



Effects of Corruption and the Black Economy on Economic Growth in the CFA Franc Zone Countries

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

We conducted this study to empirically analyse the effects of corruption and the underground economy on economic growth in the case of the CFA franc zone countries over the period 2000-2016. To do so, we have carried out econometric estimations using panel data. Our empirical results obtained by the PMG (*Pooled Mean Group*) method confirm a negative relationship between economic growth and the underground economy in the short and long term. However, the long-run effect of corruption on economic growth is positive, while this effect becomes negative in the short run. The results could provide insight into different ways of fighting corruption and the shadow economy.

Keywords: *Corruption; black economy; economic growth; PMG.*

JEL Classification: C13. C15. 011

1. INTRODUCTION

Corruption and the black economy are two complementary and destructive activities that profoundly undermine democratic governance

and the rule of law while having a strong negative influence on the economic development of nations. Corruption can be defined as an abuse of power entrusted for private purposes Transparency International [1]. Thus, many

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previous researches could show that corruption negatively affects business and economic developments [2-5].

Compared to corruption, the study of the underground economy, also known as the 'informal' or 'shadow economy', on economic growth seems to be more complex than the study of corruption on economic growth. The underground economy includes activities such as the sale of drugs and other narcotics, prostitution, money laundering, illegal gambling, counterfeiting, non-declaration of income or even non-payment of taxes, Shelak [6]. In order to have a more accurate measure of the underground economy, Torgler and Schneider [7] and Schneider et al. [8-12] note that the underground economy includes all "legal market-based production of goods and services that is deliberately concealed from public authorities for the following reasons: First, to avoid payment of income, value-added or other taxes; second, to avoid payment of social security contributions; third, to avoid compliance with legal labour market standards, such as minimum wages, maximum working hours, safety standards, etc.; and fourth, to avoid compliance with the law. According to this view, "the use of the term 'employment' is not only a way of avoiding the need to comply with certain legal labour market standards, such as minimum wages, maximum working hours, safety standards, etc., but also to avoid complying with a number of administrative procedures, such as the filling in of statistical or other administrative forms. "According to this view, the underground economy has two main components: The first component, which accounts for a significant part of the underground economy, is undeclared work. It refers to wages that workers and companies do not declare to avoid taxes or labour market regulations. The second component is represented by the under-reporting of business income to avoid a part of the tax burden. Several studies have associated the underground economy (or informal sector) with low productivity and economic development. For example, the underground economy has a lower share in high-income countries, while it accounts for up to 70% of low-income African economies [13].

On the basis of the above, we can conclude that corruption and the black economy have in common that they both allow circumvention of administrative regulations, the payment of at least part of some taxes with the consequence of lower tax revenues, and an obstacle to economic development. Previous studies have paid little

attention to the simultaneous effects of corruption and the black economy on economic growth. The objective of this paper is therefore to investigate the empirical relationship between corruption and economic growth on the one hand, and between the underground economy and economic growth on the other.

To study the effects of corruption and the underground economy on economic growth, we will adopt the PMG (*Pooled Mean Group*) approach that was presented by Pesaran et al. [14]. This study aims to make a modest contribution to the existing literature, since our approach is different from the existing literature on the effects of corruption and the underground economy on economic growth. Indeed, we have not used dynamic simultaneous equation models as has been the case in the literature to date. Instead, we have used the panel unit root and panel co-integration approach, which follows the spirit of the classical "growth model" framework. This approach ensures that there is a sound theoretical basis for the empirical analysis. The remainder of the paper is organised as follows: In section 2 we review the existing literature on the subject, in section 3 we describe the model, the data and our methodology. In section 4, we present the empirical results as well as the various discussions related to these results. We conclude and give some policy recommendations in section 5.

2. REVIEW OF THE LITERATURE

Economic agents are likely to engage in underground economic activities for several reasons such as low growth rates, rising unemployment, poverty and poor governance. The existing economic literature on the subject reveals that in the presence of declining economic growth rates, formal sector firms tend to downsize their workforce in order to limit operating costs [15,16]. The expansion of the level of the underground economy would thus be primarily due to these expected high levels of unemployment. Webb et al. [17], on the other hand, have shown that higher tax rates lead to an increase in the size of the underground economy. In fact, they found that economic agents predict that the costs of formality outweigh the benefits. The underground economy in turn leads to lower tax revenues due to tax evasion [9,18-20] while reducing the effectiveness of redistributive policies and slowing economic growth. Much empirical research tends to support the idea that the underground economy has a positive effect on

official economic growth and tax revenues [21-24], which has shown that a significant share of the income earned in the underground economy ends up being spent in the formal economy. It should be noted that the literature tends to argue that the underground economy has significant negative effects on economic growth. Bacchetta et al. [25] and La Porta and Shleifer [26] show that the large underground economy reduces global competitiveness while reducing working conditions through unfair competition from firms that use illegal sales or labour methods [25,26]. Loayza [18] studying the case of Latin America and Hassan and Schneider [27] studying the case of Egypt come to the same conclusion. Fedotenkov [28] found that the existence of underground economies essentially means that part of the income is not recorded, which is not without consequences for the official shares of income factors. On the other hand, if a part of labour income is not recorded, this would lead to a reduction in the official labour share of income.

In order to rationalize these ambiguous results, Schneider [8] conducted a comparative study for 21 OECD countries and 89 developing and transition countries and came to show that an increase in the size of the underground economy in developing countries leads to a reduction in the size of the official economy. However, he concludes that in developed and transition economies, an increase in the size of the underground economy leads to an increase in economic growth. Similarly, the relationship between the formal and informal economy differs between developed and developing countries Dreher and Schneider [29]. To some extent, the informal economy is the result of inefficient redistribution policies [24], so it is clear that there is uncertainty about the income base and the increase in money demand. Indeed, Besley and Persson [30] show that the state is more likely to take short-term measures at the expense of fiscal policy, which will result in political disruption even for those with a stable political regime. A similar point was made by Mazhar and Jafri [31] who found that much of the underground economy is always accompanied by more unstable political systems. Dreher et al. [32] also find that the size of the underground economy can be reduced in the presence of good institutional quality.

In particular, the relationship between corruption and the underground economy is ambiguous. Several studies, such as Johnson et al. [19] and

Friedman et al. [20], have shown that a high level of corruption increases the size of the underground economy as it works in a similar way to a higher effective tax on firms in the formal economy that pushes them underground. However, several other studies, such as Choi and Thum [33] and Dreher et al. [34], have shown that the underground economy reduces the distortions of the official economy while preventing the personal gain of state agents. Furthermore, looking at the results of Schneider and Klingmair (2004), the highest rates of underground or non-legal activities are observed in developing and transition countries. In Africa and South America, 41% of economic activities are clandestine Kirchler [13]. In developed countries, tax evasion is estimated at 20% of total income, while in developing countries the percentage is even higher Orviska and Hudson [35].

Previous research has highlighted the negative effects of corruption on economic growth and high levels of corruption have been found to be a common feature of all poor economies. Corruption is one of the greatest obstacles to economic growth, social development and poverty reduction World Bank [36]. Since the level of development is related to the overall level of resource munificence, one would expect corruption to be more common in less developed economies Husted [37]. De Rosa et al [38] found a correlation of 0.81 between GDP per capita and the level of corruption. In the same vein, Treisman [39] and Paldam (2002); [40,41] argue that corruption is a disease of poverty, which disappears as the country becomes richer. Several studies have shown that corruption has a negative effect on economic development, being an obstacle to increased investment [2,41], to the absorption of EU funds [42], to the effectiveness of fiscal policy [43-46] and finally to economic growth. Kaufman [45] finds a strong relationship between corruption and budget deficits in industrialised countries. He also finds that corruption reduces tax revenues, increases public expenditures, reduces productivity and economic competitiveness and growth. Following on from the above, Ivnayna et al [46] highlight that increased corruption reduces government revenues and hinders economic growth. However, there is another group of authors in the literature who empirically document the opposite results. For example, Jiang and Nie [47] conducted an empirical study on the Chinese miracle of maintaining high GDP growth due to high levels of government and official corruption.

They explain this by the fact that in countries with low quality of governance, corruption can be a favourable factor for resource allocation while contributing to productivity growth. Beck and Maher [48] found similar results. They find that in the absence of sanctions for corruption, supplier firms would be indifferent between corrupt institutions and bidders. Bribery thus proves to be a powerful instrument to obtain more expensive business opportunities. Thus, the shadow economy, especially in corrupt countries, represents an important buffer for solving many problems such as high unemployment, future use of black money in the official economy and efficient local use of public goods, based on market principles in a situation where the goods are used by a limited number of beneficiaries (local private / public beneficiaries) who pay different and voluntary contributions Zaman and Goschin [49].

The empirical studies of many previous studies such as Johnson et al. [19], Hindriks et al. [50], Hibbs and Piculescu [51] and Dreher and Schneider [29] come to a common conclusion that corruption and the underground economy are complementary. According to these researchers, the size of the underground economy is increased by corruption for several reasons: First, corruption is assimilated to a particular form of regulation and institutional quality of the underground economy [19], second, inspectors cooperate with taxpayers to obtain bribes in exchange for underreporting or minimising taxpayers' tax liability [50], and third, firms bribe dishonest bureaucrats to ignore their production activities [51].

In summary, this study investigated whether a high level of corruption and the black economy could be a brake on economic growth. The following hypotheses are formulated:

Hypothesis 1: Higher levels of corruption reduce economic growth, other things being equal;

Hypothesis 2: A higher level of the underground economy reduces economic growth, other things being equal.

3. DATA AND METHODOLOGY

3.1 Description of the Data and its Sources

For this study, we used a sample of 10 countries¹ in the CFA franc zone over the period

¹*Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal, Togo, Cameroon, Republic of Congo, Gabon and Guinea-Bissau.*

from 2000 to 2016. The availability of data justifies the choice of this study period. The descriptive statistics and data sources for our sample are presented below in Table 1. We use variables such as: gross domestic product (GDP) which is our dependent variable, gross fixed capital formation (GFCF), and trade openness (TU) from the World Bank database.

We use the International Country Risk Guide (ICRG) corruption index to capture the corruption indicator that is one of our independent variables of interest. The choice of this index is justified by two reasons, considered here as advantages of using this index. First, this corruption index covers a longer period of study, since 1984, while taking into account a larger number of countries (36 countries), and second, this index is not a composite index, so its annual comparison is more reliable compared to some other indices such as Transparency International and World Governance Indicators [52]. It is important to note that the ICRG corruption index has values ranging from 0 (highly corrupt countries) to 6 (low corrupt countries). In order to better interpret our results, this indicator has been normalised and re-parameterised according to an intuitive logic, so that a high score refers to a high risk of corruption and a low score refers to a low risk of corruption. Thus, we define the corruption variable *Corrupt*, as follows:

$$\text{Corrupt} = 1 - (\text{ICRG}_t / \text{ICRG}_{\text{max score}})$$

equivalent to $\text{corr}t = 1 - (\text{ICRG}_t/6 \text{ score})$.

Another variable of interest in our study is the size of the underground economy. The underground economy as named by Schneider and Dominik (2000) is known by different names such as the underground economy (Simon and Witte 1982; Feige 1989), the informal economy (Smith 1985) and the unofficial economy [19]. It is an integral part of the official economy. The literature presents a multitude of definitions of this concept, which vary from one author to another or even from one school of thought to another. Nevertheless, the vast majority of researchers agree that the underground economy consists of all market-based goods and services that are not captured in the official national accounts [53].

In the literature, there are three main approaches to measuring and assessing the size and expansion of the underground economy. These

Benin, Equatorial Guinea, Chad and the Central African Republic are not included in the panel due to the unavailability of data for some variables in our model.

include: Direct methods that rely on microeconomic theories to use well-designed surveys or tax control methods [54,55] (Haigner et al. 2013); indirect methods which rely on macroeconomic indicators such as foreign exchange demand [53,56,57], the gap between national income and expenditure statistics [58], the gap between civil servants and the real workforce [59]; and finally, the model methods known as MIMIC (Multiple Indicator Multiple Cause approach) in which the underground economy can be measured via a set of causes and indicators of the underground economy (Giles and Tedds 2002; Bajada and Schneider 2005) [60,61] (Vo and Pham 2014; Schneider and Buehn 2017). Among the several causes of the underground economy distinguished in these studies are tax and social security burdens, self-employment, institutional quality and tax morality. The size of the underground economy can be captured in different indicators such as the official economic situation growth, currency or cash out of the banking circuit and activity rate. In this research we use the data on underground economies from Medina and Schneider [61], in which the MIMIC approach was used for the estimation of the underground economy.

3.2 Statistical Analysis

We include in our study a brief descriptive analysis in order to know the type of data we are working with.

From the Table 1 we can see that not all standard deviations are strong, which means that the variances are minimal between these variable values. It is therefore not appropriate to proceed with a logarithmic transformation of these as is often the case in order to normalise the series.

We can also include zero-order correlations which are presented in Table 2. The values of these correlations can vary between -1 and +1, which means that for any positive increase α in one variable, there is a positive/negative increase in the zero-order correlation coefficient of the other variable. This means that the absolute coefficients of these correlations tell us something about the strength of the relationship, which means that $|-0.7148|$ has a stronger relationship than 0.3784, [62].

Table 1. Descriptive statistics table

Variable	Obs	Mean	Std. Dev.	Min	Max	sources
GDP	170	4.058629	3.216151	-6.910927	15.37624	WDI
Ecosou (% GDP)	170	37.48926	6.600963	26.43664	57.81859	Medina and Schneider
Stabiligou	170	8.355147	1.373181	5.5	11	ICRG
Corrupt	170	.6911356	.0912358	.375	.8333333	ICRG
Com	170	62.0739	19.32849	25.04194	112.761	WDI
Fbcf	170	19.06189	6.65233	5.885067	36.76441	WDI

Sources: Medina and Schneider; WDI: World Development Indicators; ICRG: International Country Risk Guide, authors' calculations

Table 2. Correlation matrix table

	GDP	Ecosou	Stabiligou	Corrupt	Com	Fbcf
GDP	1.0000					
Ecosou	-0.2760	1.0000				
Stabiligou	-0.2553	0.2199	1.0000			
Corrupt	-0.0158	0.2874	-0.1483	1.0000		
Com	-0.0647	0.0685	0.0208	-0.0209	1.0000	
Fbcf	0.2619	0.0272	0.0412	-0.1245	0.2302	1.0000

Sources: Medina and Schneider; WDI: World Development Indicators; ICRG: International Country Risk Guide, authors' calculations

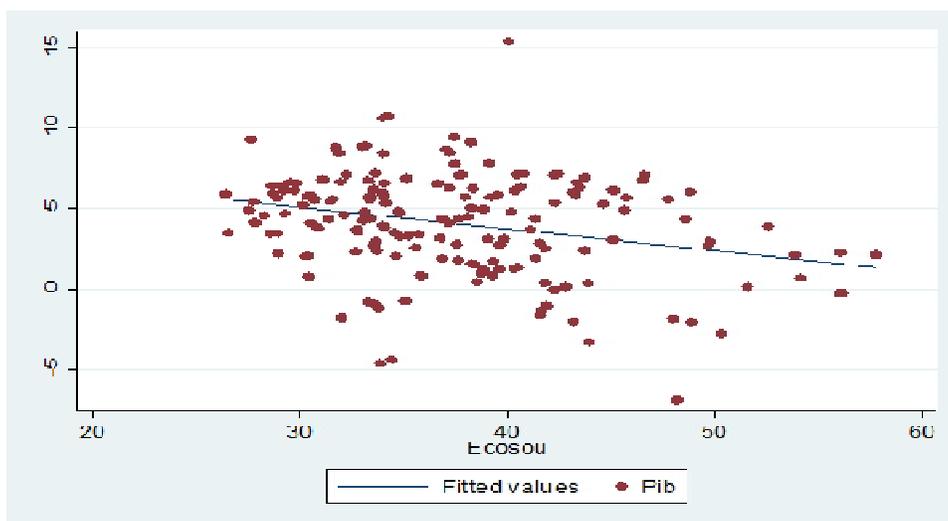


Fig. 1. Scatterplot between shadow economy and economic growth

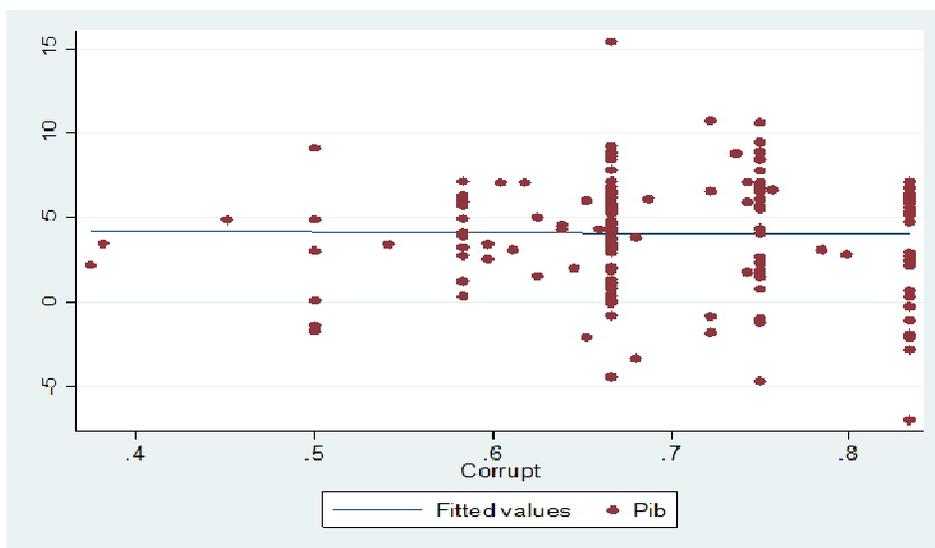


Fig. 2. Scatterplot between corruption and economic growth

Sources: Medina and Schneider; WDI; ICRG, authors' construction

The results obtained in Table 2 show the correlations between our different variables. The correlations between the independent variables do not provide much information. The most important correlations for our analysis are exclusively those in the first column.

To finish with the statistical analysis, we can include in our work scatter plots with trend consideration. These scatter plots give not irrelevant clues about the relationship between the shadow economy and GDP on the one hand

and the corruption variable and GDP on the other.

The interpretation of these graphs is quite intuitive and there are two main cases. Firstly, if the data show an upward trend when moving from left to right, this means that there is a positive relationship between the two variables involved. In other words, when one of these two variables increases (rightward movement), the other variable increases along with it (upward movement). Then, the other possibility is a

decreasing trend when moving from left to right, which means that there is a negative relationship between the two variables involved. Based on these simple preliminary analyses, we can predict that the shadow economy will have a negative effect on economic growth, but we cannot predict with certainty the influence of the corruption variable on economic growth.

3.3 Model Specification

The main objective of this study is to analyse the effects of corruption and the underground economy on economic growth in the CFA franc zone. Taking into account the variables regularly encountered in the literature, we can formulate our econometric model as follows:

$$Pib_{i,t} = \alpha_i + \beta_1 Corrupt_{i,t} + \beta_2 Ecosou_{i,t} + \beta_3 X_{i,t} + \varepsilon_{i,t}$$

where i is the country index ($i = 1$ to n), t the time index ($t = 1$ to T), $Ecosou$ is the variable representing the underground economy, $Corrupt$ represents the corruption index of the ICRG, X the column vector of the other control variables. The coefficients β_i correspond to the parameters to be estimated and α_i denotes the vector of individual (country) fixed effects, ε corresponds to the error term. In compact form, the model is written as follows:

$$Pib_{i,t} = \alpha_i + \beta' x_{i,t} + \varepsilon_{i,t}$$

Where β is the column vector of parameters to be estimated β_i and $x_{i,t}$ is the column vector of the explanatory variables of our model, the prime here represents the transpose.

With the data thus developed, the theoretical model and its variables specified, and the econometric methodology known, we can now proceed with the various estimations and the interpretation of the results that will follow.

3.4 Unit Root Tests

We use two generations of unit root tests. We justify this choice by two reasons. The countries of the CFA franc zone are not immune to heterogeneity linked to their different economic structures (first generation tests) or even to inter-individual dependence linked to the management and sharing of a common currency (second generation tests).

Table 3. Table of first generation panel unit root test results

First generation tests	Test in level		First difference test		Conclusion I (1)
	Levin et al ii Wu [63]	Maddala and [64]	Levin et al ii [63]	Maddala and Wu [64]	
GDP	-0.4705 (0.3190)	0.4264 (0.3349)	-13.3287 (0.0000)	2.6151 (0.0045)	yes
Ecosou	2.3906 (0.9916)	-2.8441 (0.9978)	-10.9256 (0.0000)	2.9513 (0.0016)	yes
Stabiligou	0.3241 (0.6271)	-0.9374 (0.8257)	-13.0004 (0.0000)	3.6807 (0.0001)	yes
Corrupt	9.0921 (1.0000)	-0.1625 (0.5645)	-16.8192 (0.0000)	12.9841 (0.0000)	yes
Com	4.8754 (1.0000)	0.9094 (0.1816)	-8.6396 (0.0000)	2.1114 (0.0174)	yes
Fbcf	3.6693 (0.9999)	-0.4281 (0.6657)	-35.4200 (0.0000)	6.3159 (0.0000)	yes

Table 4. Table of second generation unit root tests results in Pesaran panel (2007)

Second generation tests	Test in level	First difference test	Conclusion I(1)
GDP	-2.88 (-2.366)	-2.88 (-5.143)	yes
Ecosou	-2.88 (-2.619)	-2.88 (-3.686)	yes
Stabiligou	-2.88 (-2.591)	-2.88 (-4.002)	yes
Corrupt	-2.88 (-2.106)	-2.88 (-3.776)	not
Com	-2.88 (-2.873)	-2.88 (-3.858)	yes
Fbcf	-2.88 (-2.115)	-2.88 (-3.712)	yes

Reading: The results of the tests applied to the variables in level and first difference, using a model with constant and individual trend, are presented here. We have represented in brackets the p-values that are associated with the different test statistics that precede them. The conclusions of these tests are as follows: to accept the null hypothesis of non-stationarity if the critical probability is above the 5% threshold, and to reject this hypothesis in the opposite case (and vice versa). All these tests are based on the null hypothesis of non-stationarity against an alternative hypothesis of stationarity. NB: the final conclusion (integrated series of order 1) was obtained after repeating these same tests on the variables in first differences. The tests then lead to stationarity

Sources: Medina and Schneider; WDI; ICRG, authors' calculations

The results of the different unit root tests that we present in Tables (3) and (4) above globally highlight the presence of a unit root in the variables studied for all our first generation [63,64] at the 5% threshold². Pesaran's [14] second generation test for $p=3$ lags highlights the presence of a unit root in the dynamics of the variables³. The results of the tests on the variables in first difference show that they are stationary. We conclude that the order of integration of our different variables is 1. These different results on the unit root tests lead us to test if all our variables are linked by a long term relationship.

3.5 Co-integration Tests

We use two generations of cointegration tests: the Westerlund [65] and the Pedroni [66,67] tests. Four of the seven statistics proposed by Pedroni reveal the presence of a cointegrating relationship (see Table 5). We give priority to the tests based on the inter-individual dimension because the homogeneity of the panel is unlikely⁴, which leads us to conclude that there is

²In order to find the optimal number of delays, it is possible to use the information criteria or to be set arbitrarily by the modeller. In order to find the optimal number of delays for these tests, we use the information criteria.

³It should be noted that the robustness of the results depends on the choice of the number of delays. Indeed, for this test (Pesaran test), the modeller has to arbitrarily set the number of upstream delays. In order to check the robustness of the results, it is necessary to vary the number of delays and to study its effect on the results. We varied several delays and our conclusions remained unchanged regardless of the delay tested.

⁴Indeed, although the countries of the CFA franc zone share a common currency, the countries of the CEMAC zone, most of which are oil-producing countries, are characterised by

a cointegrating relationship between the gross domestic product and its different control variables. This conclusion is consistent with two of the four statistics provided by the Westerlund

test (see line G_t and P_t in Table 5, associated with heterogeneity of the cointegrating vectors). It is now possible to estimate the parameters of the cointegrating vector. To do so, we use the PMG method.

4. ECONOMETRIC ESTIMATION AND INTERPRETATION OF RESULTS

The PMG (*Pooled Mean Group*) approach presented by Pesaran et al. [14] Firstly, this approach allows the heterogeneity of countries to be taken into account, secondly, this approach allows the dynamics of countries to be taken into account and finally, it takes into account the non-stationary nature of the variables. This approach makes it possible to include heterogeneity in the short-term parameters while maintaining homogeneity in the long-term parameters. This is particularly relevant in the context of our study, since the convergence criteria established for the CFA franc zone should eventually make it possible to "erase" the heterogeneity that currently exists. Thus, the PMG approach makes it possible to determine the speed of adjustment of the gross domestic product towards the long term equilibrium.

The dynamic panel specification of the model expressed as an error correction model is given as follows:

greater volatility in their indicators compared to the countries of the WAEMU zone.

Table 5. Co-integration test results table

Pedroni tests [66,67]			Westerlund tests [65]			
Alternative hypothesis: Common autoregressive coefficients (intraindividual dimension)			Model with trend and constant			
Tests	Statistics	P-value Vc 5	Tests	Statistics	Z-Statistics	P-value
Panel :	-2.214	1.64	Gt	-6.113	-10.643	0.000
Statisticsv			Ga	-2.373	5.797	1.000
Statistics rho	2.144	-1.64	Pt	-14.843	-6.058	0.000
Statistics t	-8.442	-1.64	Pa	-3.254	4.356	1.000
ADF statistics	4.547	-1.64				
Alternative hypothesis: Individual autoregressive coefficients (inter-individual dimension)						
	Statistics	P-value				
Group:	3.126	-1.64				
Statistics rho						
Statistics t	-11.84	-1.64				
ADF statistics	5.845	-1.64				

Reading: similar to the approach taken in the case of unit root tests, we present here only the results for models with constant and trend. For the Westerlund tests, the number of lags and leads is determined from the Akaike information criterion (AIC), by setting a relatively small lag and lead interval given the small number of observations per series. The width of the Bartlett kernel window that was used in the semi-parametric estimation of the long-term variances was determined from the formula $4(T/100)^{2/9} = 3$, T being the number of time series observations. Only the probabilities calculated using the Bootstrap⁵ technique are reported. The presence of a possible cointegrating relationship is detected if the value of the P-value is lower than the 5% threshold retained for the tests. Z-statistic represents the statistic obtained following the Bootstrap procedure allowing for inter-country dependence

Sources: Medina and Schneider; WDI; ICRG, authors' calculations

$$\Delta Pib_{i,t} = v_i(Pib_{i,t-1} - \beta'x_{i,t}) + \sum_{\tau=1}^{p-1} \lambda_{i,\tau} \Delta Pib_{i,t-\tau} + \sum_{\tau=0}^{q-1} \delta_{i,\tau} \Delta x_{i,t-\tau} + \mu_i + \varepsilon_{i,t}$$

The term in the brackets contains the long-term parameters. The speed of adjustment towards the long-run equilibrium is represented by the parameter v_i . The model does not allow for a long-run relationship for $v_i \geq 0$. For v_i significantly less than zero with an absolute value not too large, then there is a long-run relationship. Particular importance is given to the parameter β containing the parameters of the long-run relationship between the variables.

⁵The Bootstrap is a statistical inference technique based on a succession of resamplings allowing, among other things, a very fine sensitivity analysis. In the case of this test, the Bootstrap makes it possible to calculate probabilities that are robust to the presence of common factors in the time series.

Table 6. Estimated long-term relationships table (PMG method)

Variables	Coefficients	Std. Err.	P> z
Ecosou	-.3519361	.0743278	0.000
Stabiligou	.1874961	.1949287	0.336
Corrupt	9.991795	2.3433	0.000
Com	-.094904	.022607	0.000
Fbcf	.1849876	.0432805	0.000

Table 7. Estimated table of short-term relationships (PMG method)

Variables	Coefficients	Std. Err.	P> z
Δ (Ecosou)	-.417638	.2374534	0.079
Δ (Stabiligou)	-.8634657	.436111	0.048
Δ (Corrupt)	-13.35017	7.812599	0.087
Δ (Com)	-.0310863	.092755	0.738
Δ (Fbcf)	.1089731	.2452975	0.657
ECM (-1)	-.9265176	.1402108	0.000

Reading: Δ denotes the first difference operator. In Tables (6) and (7) above, we have plotted the estimated values of the long-run coefficients (Table 6) and the simple arithmetic means of the estimated short-run coefficients per country (Table 7). The models are estimated taking into account individual fixed effects

Sources: Medina and Schneider; WDI; ICRG, authors' calculations

The coefficient associated with the underground economy variable, which is one of our independent variables of interest, contributes significantly and negatively to the explanation of the GdP variable in the long run relationship. This result is similar to the results found by Loayza [18] when studying the case of Latin America and by Hassan and Schneider [27] when studying the case of Egypt. Similarly, in the short run the effect of the shadow economy on economic growth remains negative in the short run but this time this effect is insignificant. The coefficient associated with the corruption variable, which is the other independent variable of interest in our study, contributes significantly and positively to the explanation of economic growth at the 5% level in the long run relationship. This result means that an increase in the level of corruption leads to an increase in the level of economic growth. This result is similar to the results that were found by Jiang and Nie [47] who show that in countries with low quality of governance, corruption can be a favourable factor for resource allocation while contributing to productivity growth. Beck and Maher [48] found similar results. In contrast, the effect of corruption on gross domestic product is negative in the short run. On the other hand, other control variables, namely: government stability, trade openness and gross fixed capital formation have positive and significant effects⁶ on

economic growth. In the short run, government stability and trade openness have a negative impact on economic growth but this negative impact is insignificant for these two variables. However, the short-run coefficient of the variable gross fixed capital formation has a positive but insignificant influence on economic growth. The estimation results show that the coefficient associated with the variable measuring the recall force (ECM (-1)) is significantly negative. This result confirms the existence of a stable long-term relationship between economic growth and the different explanatory variables of our model.

5. CONCLUSION

The main objective of this study was to analyse the effects of corruption and the black economy on gross domestic product in 10 countries of the CFA franc zone during the period 2000 to 2016. A set of other variables such as government stability, gross fixed capital formation and trade openness were considered in our analysis. Our results revealed a strong and positive relationship between corruption measured by the ICRG corruption index and gross domestic product growth was found in the long run. However, the long-term effect of the shadow economy on economic growth is significantly negative. Based on the above result, we formulate an economic policy recommendation that is not irrelevant for policy makers who need to adopt the best incentives and policies required to limit the levels of the underground economy.

⁶This significant effect does not hold for the coefficient associated with the government stability variable

Indeed, it is shown that underground activities will not help solve economic problems but, on the contrary, these underground activities constitute an obstacle and a brake to economic growth. For potential future research, it would be necessary to make the influences of corruption and the underground economy on economic growth more robust by including in our model other control variables that may have an influence on economic growth. These variables could include government stability, tax burdens, unemployment rates, as well as some cultural variables.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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