, Press Freedom, Internet Freedom*

[1] School of Development Economics, National Institute of Development Administration
Email: tanrapan.tan@stu.nida.ac.th

**บทคัดย่อ**

การศึกษานี้มีวัตถุประสงค์เพื่อทดสอบผลกระทบของเสรีภาพสื่อต่อการทุจริต รวมถึงวิเคราะห์ว่าเสรีภาพในการใช้อินเทอร์เน็ตส่งผลต่อการทุจริตอย่างไร โดยใช้วิธีการวิเคราะห์ข้อมูลเชิงประจักษ์ ข้อมูลที่ใช้เป็น unbalanced panel data จำนวน 118 ประเทศ ตั้งแต่ปีค.ศ. 1998-2017 ซึ่งครอบคลุมระยะเวลา 20 ปี สำหรับการวิเคราะห์ผลกระทบของเสรีภาพสื่อกับการทุจริต และ unbalanced panel data จำนวน 46 ประเทศ ตั้งแต่ปี ค.ศ. 2011-2020 ซึ่งครอบคลุมระยะเวลา 10 ปี สำหรับการวิเคราะห์ผลกระทบของการเข้าถึงอินเทอร์เน็ตและการทุจริต ผลการวิจัยพบว่าการมีเสรีภาพของสื่อทั้งในภาพรวมและอิทธิพลทางด้านกฎหมายและการเมือง ส่งผลในทางลบต่อการทุจริตอย่างมีนัยสำคัญทางสถิติ คือการมีเสรีภาพในสื่อสารมวลชนนั้นสามารถช่วยลดการทุจริตได้ อย่างไรก็ตามในการวิเคราะห์เชิงประจักษ์เกี่ยวกับเสรีภาพทางด้านอินเทอร์เน็ตต่อการทุจริต การศึกษาไม่พบว่าการมีเสรีภาพในการเข้าถึงอินเทอร์เน็ตส่งผลต่อการทุจริตอย่างมีนัยสำคัญ นอกจากนี้พบว่าในประเทศที่มีการส่งออกทรัพยากรธรรมชาติมากมีแนวโน้มที่จะมีการทุจริตเพิ่มขึ้น ส่วนปัจจัยทางด้านการเติบโตทางเศรษฐกิจและการมีส่วนร่วมทางการเมืองของประชาชนช่วยลดปัญหาการทุจริตได้ โดยผลลัพธ์สอดคล้องกันทั้งในส่วนของรูปแบบสื่อทั่วไปและสื่ออินเทอร์เน็ต

***คำสำคัญ:*** *สื่อ ดัชนีการรับรู้การทุจริต เสรีภาพสื่อ เสรีภาพทางอินเทอร์เน็ต*

## Introduction

### Background

Corruption is when public office holders use their office for personal benefits. This is generally accepted that corruption is illegal and punishable by law when caught. Guerrero and Rodríguez-Oreggia (2008) showed that individuals commit corruption by taking into account bribes, opportunity costs, and law enforcement to achieve the expected results. Corruption is caused by the actions of political and state power holders, which negatively affect the inefficient use of the country's resources, resulting in an unequal distribution of resources. This problem inevitably brings negative impacts to economic, political and social aspects. The media therefore play a role in monitoring the wrongdoings of state power users by acting as a forum for the free expression of public opinion and as mediators between groups for exchanging information together in society (Lessmann & Markwardt, 2010; Pratama & Setyaningrum, 2015). It is generally believed that a free and independent media acts as a monitoring devices and increases the likelihood of being exposed when public officers do corrupt activities (Brunetti & Weder, 2003).

This belief is supported by the existing literature. The past studies have stressed that the media, if free and independent, can expose corrupt activities and therefore make people scared of engaging in corruption. For example, Ahrend (2002) used regression analysis and concluded that the high degree of freedom of the media would lower the level of corruption. A free media can ease the efforts to detect corruption. Chowdhury (2004) also found similar results. Some other studies have argued the media's duty in fighting corrupt activities is overestimated (Graber, 1986; Vaidya, 2005). The media itself can be corrupt or corrupted and hide or do not report evidence of corruption among public officials. This research examined media freedom, meaning all forms of media coverage, both traditional and online, to study the impact and clarify the results of two types of the media.

**Research Objectives**

There are two objectives of this study: first, the paper examines the impact of internet access on corruption. The analysis covers various forms of restriction on internet use and how each affects corruption across countries. Second, the paper also investigates the relationship between press freedom and corruption using more complete data than previous similar study (Freille, Haque, & Kneller, 2007). The paper studies how total press freedom index and its sub-indices affect corruption. To achieve these objectives. The study formulates and tests the hypotheses outlined in the next sub-section.

**Scope of Study**

The empirical analysis involved an investigation of unbalanced panel of 118 countries from 1998 to 2017 covering a period of 20 years to explore press freedom and corruption part and an unbalanced panel of 46 countries from 2011 to 2020 covering a period of 10 years for the analysis of internet access and corruption. All the sampled countries are those with available data for all the variables used in the analysis.

**Contribution**

This research focuses on the study of media freedom, which consists of two main parts: press freedom and internet freedom. First, the study used updated data of press freedom to revisit how freedom of the press and corruption are connected. Second, the study adds to existing knowledge by expanding the analysis to cover newly available internet freedom data. This is new as

previous studies do not investigate how various forms of restrictions on the internet affect corruption. This disaggregated measure considers obstacles to internet access, limits on contents and limits on user rights separately and how each affects corruption.

**Literature Review**

The related literature is reviewed to make clear the research gap and how this study adds to previous literature on the linkage between media freedom and corruption. There are two parts of the literature that is reviewed. The first part discussed studies on press freedom (print and broadcast media) and its impact on corruption. The second part review the previous studies on the effect of ICT and internet on corruption.

In the first group of literature, a large majority of the literature that studied the effect of freedom of the press on corruption found that press freedom reduces corruption. A free press monitors and exposes corrupt public office holders. In this way, the media increases the chance of being caught when doing corrupt activities. Corrupt officials being scared of detection and punishment avoid or limit corrupt activities. Freille et al. (2007) studied the connection between press freedom and corruption using modified extreme bound analysis. They tested different measures of press freedom on corruption. The finding showed that higher freedom of the press reduced corruption. Brunetti and Weder (2003) also found that higher press freedom leads to less corruption. Ahrend (2002) studied the effect of freedom on the press and education on corruption and found that in the absence of press freedom, corruption is higher. In addition, the study found that if education improved civil society groups' ability to monitor public office holders, it reduces corruption. Hamada, Abdel-Salam, and Elkilany (2019) proved that there is a strong press freedom and corruption nexus. A highly free press leads to the reduction in corruption. Also the study showed that rule of law reduces corruption whether the country has free press or not. Chowdhury (2004) and Kalenborn and Lessmann (2013) analyze the effect of democracy and press freedom on corruption. They showed that free press and democracy have negative effect on corruption. If more people vote during elections and there is more freedom of the press, corruption would decrease in the long term.

The second part reviewed the previous studies on ICT and found that the research on internet and social media usage and corruption are scarce due to lack of reliable data. Some studies used ICT as a general measure of both internet and social media usage. Others specifically used the

level of internet penetration and a particular type of social media as proxies for internet and social media usage respectively. The results on the influence of social media and internet penetration on corruption are also not conclusive.

Several studies have studied the relationship between e-governance innovations and perception of corruption (see for example, Andersen, 2009; Garcia-Murillo, 2013; Shim & Eom, 2009). Among the few studies that have attempted to empirically examine the impact of internet use on corruption, Elbahnasawy (2014) found that e-governance is very effective in reducing corruption through improved telecommunication infrastructure and internet adoption. The paper asserted that e-governance and internet adoption are complements in the fight against corruption. Similarly, Goel, Nelson, and Naretta (2012) argued that internet use is negatively correlated with corruption perception and corruption incidence by enhancing access to information. Some studies have used social media as a proxy instead of Internet use such as Jha and Sarangi (2017)'s that used Facebook as a proxy for social media. The paper asserted that internet penetration and social media have negative impact on corrupt activities. Enikolopov, Petrova, and Sonin (2018) provided an answer that blog posts reduce market returns on state controlled companies in Russia. This is because the blog posts exposed corrupt activities within these state-owned enterprises.

The growing literature on the linkage between ICT and corruption focused on using internet penetration and a particular type of social media. However, the number of internet users and social media use are insufficient as indicators. Since it does not take into account legal restrictions and political influences, which are barriers to access, limiting the rights of users and content. Internet is highly censored in most authoritarian regimes across the world and therefore using the number of internet users to estimate the effect of internet on corruption may produce misleading results. This study explores the internet freedom data assembled by Freedom House to examine the freedom to access the internet and contents on the fight against corruption. In doing so, it helps bridge the gap in this line of literature.

**Hypotheses**

In the existing literature (Brunetti & Weder, 2003; Vemuri & Costanza, 2006), the aggregate index of press freedom is frequently used as a proxy to explore how free the press is in most countries. Freille et al. (2007) in addition to using aggregate measure of press freedom, examined the effect of each subcategory of aggregated press freedom index. The three subcategories of

aggregate measure of press freedom are legal, political and economic influences on the press. The individual relationship of the subcategories with corruption were then analyzed. The findings showed some of the subcategories of press freedom index have greater effect on corruption than others. Economic and political influence on the media were found to have negative relationship with corruption while legal influences have insignificant effect. Following these observations from the literature, this study formulated this hypothesis:

H1: Press freedom would reduce corruption.

It is observed from the review of the literature that as access to information and communication technology (ICT) increases, corruption activities are reduced. This is because as the freedom on the internet to access content and user right increases, it also increases the probability of being caught when doing corrupt activities. Corrupt officials being scared of detection and punishment avoid or limit corrupt activities. The study follows this observation in literature and formulate the following hypothesis:

H2: Freedom on the internet would reduce corruption.

## Data and Methodology

### Dependent variables

The dependent variable is Corruption Perception Index (CPI) invented by Transparency International. This index is used extensively in the corruption-press freedom literature. CPI uses expert opinion from different countries to measure the perceived levels of public sector corruption globally. CPI is measured on a scale of zero which means highly corrupt to 100 which means very clean. In line with the previous studies, this study also uses CPI to capture the level of perceived corruption in a country.

### Independent variables

The study uses two main independent variables in separate regression analysis; press freedom index and internet freedom index. Press freedom measures freedom of television, radio and the print media. Internet freedom on the other hand, measures various restriction and limitation on internet use including user rights.

The study used the Press Freedom Index by Freedom House as the main measure of how free the press is across the world. The index ranks countries according to their degree of press freedom in a scale ranging from 0 (total freedom) to 100 (lack of freedom). Freedom House described

countries scoring from 0-30 = free, scores from 31-60 = partly free and scores from 61-100 = not free. Aggregate press freedom index is derived from three aspects of violations on press freedom. These are legal, political and economic influences on the media.

This study takes advantage of the newly constructed internet freedom index by Freedom House. Various forms of restrictions on internet such as limits on access, limits on content, site blocked and user rights are used to aggregate the overall measure of the freedom on the internet. Points are added up to produce a score for each of the subcategories, and a country's total points for all three represent its final score (0-100). Freedom House assigned the following internet freedom ratings: scores 0-39 = not free, scores 40-69 = partly free and scores 70-100 = free.

**Control variables**

In this research, there are control variables that affect the model as follows: education, GDP per capita, trade openness, fuel and mineral merchandise export, political rights, plurality voting system, and parliamentary system.

**Table 1** Data and source

| Data | Source |
|---|---|
| Corruption perception index | Transparency international |
| Press freedom index | Freedom house |
| Sub index for laws and regulations | Freedom house |
| Sub index for political influences | Freedom house |
| Sub index for economic influences | Freedom house |
| Internet freedom score | Freedom house |
| Sub index of obstacles to access | Freedom house |
| Sub index of limits on contents | Freedom house |
| Sub index of limits on user rights | Freedom house |
| Secondary education (% gross) | World bank |
| GDP per capita (USD) | World bank |
| Trade (% GDP) | World bank |
| Fuel and mineral (% merchandise export) | World bank |
| Political rights index | Freedom house |
| Plurality voting system dummy | Political institutions, World bank |
| Parliamentary system dummy | Political institutions, World bank |

**Econometric Methodology**

**Granger causality test**

The study tested the direction of causality of press freedom and corruption and also internet freedom and corruption. The extent of media freedom could cause a change in the level of corruption. Likewise, the level of corruption in a country could determine the freedom of the media. The aim to conduct the causality test is to determine the direction of causality in the sampled country. It can be seen from the Table below that for press freedom and corruption, causality runs from free press to corruption. Similarly, for internet freedom and corruption, causality is from internet freedom to corruption.

**Table 2** Granger causality test for press freedom

| Null hypothesis is: | F-statistic | Prob. |
|---|---|---|
| Press freedom does not granger cause corruption | 2.8942 | 0.0341 |
| Corruption does not granger cause press freedom | 1.3099 | 0.2695 |

**Table 3** Granger causality test for internet freedom

| Null hypothesis is: | F-statistic | Prob. |
|---|---|---|
| Internet freedom does not granger cause corruption | 3.7346 | 0.0118 |
| Corruption does not granger cause internet freedom | 0.7049 | 0.5499 |

**Fixed Effects (FE) model**

As for equation (1), $Y$ is the dependent variable, $X$ is a vector of main independent variables (media freedom), $Z$ is a vector of control variables, $\alpha$ is a country specific effect, $\gamma$ is a time specific effect and $\varepsilon$ is the error term. Subscript $i$ stands for country and $t$ is time. For FE model $\alpha_i$ is assumed to be correlated with the independent variables and is included as intercept term. This means that each country in the sample have different slope parameter $\alpha_i$. The FE model is written as

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 Z_{it} + \alpha_i + \gamma_t + \varepsilon_{it} \qquad (1)$$

**Random Effects (RE) model**

In random effects estimation, it is assumed that there is no correlation between country specific residuals and explanatory variables. That is, the country specific effects $\alpha_i$ are distributed independently of the explanatory variables. This means that each country has the same intercept. $\omega_{it} = (u_i + \varepsilon_{it})$ is a composite error term, where the $u$ is the unobserved variability in the data. Equation (2) for RE model is written as

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 Z_{it} + \omega_{it} \quad (2)$$

**Hausman test**

The Hausman test was used in this study to determine whether there is a significant difference between the fixed effect and the random effect estimators. In the part of press freedom regressions, the result showed that, in all models, the fixed effect model is the preferred model compared to the random effect model in all models. In the part of internet freedom regressions, the random effect is confirmed to be the preferred model in all cases. As shown in Table 6 and Table 9.

## Results and Discussions

### Press freedom and corruption

From the 118 countries sampled, the average corruption perception index is 47.89 which indicates a high level of corruption globally. The media across the world can be regarded as partly free with average press freedom index of 40.07. The maximum press freedom index recorded is 93 which shows lack of press freedom and standard of deviation 21.40. Among the three sub-indices of press freedom index, political influences have the highest averages. This means that political influences are more severe compared to the economic and legal influences. Globally, countries are open with calculated average trade openness to GDP at 84.45% while the recorded mean of per capita GDP is 16186.98.

**Table 4** Descriptive statistics for press freedom

| Variable | Observation | Mean | St. dev | Minimum | Maximum |
|---|---|---|---|---|---|
| Corruption perception index | 1577 | 47.89 | 21.50 | 8.00 | 100.00 |
| Overall press freedom index | 1577 | 40.07 | 21.40 | 5.00 | 93.00 |
| Category A: laws and regulations | 1577 | 12.25 | 7.67 | 0.00 | 30.00 |
| Category B: political influences | 1577 | 15.93 | 8.95 | 0.00 | 38.00 |
| Category C: economic influences | 1577 | 11.88 | 5.85 | 0.00 | 28.00 |
| Secondary education (% gross) | 1577 | 85.47 | 28.42 | 5.29 | 163.93 |
| GDP per capita (USD) | 1577 | 16186.98 | 19533.37 | 286.43 | 105454.70 |
| Trade (% GDP) | 1577 | 84.45 | 48.40 | 18.12 | 353.79 |
| Fuel and mineral (% export) | 1577 | 14.67 | 22.58 | 0.00 | 99.65 |
| Political rights index | 1577 | 2.64 | 1.84 | 1.00 | 7.00 |
| Plurality voting dummy | 1577 | 0.56 | 0.49 | 0.00 | 1.00 |
| Parliamentary system dummy | 1577 | 0.49 | 0.50 | 0.00 | 1.00 |

Table 5 presents the results of hypothesized relationships between press freedom, its subcategories such as laws and regulations, political interference, economic interference, and corruption. The panel estimations revealed some interesting findings. The results showed that there is a significant and negative relationship between the overall index of press freedom and corruption in both fixed effect ($\hat{\beta}$ = -0.0957 $p < 0.01$) and random effect ($\hat{\beta}$ = -0.1317, $p < 0.01$) estimations as shown in model 1 and model 2, suggesting that press freedom reduces corruption in the sampled countries. The results mean that a percentage increase in press freedom will reduce corruption by 9.57% and 13.17% in model 1 and model 2 respectively, all things being equal. However, since Hausman test confirms fixed effect model to be the most appropriate, the subsequent analyses and discussion of findings were drawn from the fixed effect estimator.

The discussions were on the three subcategories of the aggregate press freedom index. These are laws and regulations, political influences and economic influences on the media. Findings with respect to the laws and regulation subcategory of press freedom showed that there is a negative and significant relationship between laws and regulations and corruption in fixed effect ($\hat{\beta}$ = -0.1592,

p < 0.01) estimations. This implies that laws and regulations that limit the freedom of the press would reduce corruption. By interpretation, a percentage point increase in laws and regulations would reduce corruption by 15.92% according to the fixed effect estimation.

More so, the relationship between political influence and corruption is negative and statistically significant in the fixed effect ($\hat{\beta}$ = -0.1325, p < 0.01) estimators. The estimated coefficients mean that a percentage rise in political influences on the press would reduce corruption by 13.25%. It can be observed that the negative impact of restrictive laws and regulations is larger than the impact of political influence on corruption. This indicates that restrictive press freedom laws and regulations have more severe effect on reducing corruption than political influences on the press.

The study further observes a negative and statistically significant relationship between economic influence and corruption level only in random effect estimators ($\hat{\beta}$ = -0.1607, p < 0.01). There is no statistically significant in fixed effect estimation. However, since Hausman test confirms fixed effect model to be the most appropriate, Economic influences on the media activities have the least impact in reducing corruption compared to laws and regulations influence and political influence from the sampled countries.

This study follows the existing literature and control for human capital using the secondary education enrollment. The results (Table 5) show a positive and statistically significant relationship between education and corruption in fixed effect model 1 ($\tilde{\beta}$ = 0.1033, p < 0.01), suggesting that an increase in secondary education enrollment would increase the corruption score in the sampled countries. The magnitude of the estimated coefficient is similar across all models. Thus, a percentage increase in secondary education enrollment would reduce the level of corruption by 10.33%. It can also be observed in the fixed effect estimations in model 3 ($\tilde{\beta}$ = 0.0934, p < 0.01), model 5 ($\tilde{\beta}$ = 0.0973, p < 0.01) and model 7 ($\tilde{\beta}$ = 0.0918, p < 0.01). Education increases the efficiency of the monitoring technology and hence leads to the reduction in corruption.

The GDP per capita was used as a control variable in the relationship between press freedom and corruption. The findings from the fixed effect estimations showed that GDP per capita has a consistently positive impact on corruption from models (1) to (8). As GDP increases, the corruption perception index increases as well. This means developed countries would have lower levels of corruption. The reason is that developed countries may have advance monitoring system and can detect and punish corrupt individuals.

The findings showed that there is a positive and statistically significant relationship between trade openness and the level of corruption in all models. This means that a country's openness to international trade reduces the level of perceived corruption. According to the estimate from model 1, a percentage increase in trade openness would lead to 3.51% decline in corruption. The findings are in line with other literature (Gokcekus & Knörich, 2006; Zakaria, 2009).

The proportion of fuel and mineral exports in merchandise exports was used to measure the natural resources endowment of a country. It is observed that a lot of natural resources in a country give government officials the opportunity to exploit the resources for their own benefits. This leads to corrupt activities. As can be seen in Table 5, there is a significant and negative relationship between fuel and mineral rents and corruption in model 3. The estimated coefficient in model 3 is $\tilde{\beta}$ = -0.0347, $p < 0.10$ and means that a percentage increase in fuel and mineral exports would lead to an increase in corruption by approximately 3.47%.

The results in Table 5 further revealed that political rights have no significant impact in models 1, 3 and 5 on corruption. However, in model 7, the coefficient of political rights is negative and statistically significant ($\tilde{\beta}$ = -0.4846, $p < 0.05$). The result in this model means that an increase in political rights increases the corruption perception score. Since the increase in the corruption score means the reduction in corruption, citizens' rights to take part in the political process would lead to the decline in corruption. In some previous papers, the similar results can be seen which suggest that political rights have the potential to reduce the level of corruption.

This study examines whether countries that adopt a plurality voting system are able to control corruption. The results revealed that the relationship between simple plurality voting system and corruption is positive and statistically significant at 1% level in the fixed effect estimations in all models. This implies that countries with plurality voting would have a decline in the level of corruption by 3.00 units, 3.11 units, 3.16 units and 3.15 units respectively compared to countries that do not practice the plurality voting system.

The study found a significant negative relationship between the countries that practice the parliamentary system of government in the sample and the level of corruption in fixed effect estimation. Random effect estimations, however, showed no significant effect of the parliamentary system on corruption. The results implied that the countries that practice the parliamentary system would have higher levels of corruptions than those that do not.

**Table 5** Estimation results for fixed effect and random effect models using press freedom as independent variable. Dependent variable: Corruption perception index.

| Variables | FE (1) | RE(2) | FE(3) | RE(4) | FE(5) | RE(6) | FE(7) | RE(8) |
|---|---|---|---|---|---|---|---|---|
| Press Freedom | -0.0957*** | -0.1317*** | | | | | | |
| | (0.02) | (0.02) | | | | | | |
| A: Laws and regulations | | | -0.1592*** | -0.1987*** | | | | |
| | | | (0.05) | (0.05) | | | | |
| B: Political influences | | | | | -0.1325*** | -0.2035*** | | |
| | | | | | (0.04) | (0.04) | | |
| C: Economic influences | | | | | | | -0.0773 | -0.1607*** |
| | | | | | | | (0.05) | (0.05) |
| Education | 0.1033*** | 0.0954*** | 0.0934*** | 0.0837*** | 0.0973*** | 0.0903*** | 0.0918*** | 0.0838*** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| GDPPC | 0.0012*** | 0.0014*** | 0.0011*** | 0.0014*** | 0.0011*** | 0.0014*** | 0.0011*** | 0.0014*** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| GDPPC squared | -0.0000*** | -0.0000*** | -0.0000*** | -0.0000*** | -0.0000*** | -0.0000*** | -0.0000*** | -0.0000*** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Trade | 0.0351*** | 0.0305*** | 0.0339*** | 0.0283*** | 0.0356*** | 0.0301*** | 0.0348*** | 0.0296*** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Fuel and mineral export | -0.0296 | -0.0622*** | -0.0347* | -0.0686*** | -0.0323 | -0.0685*** | -0.0310 | -0.0650*** |
| | (0.02) | (0.01) | (0.02) | (0.01) | (0.02) | (0.01) | (0.02) | (0.01) |
| Political rights | -0.1089 | -0.0144 | -0.2834 | -0.3637* | -0.2258 | -0.2054 | -0.4846** | -0.5858*** |
| | (0.24) | (0.23) | (0.22) | (0.21) | (0.23) | (0.22) | (0.21) | (0.20) |
| Plurality voting | 2.9951*** | 1.9474*** | 3.1080*** | 2.0484*** | 3.1595*** | 2.0921*** | 3.1479*** | 1.9830*** |
| | (0.83) | (0.72) | (0.83) | (0.73) | (0.82) | (0.72) | (0.83) | (0.72) |
| Parliamentary | -2.4717* | -0.4029 | -2.4716* | 0.0339 | -2.4406* | -0.1197 | -2.1315 | 0.3913 |
| | (1.41) | (1.09) | (1.41) | (1.10) | (1.41) | (1.08) | (1.41) | (1.08) |

**Table 5** Estimation results for fixed effect and random effect models using press freedom as independent variable. Dependent variable: Corruption perception index. (continue)

| Variables | FE (1) | RE(2) | FE(3) | RE(4) | FE(5) | RE(6) | FE(7) | RE(8) |
|---|---|---|---|---|---|---|---|---|
| Constant | 28.8838*** | 26.9510*** | 29.0522*** | 25.7640*** | 27.9804*** | 25.2983*** | 28.2038*** | 25.3472*** |
| | (1.75) | (1.61) | (1.77) | (1.63) | (1.74) | (1.55) | (1.75) | (1.60) |
| R-squared | 0.96 | 0.36 | 0.96 | 0.33 | 0.96 | 0.35 | 0.95 | 0.35 |

*significant at 10%, **significant at 5% and ***significant at 1%. Standard errors are in the parenthesis. For CPI, low score means high corruption and high score means low levels of corruption. For press freedom, low score means free press and high score means not free. For political rights, low values mean better democratic institutions.

**Table 6** Hausman test for press freedom

| | Chi-Sq. statistic | Chi-Sq d.f. | Probability | Prefered model |
|---|---|---|---|---|
| Model 1 vs Model 2 | 48.9127 | 9 | 0.0000 | Model 1 |
| Model 3 vs Model 4 | 50.1074 | 9 | 0.0000 | Model 3 |
| Model 5 vs Model 6 | 55.3487 | 9 | 0.0000 | Model 5 |
| Model 7 vs Model 8 | 57.2401 | 9 | 0.0000 | Model 7 |

**Internet freedom and corruption**

It can be seen that the average corruption perception records the mean of 43.05 and a standard deviation of 15.79. The most corrupt country has the minimum index of 18 and the country that is perceived to be the least corrupt has the maximum corruption index of 85. The sample countries record the average overall internet freedom index of 56.65 and a standard deviation of 18.78. While the minimum overall internet index is 9 that of the maximum internet index recorded in sample is 94. With respect to the subcategories of internet freedom, the average obstacles to internet access is 15.17 with the dispersion of 4.82. While the minimum obstacle to internet access is 2 that of the maximum is 25. As regards limit on access, the average limit on content is 21.70, the dispersion is 7.33, with the minimum and maximum records of 3 and 34 respectively. With respect to user rights, the average user right is 19.80 with the standard deviation of 7.94. Whereas the minimum value is 1 that if the maximum value is 37.

**Table 7** Descriptive statistics for internet freedom

| Variable | Observation | Mean | St. Dev | Minimum | Maximum |
|---|---|---|---|---|---|
| Corruption perception index | 303 | 43.05 | 15.79 | 18.00 | 85.00 |
| Overall internet freedom index | 303 | 56.65 | 18.78 | 9.00 | 94.00 |
| Category A: obstacles to access | 303 | 15.17 | 4.82 | 2.00 | 25.00 |
| Category B: limits on contents | 303 | 21.70 | 7.33 | 3.00 | 34.00 |
| Category C: user rights | 303 | 19.80 | 7.94 | 1.00 | 37.00 |
| Secondary education (% gross) | 303 | 91.70 | 22.38 | 33.76 | 157.16 |
| GDP per capita (USD) | 303 | 12507.90 | 14922.61 | 489.99 | 61173.90 |
| Trade (% GDP) | 303 | 75.81 | 48.67 | 20.72 | 324.32 |
| Fuel and mineral (% export) | 303 | 20.76 | 25.43 | 0.00 | 96.47 |
| Political rights Index | 303 | 3.78 | 2.03 | 1.00 | 7.00 |
| Plurality voting dummy | 303 | 0.64 | 0.47 | 0.00 | 1.00 |
| Parliamentary system dummy | 303 | 0.35 | 0.48 | 0.00 | 1.00 |

The second research hypothesis H2 states that all forms of freedom on the internet would reduce corruption. As shown in Table 8, estimation results failed to support H2, meaning that freedom on the internet does not have statistically significant effect on corruption. H2 is also not supported where obstacles to internet access, limits on contents, and limits on user rights are used as independent variables. It should be noted that the results are significant in all fixed effect models. As the results of Hausman test to support random effect, it is concluded that H2 is not supported.

The estimated coefficients of fuel and mineral exports showed negative and significant in all models. The coefficient in model 10 ($\tilde{\beta}$ = -0.1310, $p < 0.01$) of fuel and mineral exports means that a percentage increase in fuel exports would lead to an increase in corruption related activities by 13.10% with all else being equal. The negative effect of fuel and mineral exports on the corruption score is in line with the existing literature (Treisman, 2000).

GDP per capita tends to show a positive and significant impact on the level of corruption in all models, meaning that an increase in GDP would decrease corruption in the sampled countries. Likewise, political rights have a negative sign meaning that it reduces corruption as shown in Table

8. The result is similar to the one obtained when press freedom is used as the independent variable in Table 5. However, the estimated coefficients vary.

**Table 8** Estimation results for fixed effect and random effect models using internet freedom as independent variable. Dependent variable: Corruption perception index.

| Variables | FE (9) | RE(10) | FE(11) | RE(12) | FE(13) | RE(14) | FE(15) | RE(16) |
|---|---|---|---|---|---|---|---|---|
| Internet freedom | 0.1613*** | 0.0065 | | | | | | |
| | (0.04) | (0.05) | | | | | | |
| A: Obstacles to access | | | 0.6395*** | 0.2205 | | | | |
| | | | (0.18) | (0.17) | | | | |
| B: Limits on contents | | | | | 0.2325** | 0.1102 | | |
| | | | | | (0.11) | (0.10) | | |
| C: Limits on user rights | | | | | | | 0.3893*** | -0.0794 |
| | | | | | | | (0.09) | (0.09) |
| Education | -0.0869*** | 0.0414 | -0.0994*** | 0.0335 | -0.0852*** | 0.0405 | -0.0761*** | 0.0375 |
| | (0.02) | (0.03) | (0.02) | (0.03) | (0.02) | (0.03) | (0.02) | (0.03) |
| GDPPC | 0.0007*** | 0.0010*** | 0.0006*** | 0.0009*** | 0.0008*** | 0.0011*** | 0.0008*** | 0.0010*** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| GDPPC squared | -0.0000 | -0.0000 | 0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Trade | 0.0526*** | 0.0183 | 0.0504*** | 0.0198 | 0.0595*** | 0.0184 | 0.0505*** | 0.0184 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.0179) |
| Fuel and mineral export | -0.1110*** | -0.1310*** | -0.1078*** | -0.1211*** | -0.1139*** | -0.1322*** | -0.1131*** | -0.1261*** |
| | (0.02) | (0.03) | (0.02) | (0.03) | (0.02) | (0.03) | (0.02) | (0.03) |
| Political rights | 0.2952 | -1.1959** | -0.1545 | -1.0815*** | -0.2153 | -1.0028** | 0.3133 | -1.4141*** |
| | (0.47) | (0.47) | (0.39) | (0.40) | (0.49) | (0.45) | (0.44) | (0.44) |
| Plurality voting | -1.8181* | 1.0807 | -1.9136* | 1.2626 | -2.5404** | 1.0909 | -1.1235 | 0.8762 |
| | (1.05) | (2.61) | (1.05) | (2.60) | (1.05) | (2.65) | (1.09) | (2.59) |
| Parliamentary | 3.1848** | 1.9286 | 2.6845** | 1.7376 | 3.3302** | 1.8370 | 3.0281** | 2.3342 |
| | (1.26) | (3.14) | (1.26) | (3.11) | (1.30) | (3.18) | (1.25) | (3.12) |

**Table 8** Estimation results for fixed effect and random effect models using internet freedom as independent variable. Dependent variable: Corruption perception index. (continue)

| Variables | FE (9) | RE(10) | FE(11) | RE(12) | FE(13) | RE(14) | FE(15) | RE(16) |
|---|---|---|---|---|---|---|---|---|
| Constant | 29.3514*** | 32.2601*** | 33.1647*** | 29.8691*** | 34.8696*** | 29.4871*** | 29.3385*** | 35.3195*** |
| | (4.65) | (5.53) | (3.84) | (4.59) | (4.77) | (5.11) | (4.29) | (4.96) |
| R-squared | 0.76 | 0.37 | 0.76 | 0.37 | 0.75 | 0.36 | 0.76 | 0.37 |

*significant at 10%, **significant at 5% and ***significant at 1%. Standard errors are in the parenthesis. For CPI, low score means high corruption and high score means low levels of corruption. For internet freedom, low score means not free and high score means free. For political rights, low values mean better democratic institutions.

**Table 9** Hausman test for internet freedom

| | Chi-Sq. statistic | Chi-Sq d.f. | Probability | Prefered model |
|---|---|---|---|---|
| Model 9 vs Model 10 | 7.7926 | 7 | 0.3512 | Model 10 |
| Model 11 vs Model 12 | 7.3261 | 7 | 0.3957 | Model 12 |
| Model 13 vs Model 14 | 7.4133 | 7 | 0.3872 | Model 14 |
| Model 15 vs Model 16 | 9.8564 | 7 | 0.1969 | Model 16 |

## Conclusions

Some interesting findings have been established. First, the overall press freedom was observed to have an effect on reducing corruption, meaning that an increase in press freedom reduces the level of corruption. This may be because a free press acts as a monitoring system and increases the possibility of being caught when individuals engage in corrupt activities. Additionally, the subcategories of press freedom including laws and regulations, and political influences were also observed to reduce corruption among sampled countries. Second, restrictions on internet in all forms was found to have no effect on corruption. Third, regarding the control variables, while fuel and mineral exports was found to increase corruption, GDP per capita and political rights are observed to decrease corruption in the sample of the countries analyzed. The results are important for policy making. Laws and political influences on the media that limit the freedom or work of the press have to be removed to help in fighting corruption.

**Limitations and Further Study**

A limitation of this study is the short time period of the newly available freedom of the net data. Future research on the effect of internet freedom on corruption is needed when long time period panel data is available.

**References**

Ahrend, R. (2002). *Press freedom, human capital and corruption*. Jordan: Delta.

Andersen, T. B. (2009). E-Government as an anti-corruption strategy. *Information Economics and Policy, 21*(3), 201-210.

Brunetti, A., & Weder, B. (2003). A free press is bad news for corruption. *Journal of Public Economics*, *87*(7-8), 1801-1824.

Chowdhury, S. K. (2004). The effect of democracy and press freedom on corruption: An empirical test. *Economics Letters, 85*(1), 93-101.

Elbahnasawy, N. G. (2014). E-government, internet adoption, and corruption: An empirical investigation. *World Development, 57*, 114-126.

Enikolopov, R., Petrova, M., & Sonin, K. (2018). Social media and corruption. *American Economic Journal: Applied Economics, 10*(1), 150-174.

Freille, S., Haque, M. E., & Kneller, R. (2007). A contribution to the empirics of press freedom and corruption. *European Journal of Political Economy, 23*(4), 838-862.

Garcia-Murillo, M. (2013). Does a government web presence reduce perceptions of corruption? *Information Technology for Development, 19*(2), 151-175.

Goel, R. K., Nelson, M. A., & Naretta, M. A. (2012). The internet as an indicator of corruption awareness. *European Journal of Political Economy, 28*(1), 64-75.

Gokcekus, O., & Knörich, J. (2006). Does quality of openness affect corruption? *Economics Letters, 91*(2), 190-196.

Graber, D. A. (1986). Press freedom and the general welfare. *Political Science Quarterly, 101*(2), 257-275.

Guerrero, M. A., & Rodríguez-Oreggia, E. (2008). On the individual decisions to commit corruption: A methodological complement. *Journal of Economic Behavior & Organization, 65*(2), 357-372.

Hamada, B. I., Abdel-Salam, A.-S. G., & Elkilany, E. A. (2019). Press freedom and corruption: An examination of the relationship. *Global Media and Communication, 15*(3), 303-321.

Jha, C. K., & Sarangi, S. (2017). Does social media reduce corruption? *Information Economics and Policy, 39*, 60-71.

Kalenborn, C., & Lessmann, C. (2013). The impact of democracy and press freedom on corruption: Conditionality matters. *Journal of Policy Modeling, 35*(6), 857-886.

Lessmann, C., & Markwardt, G. (2010). One size fits all? Decentralization, corruption, and the monitoring of bureaucrats. *World Development, 38*(4), 631-646.

Pratama, R. D., & Setyaningrum, D. (2015). *The effect of functional, legislative and public monitoring on local government performance*. Jakarta, IN: Universitas Indonesia.

Shim, D. C., & Eom, T. H. (2009). Anticorruption effects of information communication and technology (ICT) and social capital. *International Review of Administrative Sciences, 75*(1), 99-116.

Treisman, D. (2000). The causes of corruption: A cross-national study. *Journal of Public Economics*, *76*(3), 399-457.

Vaidya, S. (2005). Corruption in the media's gaze. *European Journal of Political Economy, 21*(3), 667-687.

Vemuri, A. W., & Costanza, R. (2006). The role of human, social, built, and natural capital in explaining life satisfaction at the country level: Toward a national well-being index (NWI). *Ecological Economics, 58*(1), 119-133.

Zakaria, M. (2009). Openness and corruption: A time-series analysis. *Zagreb International Review of Economics & Business, 12*(2), 1-14.