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Corruption and economic growth (with Vietnam case-study)

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Abstract Despite the Government's recognition of the serious threat of uncontrolled corruption to the legitimacy and long-term survival of the current political system, Vietnam is still struggling to translate its policies and comparatively strong legislative framework into practice. There exists little reliable, quantitative evidence of the harmful impact of corruption on economic growth in Vietnam. Using the most updated and available data and a model incorporating transmission channels, this article attempts to estimate the direct and indirect effects of corruption on GDP growth rate. In general, the findings confirm the negative association between corruption and economic growth. Investment appears to be the most important transmission channel and the effect of corruption on investment is non-linear so that indirect effects of corruption on growth (via investments) depends on the value of each country's corruption level. In case of Vietnam, a one unit increase in the corruption perception index (CPI)[1] leads to a 2.15% increase in the proportion of gross domestic investment over GDP, which in turns increases growth rate by 0.372%. Counting both direct and indirect effects, a one-unit increase in the corruption perception index (CPI) will increase the growth rate by 0.509%, indicating that the investment channel accounts for 62.92% of total effects.

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[1] The higher the CPI index value, the less corrupt the country is perceived to be.

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1. Introduction and Context

Corruption is a costly phenomenon for individuals, businesses, orgnizations, the public sector and the economy in general. The harmful effects of corruption on national economic development are widely acknowledged in the economics literature. Using empirical approaches, several authors have shown that corruption detracts investors, reduces the productivity of public expenditures, distorts the allocation of resources and thus lowers economic growth ([1], [2], [3], [4]). The magnitude of the costs of corruption has also been the focus of various international studies. According to the World Bank's estimate, the cost of corruption at the global level is about 1 trillion US dollars per year in a world economy of 30 trillion US dollars [5] (Kaufmann, 2005). According to the African Development Bank, the cost of corruption for Africa may reach 25% of the continent's GDP [6].

There is consensus that corruption is a serious threat to the national development of Vietnam. In particular, the government recognizes the threat that corruption poses to the legitimacy and long-term survival of the political system and, as a result, has taken some steps to address the problem. Although some progress has been made (i.e., passage of the Anti-corruption Law, the Anti-corruption strategy 2020, etc), Vietnam is still struggling to translate its policies and comparatively strong legislative framework into practice on the ground.

Despite its important policy implications, there appears to be little research into the costs of corruption in Vietnam. Previous studies on corruption have mostly focused on measuring the prevalence of corruption, and identifying its forms and causes ([7], [8]). More recently, there have been a number of attempts to measure the costs of corruption. For example, in the annual Provincial Competitiveness Index (PCI) survey, there is a questionnaire that does try to capture the amounts of bribes firms have to pay as a percentage of their sales [9]. Similarly, the recent survey in 2012 by DEPOCEN also attempted to capture the actual financial magnitude of bribery at the firm level [10]. Although interesting, the magnitude of these estimates only capture a small part of the true total costs of corruption, as they ignore the effects of corruption on system efficiency and performance, as well as the particularly adverse effects of

corruption on the poorest populations. This is somewhat surprising given that Vietnam needs to sustain high growth rates for decades in order to avoid the middle income trap. There is thus an urgent need for concrete, overall estimates of the harmful effects of corruption on economic development in Vietnam.

The main purpose of this artcile is to estimate the costs of and impact of corruption. It asks whether corruption has a negative impact on economic growth, or said differently, whether lower corruption levels in a country is associated with higher GDP growth. Using international, macro-level data sets of over seventy countries, the article begins by specifying and estimating the multiple operationalisations of the costs of corruption . The results of this estimation is then used to quantify the impact of corruption on economic growth in Vietnam..

It is expected that the findings of this article will provide interested stakeholders (e.g anti-corruption agencies, officials, business and donors) with much needed evidence to show that corruption hampers economic development. It is also anticipated that this kind of research will encourage further studies on the impact of corruption on Vietnam's economic growth.

The paper is organised as follows. The next section reviews the literature on the relationship between corruption and economic growth. The estimation methodology and data employed in this article are described in the next two sections respectively. Estimation results and implications are then discussed and analyzed. The final section concludes.

2. Literature Review

The literature on the impact of corruption on economic growth remains inconclusive despite the growing number of studies over a long time period. Some authors argue that corruption could facilitate economic growth, while others consider corruption as a barrier to economic growth. In this section, the theoretical background governing the effect of corruption on economic growth is first presented. The empirical results are then critically reviewed. In addition, the contribution of transmission channels between corruption and economic growth are discussed.

Theoretical framework

There is an important strand of literature that considers that corruption is the essential 'grease' to run the bureaucratic wheels. In a pioneering contribution, Leff (1964) [11] claimed that in a second best world characterized with the distortions caused by ill-functioning institutions, bribery is necessary to reduce the rigidities which constraint economic growth and reduce investment, especially in underdeveloped countries. For example, the difficulties of an investment decision of an enterprise may arise from economic and political environments such as the unknown and irrational behavior of the government. In this case, corruption could reduce uncertainty and increase investment because bribes are expected to enable the enterprise to control and affect the decision of government employees.

In the same vein, Lui (1985) [12] suggested a bribing model in which the decision of paying bribes by the customers could achieve social optimal equilibrium. If the customers take into account their time value and some other characteristics, their decisions could lead to the social optimal point due to waiting cost minimization. In addition, given the customers' decision, the governmental officials could improve their efficiency and make decisions faster. Similarly, with a less extreme view on the positive effect of corruption, Beck & Maher (1986) [13] found that there is an indifference between bribery and the competitive bidding model because the most competitive firm, i.e. the firm producing the same product with the lowest cost, would be able pay the highest "bidding" bribery price. Hence, corruption can improve efficiency by providing the projects for the most efficient firms. A more recent study by Acemoglu and Verdier (1998) proposed that property rights enforcement, which is decided by the government officials, is the key condition for wealth creation. Consequently, it is necessary to prevent all forms of corruption. However, the costs associated with doing so are prohibitively high, making the socially optimal resource allocation obtained with less than full enforcement of property rights and some corruption.

Opponents of the 'efficiency enhancing' school of thought (which together contribute to the 'sand in the wheel' hypothesis) argue that the positive impact of corruption is based on weak and problematic assumptions. For instance, they argue the efficiency enhancing approach assumes that the bureaucrats will work to promote

economic growth. Tanzi (1998) [14] claimed that the rigidities are not the nature of the society, but created by the governmental officials, especially in case where such obstacles can attract more bribes. Consequently, it is unreasonable to claim that corruption can enhance the efficiency by removing rigidities. Myrdal (1968) [15] also state that, in case of corruption, rather than accelerating administrative procedures, officials would maintain the rigidities in order to receive more payments. Kaufmann and Wei (1999) [16] support this view, arguing that, bureaucrats can endogenously choose regulatory burdens and delays. Consequently, firms are likely to spend more time in negotiating with the officials, leading to higher cost of capital. In contrast to Beck and Maher (1986) [13], firms which pay the highest bribes may not be the most economically efficient ones because they would consider bribe as a high rate of return on investment (Tanzi, 1998 [14]).

It should be noted that corruption does not impact the efficiency only through the price mechanism alone. For example, Murphy et al. (1991) [17] found that, due to corruption, people are likely to move from productive to unproductive rent-seeking activities. In other words, it is corruption that causes the employment reallocation to the lower-than-optimal point, which would harm the human capital and consequently economic growth. Moreover, corruption also impacts on domestic and foreign investment, trade openness and political stability, as has been studied in the literature.

Review of empirical studies

Empirical results largely confirm the inefficiency view. Mauro (1995) [18] employed cross-section data including 58 countries during the 1960–85 period and found that the negative relationship between corruption and economic growth is statistically and economically significant. The negative relationship between corruption and growth was later confirmed by many empirical studies [Mauro (1997) [18], Tanzi (1998) [14], Mo (2001) [19], Pellegrini & Gerlagh (2004) [20], Pierre-Guillaume & Khalid (2005) [21], [22 & Herzfeld (2005) [22], Hodge et al. (2009) [23], and Dridi (2013) [24]]. Besides data issues, these empirical studies question the causality and the robustness of the relationship between economic growth and corruption, as we now explain.

The causal relationship between corruption and economic growth has encountered three major issues. First, although the interpretation that corruption leads to lower

economic growth has dominated the literature, the reverse relationship (lower economic growth leads to corruption) seems to be equally reasonable. In fact, some people argue that economic growth is the determinant of a country's corruption level because preventing corruption is known to be a costly process, which low income countries cannot afford. In other words, questions remain over whether corruption negatively determines growth or vice versa. Moreover, estimation bias may arise from corruption indices which are mostly based on the perception of people in very different countries. Finally, many factors, which determine economic growth and are included in the growth model, are influenced by corruption.

The robustness of the relationship between economic growth and corruption may also be questioned because of the significant effect of corruption on economic growth disappears when other variables, such as investment, human capital, political instability, etc, are included in the model. Further, the impacts of these factors are not consistent among different countries. Regarding the country context, Svensson (2005) [25] argued that a puzzle remains in the relationship between corruption in a cross-country setting. More recent studies have confirmed this view and introduced non-linear relationships between economic growth and corruption. These studies suggest that the association between corruption and economic growth depends on the institutional quality. For example, Méndez and Sepúlveda (2006) [26] studied the impact of corruption on long-run growth and found that the type of political regime is an important determinant of that relationship.

Additionally, they also found a non-monotonic relationship after a number of economic variables had been controlled for and the sample was restricted to 'free' countries that have achieved a high level of political freedom. The result indicates the growth-maximizing level of corruption actually exists and is significantly greater than 0, which is later interpreted as saying that corruption facilitates economic growth at low levels of incidence while it is harmful at high levels. A study conducted by Aidt et al. (2008) [27] drew similar findings. Specifically, in the regime with high quality of political institutions, corruption is found to have a significantly negative impact on economic growth. However, the corruption appears to have no impact on growth in low quality political regimes. The strong point of this study is that, instead of splitting the sample of countries according to some predetermined rule like Méndez and Sepúlveda (2006) [26] did, the data is allowed to determine to which of two

potential growth regimes a country belongs. More recent studies also support this result. For example, Pierre-Guillaume & Khalid (2005) [21] employed a panel data of 54 developed and developing countries and found that corruption is positively associated with efficiency in countries with ineffective institutions and vice versa. Most recently, Assiotis and Sylwester (2013) [28] investigated the impact of corruption on economic growth given democratic and non-democratic regimes. They demonstrated that the association between corruption and economic growth is less positive, and could even be negative in democratic regimes. In summary, all authors in this strand of empirical studies provide evidence that countries with high institutional quality tend to suffer more from corruption, while those with less effective institutional frameworks could even benefit from corruption.

Another problem found in empirical studies is that the significant relationship between corruption and economic growth tends to disappear when other controlling variables are included in the regression model. When Mauro (1995) [18] included investment in the list of independent variables in his OLS regressions, the coefficient on the corruption index becomes statistically insignificant. Similarly, when adding the structural reform index to the growth regression which includes a corruption index, initial real per capita GDP, initial life expectancy, inflation rate and the ratio of fiscal balance to GDP, the coefficient on corruption index also became insignificant (Abed & Davoodi, 2000 [29]). Other authors such as Mo (2001) [30], and Pellegrini and Gerlagh (2004) [20] also confirmed this finding. This trend could be interpreted that the effect of corruption on economic growth is transmitted through other determinants of growth (Dridi, 2013) [24].

Transmission channel between corruption and economic growth

To address the above issue, particularly addressing the robustness and causality of the relationship between corruption and economic growth, some authors have suggested that besides its direct impact on growth, the impact of corruption may also be transmitted indirectly through some transmission channels, for example by affecting key determinants of growth such asdomestic private investment, human capital, investments, etc.

Mauro (1995) [18] appeared to be the first author who raised the idea about the transmission channels between corruption and economic growth. However, it is not

until Mo (2001) [30] that empirical proof was provided concerning the exact channels. This study used data for 45 countries during the 1970–85 period and estimated the impact of corruption on economic growth through different types of channels by OLS regression using corruption as a determinant of economic growth. The significantly negative association between corruption and economic growth is observed when the model includes the initial per capita income, political right index, and rate of population growth. Accordingly, a one percent increase in corruption level leads to a 0.72% reduction of economic growth. However, the coefficient of corruption index becomes statistically insignificant after controlling for human capital, political instability and investment. Moreover, the value of the coefficient also witnesses a sharp decrease from 0.545 to 0.064. This leads to the conclusion that apart from the direct impact of corruption on economic growth, the indirect effects of corruption on economic growth through some channels such as investment, human capital, and political stability are observed. Among those, the impact of corruption on political stability proved to be the most important channel, accounting for 53% of total effect. The indirect effects of the other two channels, investment and human capital, account for 21.4% and 14.8% respectively. The drawback of this research is the validity of instrumental variables (regional dummies and ethno-linguistic fractionalization index) is not tested properly.

A later study conducted by Pellegrini & Gerlagh (2004) [20] utilized the same method as Mo (2001) [30] with a dataset that covers a slightly longer period of time (1980−2004 versus 1975−1996) and a different set of instrument variables for corruption. They examined both direct and indirect effects of corruption on economic growth and confirmed a negative impact of corruption on economic growth. The role of the transmission channel is significant, accounting for 81% of the overall impact. The indirect effects of the four channels (investment, trade openness, political instability and human capital) are 32%, 28%, 16% and 5% respectively.

In terms of methodology, decomposition and channel methodology dominate the literature, but the former seems to be more popular (Dridi, 2013) [24]. However, the decomposition method is problematic since “it explicitly includes independent variables that are theoretically and empirically consequences of corruption” (Akai et. al, 2005) [31]. In order to tackle this problem, the channel methodology involving a set of equations can be employed. The major difference between two methods is that

the channel methodology excludes corruption in the growth regression and covers a set of equations, which is jointly estimated by the three-stage least squares (3SLS).

Dreher & Herzfeld (2005) [22] employed 3SLS to estimate seven equations, one of which captures the direct impact of corruption on economic growth and the remaining six equations estimated the effect of the contribution channels. Regarding data, 71 countries from 1975 to 2001 were examined in this study. One point increase in the corruption index is associated with 0.451%, 0.225%, 0.129% increases in economic growth. On the other hand, foreign aid proves to reduce economic growth. Other channels such as life expectancy, school enrolment, and initial GDP do not provide a significant relationship between them and economic growth. It was confirmed that if the corruption index increases by one point, GDP growth will reduce by 0.13%.

Likewise, Hodge et al. (2009) [32] used a cross-section data of 81 countries over the period from 1984 to 2005, which is a significantly larger coverage in comparison to previous studies. Moreover, they divided the time period into different five-year and six-year periods to capture the business cycle effect. Better still, this study collected data on corruption from two sources to check the consistency of result, namely Political Risk Services (ICRG), and Control of Corruption (WB). Compared to the study of Pellegrini and Gerlagh (2004) [20], this research is better in terms of control variables. The control variables in the study of Pellegrini and Gerlagh (2004) [20] are similar among different channels. Moreover, the cross dependence between those channel variables is not examined. This issue is solved in this study since each channel has a set of control variables. The estimation results suggest that corruption has a negative effect on growth through the investment, human capital and political instability channels, while corruption facilitates economic growth via the trade and government consumption channels. They argue that effort to lower corruption could reduce trade volumes. A country that prohibits its firms to engage in corruption practices would limit its own firms' ability to compete against firms from other countries who were able to engage in corruption. Again, Hodge et al. (2009) [32] found a negative and statistically significant effect of corruption on economic growth.

Similarly, Dridi (2013) [24] followed the channel methodology to estimate the contribution of five transmission variables, which includes investment, human capital, government expenditure, political instability and inflation, and draws consistent

results with previous studies. This study covers 82 countries from 1980 to 2002 and uses a variety of corruption index. The major transmission channels are human capital and political instability and investment is not proven to be a significant transmission channel. The overall negative effect of corruption on economic growth is confirmed.

In summary, the relationship between corruption and economic growth remains inconclusive both theoretically and empirically. Many studies reveal the significant negative effect, while others find an insignificant relationship. In addition, a number of papers revealed that the negative association would change when taking into account other variables or the institutional quality of a country. This could be explained by the fact that the effect of corruption on economic growth is transmitted through particular channels, such as investment, human capital, political instability etc. In this paper, we rely on more recently available data to revisit the growth – corruption relationship and at the same time disentangle the channels through which corruption may have effects on growth. We also analyse this with a special focus on Vietnam.

3. Estimating Methodology

To address our key research question (*is lower corruption levels in a country associated with higher GDP growth?*) and test our hypothesis that there is a negative impact of corruption on growth, we follow the approach set out by Mo (2001) [30]. This consists in estimating this impact by drawing on the transmission channel method. First, GDP growth rate is regressed on initial GDP per capita (Y_0) and corruption and later on a number of other common independent variables which are believed to operate as transmission channels for corruption on growth. We focus on key transmission channels, including human capital (HC), investment (INV), and institution as measured by "voice and accountability" (V&A).

In this baseline model, the direct effect of corruption on growth is captured by β_5.

$$GDPgrowth = \beta_0 + \beta_1 lnY_0 + \beta_2 HC + \beta_3 INV + \beta_4 V\&A + \beta_5 corruption + \varepsilon \quad \text{(a)}$$

Besides the direct effect, corruption can have indirect effects on growth through transmission channels of a number of intervening variables. In our paper, we focus on the following channels: i) investments, ii) human capital, and iii) institution as measured by voice and accountability. Following the literature, each of these intervening variables is specified as a function, among other variables, of corruption. In particular, the following channels are specified and estimated:

$$HC = \alpha_0 + \alpha_1 lnGDPpc + \alpha_2 PSE + \alpha_3 Urban + \alpha_4 corruption + \varepsilon \quad (b)$$

$$INV = \delta_0 + \delta_1 SSE + \delta_2 lnY_0 + \delta_3 POP_{15} + \delta_4 POP_{65} + \delta_5 TRADE + \delta_6 corruption + \varepsilon \quad (c)$$

$$V\&A = £_0 + £_1 lnY_0 + £_2 Llock + £_3 corruption + \varepsilon \quad (d)$$

To estimate the total impact of corruption on growth, these equations will be estimated separately and the relevant coefficients of corruption will be combined to derive to total impact of corruption on economic growth, with the following formula

$$\frac{dGROWTH}{dCORRUPTION} = \frac{\partial GROWTH}{\partial CORRUPTION} + \sum_{TC} \left(\frac{\partial GROWTH}{\partial TC} \frac{\partial TC}{\partial CORRUPTION} \right)$$

To estimate the direct and indirect effects, we substitute equations (b), (c), and (d) in (a). As a result, β_5 captures the direct effect of corruption on growth and $(\alpha_4\beta_2 + \delta_6\beta_3 + £_3\beta_4)$ is the indirect of corruption on growth.

As discussed above, the relationship between corruption and economic growth is potentially endogenous. The standard practice in the literature to deal with this problem is to use instrumental variable approach. The most popular instrument is ethnolinguistic fractionalization (see Mauro 1995, Mo 2001, Pellegrini and Gerlagh 2004). However, Easterly and Levine (1997) suggested that ethnic diversity has direct effects on growth, and may therefore not be an appropriate instrument for measuring corruption. Other instrumental variables used in the literature include regional dummy variables (Barro–Lee 1991, Mo, 2001), legal origins (Pellegrini and Gerlagh 2004). In our paper, we employ legal origins dummy variables as an instrument for corruption. The results of endogeneity and over-identification tests confirm the validity of legal origins as a relatively strong instrumental variable in our study.

4. Data

In order to estimate the impact of corruption on economic growth, we need to use national level data. The data, which includes economic indicators, governance and corruption indices and fixed factors such as legal origin, regional factors, and level of development, is constructed from three major sources. The economic indicators including GDP growth rate, gross domestic investment, and population, are obtained from the World Development Indicators (World Bank) [33]. Meanwhile, corruption indices are collected from two main data sources, the World Governance Indicators (World Bank) [34] and the Corruption Perceptions Index (CPI) (Transparency International [35]).

Economic data goes as part back at 1960 for some countries, but in the case of Vietnam, it is only available from the 1990s. Similarly, despite the fact that the Transparency International CPI has been collected from 1980, Vietnam has only been included in the Index since 1995. Even then, we are unable to choose the period starting from 1995 because the country coverage of the CPI was small and varied between years. For example, 1995, 1996 and 1997 only cover 41, 54 and 52 countries respectively. Another problem is that although the country coverage increased to around 90 countries from 1998 to 2001, the CPI of some countries has not been continuously collected. The availability of the CPI was recorded consistently for 81 countries from 2000 to 2012, so this thirteen-year period is chosen for this study. Among those 81 countries, Argentina did not report GDP indicators in 2012, and Zimbabwe had a negative growth rate. Thus, there are 79 countries included in our sample, generating 1,040 observations in total. To obtain the cross country dataset, we calculate the average of each variable over the period under study.

The dependent variable[2] -- GDP growth rate -- is a compound of annual growth rate in the period from 2000 to 2012.[3] As mentioned above, the measure of corruption is drawn from two sources: World Governance Indicators (WB) and CPI (TI). The data obtained from these two different sources appears to be highly correlated[4] so the CPI is chosen. This index varies from 0 to 10, where a higher index indicates a less corrupt country. The population growth rate is the proxy for that of human capital because the data on population is more reliable (Mo, 2001) [30]. The physical capital

[2] A variable is said to be dependent when it changes in response to iterations to the value(s) of the independent variable(s).
[3] r denotes annual GDP growth rate. It is defined as follow: $rGDP2000*(1+r)^{13}=GDP2012$ where GDP2000 and GDP2012 are real GDP in 2000 and 2012 respectively.
[4] The CPI and WGI (Control of corruption) have a correlation of 99%.

is measured by gross domestic investment (public and private) as a percentage of GDP.

Our baseline model of corruption and economic growth without transmission channels incorporates 79 countries. However, due to missing value for gross domestic investment as percentage of GDP, and secondary education gross enrolment for a few countries, we are left with less than 79 observations depending on the specification to be estimated. There are a few countries where the data on legal origin is missing for the Instrumental variable (IV) equation. 71 countries are used when running regression in order to capture all variables in the models. The descriptive statistics of variables used in our studies is introduced in Table 1.. Usually, the impact of corruption on growth is estimated within the framework of growth regression. In our empirical work, the initial income is measured by log of GDP per capital in 2000 and included in the model as the initial income level would influence the growth rate. Population is also included as a measure of labour in the growth model. We include government spending on education as an independent variable for the human capital regression and .

Table 1. Summary of Statistics of Variables Used in Analysis

VARIABLES	N	mean	sd	min	max
Trade (% of GDP)	71	88.0	54.6	25.5	369.3
Gross Domestic Investment (%GDP)	71	22.6	4.6	10.1	42.9
Population ages 0-14 (% of total)	71	25.2	9.8	13.8	49.1
Population ages 65 and above (% of total)	71	10.1	5.6	2.5	20.6
Urban population (% of Total)	71	64.7	20.0	13.8	100.0
Public spending on education	71	4.9	1.4	2.7	8.4
School enrollment, secondary (% gross)	71	87.0	25.2	21.1	140.4
Voice and accountability	71	0.4	0.9	-2.0	1.6
Log of GDP per capital in 2000	71	8.6	1.6	5.4	11.2
Growth	71	3.6	2.2	0.1	12.1
Log of GDP per capita (mean)	71	8.9	1.5	5.5	11.3
Corrupion (CPI - rescaled)	71	5.9	2.4	1.5	8.9
Corrupion (Control of corrruption - rescaled)	71	2.1	1.1	0.0	3.6
Landlock	71	0.2	0.4	0.0	1.0

5. Empirical Results

Because the correlation between the CPI and the World Bank's Control of Corruption

(CoC) is very high, we estimate the impact of corruption on growth using these two indices and obtain very similar results. In this paper, however, we report only the estimation results using the CPI, and will make the estimation results available upon request.

Initial estimation results

We first estimate our cost of corruption on growth using simple regression model and the results are presented in Table 2.

Table 2: Corruption and growth – OLS regression

VARIABLES	Growth (without transmission channel)	Growth (without corruption)	Growth (with corruption and transmission channels)
School enrollment, secondary (% gross)		0.022**	0.023***
		(0.009)	(0.008)
Gross domestic investment (%GDP)		0.175***	0.173***
		(0.031)	(0.029)
Voice and Accountability		-0.599**	-0.890***
		(0.257)	(0.273)
Log of GDP per capita in 2000	-1.214***	-0.890***	-1.149***
	(0.214)	(0.188)	(0.208)
Corruption (CPI - rescaled)[5]	-0.180		-0.303**
	(0.144)		(0.121)
Constant	15.140***	5.558***	9.708***
	(2.621)	(1.475)	(2.184)
Observations	79	75	75
R-squared	0.536	0.732	0.754

The specification in column 1 includes only the initial GDP and the corruption index. Like previous studies, the initial capital is statistically significant. However, contrary to what Mo (2001), and Pellegrini and Gerlagh (2004) reported, the corruption variable is not significant statistically. This is also the finding that motivates Mauro (1995) to suggest the transmission channel. The specification in column 2 includes our transmission channel variables but not corruption index. The specification in column 3 includes both corruption and transmission channel variables. The overall

[5] The corruption index is rescaled as an inverse of the original scale to facilitate interpretation. The higher the corruption score, the higher the level of corruption prevalence.

diagnostic statistics suggest that the model fits with the data relatively well. **We find that corruption is negatively correlated with growth**.

Our finding is different from the results of Mo (2001), and Pellegrini and Gerlagh (2004) for another reason. In previous studies using transmission channels, authors often stated that the role of corruption decreases when transmission channels are included into the growth model. For other variables, the coefficient on the share of domestic investment has the expected sign and indicates **that a 10% increase in the share of domestic investment in GDP will lead to a 1.73% increase in GDP growth rate** (Column 3). Secondly, similar to investment, human capital (school enrollment in secondary) has a significant and positive impact on growth, since **a 10% increase in school enrollment increases GDP growth rate by 0.23%** (Column 3). In contrast, **higher levels of voice and accountability are associated with lower levels of growth** (Column 3). This could be because countries that experience high levels of voice and accountability are often more-developed countries and vice versa, although this would need to be further researched. In general, the GDP growth rate of these countries is often lower than the GDP growth rate of developing countries.

Instrumental variable approach

Previous studies point out that the relationship between corruption and growth may be subject to endogeneity. Following the standard approach to control for potential endogeneity of corruption and growth, we rely on the instrumental variable method. In our analysis, we use the legal origins as instrument, as is often carried out in previous studies (e.g. Pellegrini and Gerlagh 2004).

The results of the first-stage estimation are summarized in the Appendix. The results of instrumental variable regression together with endogeneity and over-identification tests are presented in Table 3. Overall, the test statistics indicate that the legal origin passes all the tests for a good instrument. Qualitatively, the results from the instrumental variable regression are similar to what we obtained from the OLS regression. The estimated coefficient of corruption index is statistically significant and has a negative sign **which suggests that corruption is bad for growth.**

Table 3: Corruption and growth – Instrumental variable

VARIABLES	Growth
Corrupion (CPI - rescaled)	-0.504**
	(0.221)
School enrollment, secondary (% gross)	0.023***
	(0.008)
Gross domestic investment (%GDP)	0.171***
	(0.030)
Voice and Accountability	-1.108***
	(0.329)
Log of GDP per capital in 2000	-1.313***
	(0.263)
Constant	12.407***
	(3.408)
Observations	71
R-squared	0.754
Test of endogeneity	No
Durbin Chi2 (p-value)	0.254
Wu Hausman F (p-value)	0.278
Test of overidentification	No
Sargan Chi2 (p-value)	0.328
Basmann Chi2 (p-value)	0.367

Transmission channels

As discussed in the literature, the coefficient of the corruption index only reveals the direct effect of corruption. In order to capture the indirect impact of corruption on growth through investments, human capital, and institutions, we estimate and report results of three regression models of the transmission variables on corruption in Table 4. As can be seen, corruption is found to be related to these variables in both positive and negative ways, and this relationship is statistically significant.

There are a few interesting things to note, however. First, corruption is positively correlated with human capital (Column 1). The fact that human capital is positively correlated with growth suggests that corruption hence has some growth-enhancing effect.[6] Second, corruption is negatively correlated with institutions/political regime as measured by voice and accountability. This has a negative impact on growth.

[6] Hodge et al (2009) find that corruption does not have impact on human capital.

Hence through this channel, corruption "greases" the wheels of growth., although corruption is negatively associated with growth through the investment channel.

Table 4: Transmission channels

VARIABLES	Human capital	Investment	Voice and accountability
School enrollment, secondary (% gross)		-0.041	
		(0.036)	
Log of GDP per capital in 2000		-2.328***	0.278***
		(0.747)	(0.074)
Corruption (CPI - rescaled)	2.740*	-0.803*	-0.150***
	(1.408)	(0.420)	(0.049)
Log of GDP per capita (mean)	15.184***		
	(2.584)		
Public spending on education	2.879**		
	(1.336)		
Urban population (% of Total)	0.248*		
	(0.129)		
Population ages 0-14 (& of total)		-0.690***	
		(0.143)	
Population ages 65 and above (& of total)		-0.686***	
		(0.215)	
Trade (% of GDP)		-0.007	
		(0.010)	
Landlock			0.036
			(0.149)
Constant	-95.154***	76.088***	-1.154
	(30.003)	(12.127)	(0.939)
Observations	72	75	79
R-squared	0.750	0.339	0.704

Corruption and growth: Direct impact and Transmission channels

In Table 5, we calculate the impact of corruption on growth under a number of scenarios drawing on some statistical estimates from Table 4 and following the transmission method. We first calculate the total impact of corruption on growth using all three channels and then simulate the impacts assuming each of the transmission variables alternatively. As discussed above, the impact of corruption on growth is more complicated than we originally thought. There is evidence that corruption greases the wheels of growth through improvement in human capital and voice and accountability. At the same time, corruption sands the wheels though the investment channel and the impact though this channel is relatively high. However, despite its "greasing the wheel" effect, the net impact of corruption on growth is negative.

Table 5: The indirect and indirect effects of corruption on growth

a) With transmission channel

	All channels (1)	Human capital (2)	Investment (3)	Voice & accountability (4)
Direct impact	-0.504	-0.504	-0.504	-0.504
Indirect impact				
Human capital	0.023*2.740=0.063	0.023*2.740=0.063		
Investments	0.171*-(0.803)=0.137		0.171*-(0.803)=-0.137	
Voice & accountability	(-1.313)*(-0.150)=0.196			(-1.313)*(-0.150)=0.196
Total Impact	-0.381	-0.441	-0.641	-0.307
b) without transmission channel				
Total Impact	-0.191	-0.191	-0.191	-0.191

6. Case-study analysis for Vietnam

The Government of Vietnam recognizes the threat that corruption poses to the legitimacy and long-term survival of the political system, and as a result has taken some steps to address the problem. This includes passing the 2005 Anti-corruption Law and other relevant legislation (e.g. on asset disclosure and money laundering), as well as drafting a National Strategy for the fight against Corruption towards 2020. There have been efforts to reform and modernize Public Administration Systems as well. However, Vietnam is still struggling to leverage on these efforts and translate policies into practice, and corruption perception levels remain high.

Meanwhile, whilst there is literature on corruption in Vietnam, there is a relatively little research that has gone into understand the costs of corruption. Previous studies mostly focused on measuring the prevalence forms and causes of corruption. Recently, however, there have been a number of attempts to address this gap. For example, the annual Provincial Competitiveness Index (PCI) survey questionnaires try to capture the amount of bribes firms have to pay as a percentage of their sales. Similarly, the recent survey conducted by DEPOCEN in 2012 also attempts to capture the actual financial magnitude of bribery at the firm level. Although interesting, the magnitude of these final estimates only captures a fraction of the true total costs of corruption, as they ignore the effects of corruption on system efficiency and performance, as well as the adverse effect of corruption on the poorest populations.

Empirical results

Based on the panel data and analysis presented earlier in the paper, we estimate the impact of corruption on growth for Vietnam from 2000 to 2012. On average, the country's GDP growth in this period is 6.732%. Expand

If the corruption level fell one unit of the 'CPI rescaled' (meaning that the CPI of Vietnam increases from 2.639 to 3.639), the economy would growfrom 6.732% to 6.941%. Moreover, since the standard deviation of the 'CPI rescaled' is 2.369, this suggests that if corruption levels in Vietnam fell one standard deviation (CPI increases from 2.639 to 5.008), then Vietnam could achieve a growth rate of 7.227% on average during the 2000-2012 period (i.e. an increase of 0.495 percentage points from the actual average of 6.732%). The more detailed calculation on the effect of corruption on growth in Vietnamese context is described in Table 6 below.

Table 6: Simulation results for Vietnam

	Effect of corruption (CPI)	GDP growth (Average GDP growth = 6.732%)	Effect of corruption (CoC)	GDP growth (Average GDP growth = 6.732%)
	-0.209		-0.307	
Corrruption reduce 1 unit	0.209	6.941	0.307	7.039
Corrruption reduce 1 Sd	0.495	7.227	0.338	7.070
Corrruption reduce 2 Sd	0.990	7.722	0.675	7.407
Corrruption reduce 3 Sd	1.485	8.217	1.013	7.745

7. Conclusions (tbc)

This article set out to investigate the relationship between growth and corruption. Specifically, it asked whether *lower corruption levels in a country are associated with higher GDP growth.* Our key hypothesis is that there is a negative correlation between the two (corruption hampers growth). To address this, we used recent panel data from 2000 to 2012 to both evaluate the direct and indirect effects. Drawing on analyses conducted by Mo (2001) [30], we disaggregate the indirect effects of corruption on economic growth through three transmission channels: i) investment in physical capital; ii) human capital (*Education*); and iii) institutions.(measured through *Voice & Accountability)*

Our hypothesis is confirmed. Using both a simple regression model and instrumental variable approach, we find there is a negative correlation between corruption and growth. Specifically, we show that:

- A 10% increase in the share of domestic investment in GDP will lead to a 1.73% increase in GDP growth rate.
- A 10% increase in school enrolment increases GDP growth rate by 0.23% (school enrolment therefore has a significant and positive impact on growth)
- In contrast, however, higher levels of voice and accountability are associated with lower levels of growth.

In order to capture the indirect impact of corruption on growth through three transmission channels (investments in physical capital, investments in human capital, and institutions, we estimate and report results of three regression models of transmission variables on corruption. We show that (**tbc**):

- Corruption is positively correlated with human capital
- Corruption is negatively correlated with institutions

This article complements our understanding of how corruption affects growth. This is particularly true for our understanding of the costs of corruption to the Vietnamese economy, provided in the case-study analysis. We find that (**tbc**)

- If the corruption level fell one unit of the 'CPI rescaled' (meaning that the CPI of Vietnam increases from 2.639 to 3.639), the economy would growfrom 6.732% to 6.941%. Moreover, since the standard deviation of the 'CPI rescaled' is 2.369, this suggests that if corruption levels in Vietnam fell one standard deviation (CPI increases from 2.639 to 5.008), then Vietnam could achieve a growth rate of 7.227% on average during the 2000-2012 period.

These findings not only show that corruption undermines growth, but also how this can happen. This analysis – particularly on Vietnam -- is timely. The global economy is slowly recovering from the downturn than began in 2008. In Vietnam, the recovery is still fragile. The country is transitioning from a low to middle-income economy. And whilst levels of Foreign Direct Investments in the country are healthy, there is increasing competition with direct neighbours, and a growing unease with high corruption levels in Vietnam, and how this undermines competitiveness. This paper is

particularly useful in demonstrating to policy-makers, business leaders and other stakeholders, the real impact corruption has, and the potential loss of earnings it generates. Moreover, the findings do not only show that investment matters, but also that investments in social development and human factors such as education can eventually lead to positive dividends.

- Include here additional discussion when final results are produced
- Research Gaps/limitations of study?

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Appendix 1: Instrumental variable regression – First stage model

VARIABLES	First stage of growth model
School enrollment, secondary (% gross)	-0.009
	(0.008)
Gross domestic investment (%GDP)	-0.025
	(0.026)
Voice and Accountability	-0.687***
	(0.212)
Log of GDP per capital in 2000	-0.745***
	(0.163)
leg_british	0.868*
	(0.490)
leg_french	1.893***
	(0.472)
leg_socialist	2.261***
	(0.553)
leg_german	1.182**
	(0.580)
Constant	12.420***
	(1.324)
Observations	71
R-squared	0.875