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Inherent effects of corruption on the erosion of political trust in developing countries: Evidence from Ghana

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Abstract

A growing literature highlighting the inherent effects of corruption on the erosion of political trust has emerged recently, but few studies focus on Sub-Saharan African countries. The paper uses an identification strategy based on a control function approach, along with individual level data to disentangle the nexus between perceived corruption and political trust in Ghana. Results show that perceived corruption substantially erodes political trust, whilst political trust only slightly impacts people's perception of corruption. In essence, perceived corruption propagates a climate of mistrust in Ghana. Moreover, heterogeneous effects on these relationships are observed across regions, ethnic groups, gender and education. For example, men tend to perceive the presidency office as corrupt whilst trusting the president, thereby repudiating the general view that individuals who trust more automatically perceive less corruption.

Key words: Corruption; Mistrust; Simultaneity; Ghana; Presidency office; Control function approach.

JEL Codes: O17, N27, C35.

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1 Introduction

The complexity of political trust and corruption nexus has evoked heated debates on whether political mistrust engenders corruption or corruption breeds mistrust. Despite the abundant literature (see e.g. Seligson, 2002; Catterberg and Moreno, 2006; Chang and Chu, 2006; Morris and Klesner, 2010; Anderson and Tverdova, 2003; Dalton, 2004; Uslaner, 2005; Rothstein and Uslaner, 2005; Wroe et al., 2013) and the importance of the issue in African countries, research on this topic is minimal or absent in these developing economies. Furthermore, from a methodological point of view, existing studies are dissonant on the most suitable approach to deal with the simultaneous determination of corruption and political trust, especially in the estimation strategy. More, prevailing studies on the issue fail to differentiate between different degrees of corruption and political trust, as they use proxy indexes to measure corruption and political trust.

This study uses Ghana as a natural experiment in developing Africa to investigate the relationship between corruption and political trust. The main contribution of the paper is twofold. First, the study distinguishes between different levels of political trust and corruption to avoid polarisation towards extreme cases. By considering disaggregated level measures of corruption and political trust (which are often gathered in the form of qualitative information), the study ultimately minimises potential measurement errors subjected to the use of proxy measures. Second, using a novel econometric technique recently developed by Wooldridge (2015) – the control function (CF) – encapsulated in an ordered probit setting, the study overcomes the issues of coherence and completeness conditions predominantly encounter in simultaneous equations modelling with discrete dependent variables. By embedding the control function approach into an ordered probit estimation, the discrete nature of corruption and political trust measures is efficiently accommodated within the framework of simultaneous equations.

Several studies have emphasised the "trust-eroding" effect of corruption (see e.g. Seligson, 2002; Catterberg and Moreno, 2006), since political corruption is considered as the most corrosive problem encountered in governments and institutions. Political corruption is defined as the breach of fidelity as governmental officials undertake malfeasance for personal enrichment (Bardhan, 1997). It fortifies society's

mistrust towards political institutions (Doig and Theobald, 2000). In particular, it triggers disruption of the political system (Seligson, 2002), as pivotal principles of the democratic setting – such as accountability and equality – are violated. The proper functioning of the government and institutions, combined with trust in political institutions, are two prominent mechanisms that enable efficient human cooperation and information exchange. This provides a supportive cultural and legal structure for economic development, which insinuates corruption is detrimental to a country's economic performance. Particularly for developing countries, impediments to economic growth are fatal. Seligson (2002) investigates this issue further in El Salvador, Nicaragua, Paraguay and Bolivia and finds that political trust is negatively affected by corruption permissiveness. Catterberg and Moreno (2006) find no evidence of the erosion of political trust due to corruption in countries like Argentina, Chile, Mexico and Peru, but in new and established democracies, as well as six former Soviet Republics, corruption permissiveness exacerbates political mistrust. Generally, scholars conform with the peculiarity of trust, consonant that political trust is both the cause and consequence of corruption, signalling both are simultaneously determined (Dalton, 2004). Therefore, identifying the relationships between political trust and corruption requires accounting for this simultaneous determination.

Previous studies have used the simultaneous equations framework to control for the bi-directional relationship between corruption and political trust (see Uslaner, 2005; Chang and Chu, 2006; Morris and Klesner, 2010). Morris and Klesner (2010) stress the counterproductive endogenous nature of perceived corruption and mistrust in Mexico. They show that trust in public institutions is eroded by higher levels of corruption but the effect is weaker the other way around. More precisely, a 10% increase in the corruption index entails more than a 16% decline in the index of institutional trust, whilst a 10% increase in the institutional trust index yields about a 6% rise in the perceived corruption index. As a result (especially in nations with systemic corruption), corruption propagates a climate of mistrust, which nurtures corruption arousing a vicious cycle. Similar findings are found by Chang and Chu (2006) in the context of Asian countries. Uslaner (2005) documents that less trusting societies breed corruption. Similarly, Rothstein and Uslaner (2005) analysis of equality, social trust and corruption indicates that mistrust and inequality cause higher corruption levels.

Despite the endemic nature of corruption in developing countries, in more advanced democracies corruption is generally predicted to be less prevalent. Wroe et al. (2013) explore the effects of trust on the perceived presence of corruption in the United Kingdom. Their results confirm that less trusting individuals are more likely to perceive the presence of corruption. While Wroe et al. (2013) and Uslaner (2005) accentuate political trust as an intrinsic causal factor of corruption in advanced democracies, Morris and Klesner (2010) and Chang and Chu (2006) highlight the dominance of corruption in this convoluted reciprocal relationship in developing countries.

In line with the literature on developing economies, our results indicate perceived corruption determines individuals' political trust level by a greater extent in Ghana. Individuals who assume all officers in the presidency office engage in malfeasance are 90.3% more likely to not trust the president at all. In contrast, individuals with the highest trust in the president are 31% less likely to perceive the presidency office as completely corrupt. More generally, any degree of perceived corruption tremendously decreases political trust and heterogeneous responses are observed across them, whereas the marginal effect of different levels of political trust on corruption is less strong and portrays only a slight variability. Clearly, in Ghana the perceived corruption in the presidency office initiates political mistrust, which in turns reinforces individuals' perception of the presidency officers rent-seeking behaviour, thus triggering a vicious cycle.

2 Data

The data is provided by an independent research network, Afrobarometer. Afrobarometer conducts face-to-face interviews on several African countries, whereby roughly 1200 to 2400 individuals aged above 18 are randomly selected for each country. Each survey focuses on individuals' attitudes towards governance, economic conditions, democracy and other relevant issues, such as trust and corruption, thereby measuring the economic sentiment and social-political atmosphere in each country. A clustered, stratified, multi-stage, area probability sampling approach minimises the probability of excluding distinct languages or ethnic groups. The sampling design ensures that the margin of sampling error is no more than $+/-$ 2.8% within a 95%

confidence level for the sample size of 1200, whilst the sample size of 2,400 has a $+/-2\%$ error margin within a 95% confidence interval. The uniqueness of the sample structure elevates the reliability of the data, thus reinforcing the implications of our results for policy analysis. Seminal studies have used the same data; see e.g. Nunn and Wantchekon (2011).

We use data from five survey rounds (from 2002 to 2014) for Ghana containing 8,397 randomly selected individuals. Responses such as "do not know" or "refused to answer" are excluded from the analysis, as these outcomes do not contribute towards the analysis. The remaining sample is balanced and reflects an equilibrated variation in age ranges, gender, ethnic groups, regions, educational attainment and employment status, as illustrated by the summary statistics in Table A2 in the Appendix. Accordingly, the most significant individual character attributes in the sample are either represented proportionally in terms of their size (e.g. ethnic groups and regions) or equally distributed according to the sample size (e.g. age ranges, gender and employment status).

Since we emphasise on the relationship between political trust and corruption in the government, questions on trust and corruption within the survey are of crucial relevance. To avoid any polarisation towards extreme values of political trust or perceived corruption, we use four different levels for both variables, which contrasts with the proxy index approach adopted by previous studies. Using the level measures should minimise inaccuracies of self-calculated proxies, and enables to analyse heterogeneous impacts of different political trust and corruption degrees. Since both variables are categorical, numerical values are assigned to all responses, similar to Nunn and Wantchekon (2011). The degree of trust is measured in four numeric levels $k = 1, 2, 3, 4$, whereby 1 conforms with "not at all", 2 with "just a little", 3 with "somewhat" and 4 with "a lot",[1] whilst corruption is also measured in four levels, $l = 1, 2, 3, 4$, corresponding to "none", "some of them", "most of them" and "all of them" respectively.

In addition to controlling for individual characteristics such as age, educational attainment, employment status, ethnicity and regional determinants, we also include a variety of other covariates – indicators for satisfaction with democracy, bribe votes,

[1]Note that Nunn and Wantchekon (2011) use numeric values from 0 to 3 instead of 1 to 4.

president's ability to handle job creation; living standards; and corruption. Controlling for these variables is important to account for the political environment and individuals' sentiment towards the president.

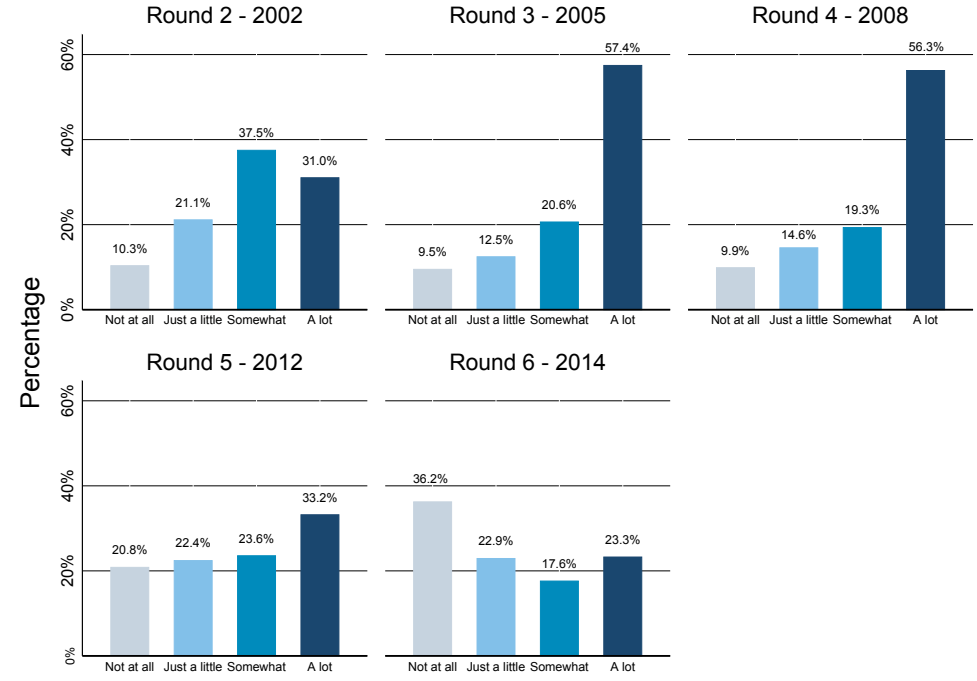
2.1 Perception towards the government

According to Norris (1999) and Pharr and Putnam (2000), corruption has contributed to the decline in political trust in most contemporary democracies. Figure 1a shows the evolution of trust in the president in Ghana, while Figure 1b illustrates individuals' perception of corruptible behaviour in the presidency office.

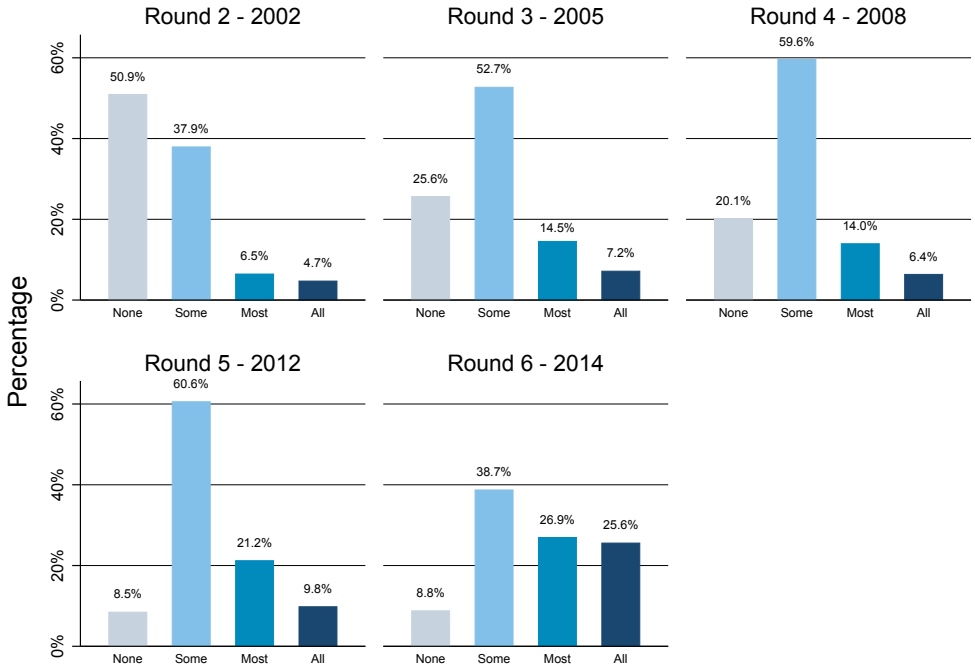
Focusing first on political trust in Ghana, Figure 1a shows that trust in the president was relatively high for the period 2005-2008 but this trust has eroded in recent years. This erosion of trust could be exacerbated by the death of president John Atta Mills in late July 2012. The sudden change of president, as John Dramani Mahama took office on the same day, has probably contributed to the rise of mistrust, with 36.2% of respondents not trusting the president at all in 2014, compared to 20.8% in 2012.

Figure 1b illustrates that the perceived corruption level has steadily risen since 2002, with 25.6% of respondents saying all officers in the presidency office engage in corrupt behaviour in 2014, compared to only 4.7% in 2002. The same trend is also observed with respondents who think most officers in the presidency office are corrupt; with 6.5% in 2002 against 26.9% in 2014. This has led to a large majority of respondents (approximately 91.2%) believing that the presidency office engages in corrupt behaviour in 2014, which in turns could explain the higher level of mistrust in the president.

Figure 1 clearly illustrates an inverse relationship between political trust and corruption, as documented in the literature, i.e., the lower the trust level the higher the perceived corruption level. This finding aligns with the prevailing stance of scholars such as Beugelsdijk et al. (2004) who argue that societies with higher trust level are less likely to adopt a criminal or corrupt behaviour, which in turns can boost economic growth (Zak and Knack, 2001).



(a) Trust



(b) Corruption

Figure 1: Distribution of trust and corruption

2.2 Variation across regions

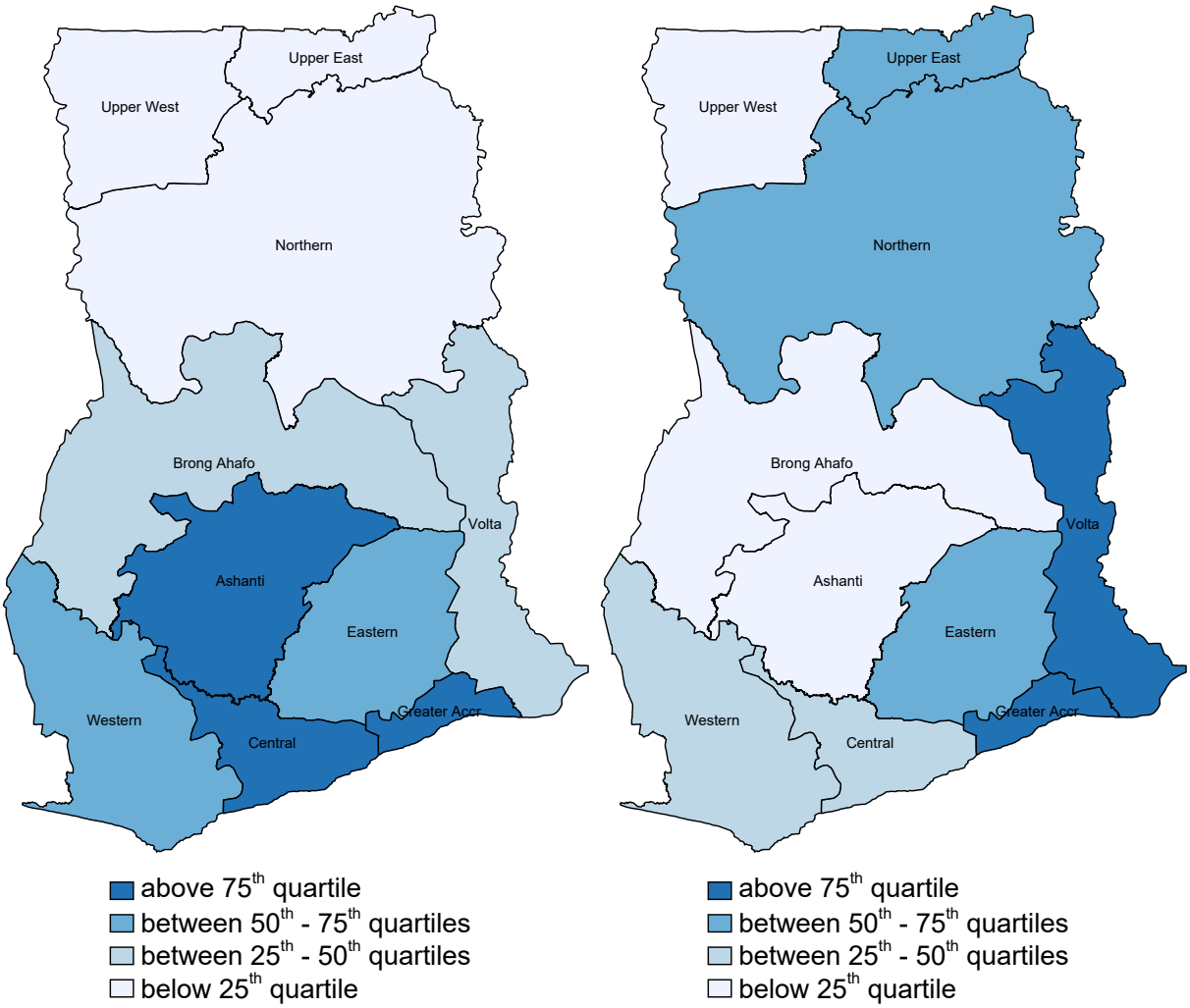
The literature purports regions with lower trust levels perceive more corruption and vice versa. In this section, we explore the variability of political trust and corruption across different regions of Ghana. For each region, we consider the proportion of respondents who reported mistrusting the president (i.e. trust level "Not at all") and the proportion of respondents who reported officers in the presidency office have engaged in a corrupt behaviour (this includes respondents who said "Some of them", "Most of them" and "All of them"). Figure 2 illustrates the regional distributions of mistrust and perceived corruption. Quartiles are reported for each Figure. The regions coloured in dark blue indicate a higher proportion of respondents mistrust the president/perceive corrupt behaviour in the presidency office.

The figure highlights important regional differences in both the president's trustworthiness and the perception of corruption in Ghana. While mistrust in the president is high in the Ashanti, Central, and Greater Accra, respondents in regions such as Northern, Upper East and Upper West expressed more confident in the president (Figure 2a). The dispersion in the mistrust level is relatively large, with 29.42% of the respondents in Ashanti reporting the highest mistrust in the president, whereas in Upper West only 11.39% of individuals do not trust the president at all.

Considering the perceived corruption in the presidency office (Figure 2b), there is a strong consensus in the country that the presidency office is corrupt. The lowest perceived corruption level is observed in the Ashanti, Brong Ahafo, and Upper West regions with 73.9%-80% of respondents believing the presidency office is corrupt. In the Greater Accra and the Volta, the sentiment of corruption in the presidency office has soared with 85.9%-88.5% of respondents believing at least some officers in the presidency office engaged in corrupt behaviour. Although the perceived corruption is undeniably high, there is substantial regional variation with 73.9% of respondents in Brong Ahafo and Upper West reporting their belief in the corruptible behaviour of the presidency office, while this proportion has bounced to 88.5% in the Greater Accra and Volta regions.

Interestingly, respondents from the Northern region, trust the president despite 82.7%-85.8% of them believing the presidency office is corrupt (Figure 2b). Ashanti, on the other hand, is amongst the regions with a low proportion of respondents

observing criminal and corrupt activity in the presidency office. Even so, Ashanti represents one of the highest levels of mistrust. Respondents in the Greater Accra (where the Capital Accra is located) and Eastern regions are among those who seem coherent in their judgement - mistrust leading to a higher level of perceived corruption.



(a) Mistrust **(b)** Corruption

Figure 2: Regional differences

Note: Mistrust in Figure (a) aggregates the proportion of individuals who affiliate themselves with a trust level of "Not at all" for each region over all rounds. Corruption in Figure (b) aggregates the proportion of individuals who respond one of the following three levels of corruption: "Some of them", "Most of them", "All of them" for each region separately over all rounds. Only respondents reporting "No corruption" are excluded. All values, corruption and trust levels, are classified in quartiles. The darkest blue illustrates the 75^{th} quartile, while the lightest blue demonstrates the 25^{th} quartile.

3 Empirical specification

We consider the following simultaneous equation relating trust to corruption:

$$\begin{aligned} trust_i^* &= \beta_0 + \alpha_r + \gamma_t + \beta_1 corrp_i^* + X_i'a_1 + Ztrust_i'\gamma_1 + u_i \quad (1) \\ corrp_i^* &= \delta_0 + \rho_r + \phi_t + \delta_1 trust_i^* + X_i'a_2 + Zcorr_i'\gamma_2 + v_i, \quad (2) \end{aligned}$$

where $trust_i^*$ and $corrp_i^*$ are latent measures of trust and corruption respectively for individual i; β_1 measures the impact of corruption on political trust while δ_1 measures the impact of political trust on corruption; α_r and ρ_r are regional fixed effects, while γ_t and ϕ_t are survey year fixed effects, X_i includes exogenous characteristics that are both common to (1) and (2) – such as age, gender, education, ethnicity, and employment status, satisfaction with democracy, government handling of job creation, living standard and crime, bribe votes. $Ztrust_i$ contains exogenous variables included in (1) but not (2). $Zcorr_i$ contains exogenous variables included in (2) but not (1); u_i and v_i are idiosyncratic with mean zero and unit variance. In addition, we assume that $(u_i, v_i)'$ are i.i.d. normally distributed.

As it is usually the case in discrete choice models, $trust^*$ and $corrp^*$ are not observed but we assume that

$$\begin{aligned} trust_i &= k \quad \text{if} \quad \mu_{k-1} < trust_i^* \leqslant \mu_k, \; k = 1,2,3,4 \quad (3) \\ corrp_i &= l \quad \text{if} \quad \nu_{l-1} < corrp_i^* \leqslant \nu_l, \; l = 1,2,3,4, \quad (4) \end{aligned}$$

where $\mu_0 = \nu_0 = -\infty$ and $\mu_4 = \nu_4 = +\infty$. Due to the discrete nature of the observed measures of trust and corruption in (3)–(4), identifying the SEM (1)–(2) requires imposing the so-called "principle assumption" (see e.g. Heckman, 1978). Accordingly, both the completeness and coherence conditions must hold in order to achieve identification; see Blundell and Smith (1994), Lewbel (2007) and Chesher and Rosen (2012) among others. Lewbel (2007) argues that the coherence condition insures the existence of an implicit reduced form for each observable endogenous variable, $trust_i$ and $corrp_i$, whereby the completeness condition implies uniqueness of these reduced forms. Moreover, the fact that the right-hand side endogenous variables of the SEM (1)–(2) take discrete values once the latent variables are replaced with the observed

ones, the method proposed in the previous literature (see e.g. Rivers and Vuong, 1988; Blundell and Powell, 2003; Blundell and Matzkin, 2010; Blundell et al., 2013) are no longer applicable. To alleviate both difficulties, we generalise the CF approach recently developed in Wooldridge (2015) to the ordered probit setting.

As such, our identification strategy is basically a two-step methodology (similar to Wooldridge, 2014, Ch.16). First, note that given the instruments in Zcorr and Ztrust, thus both equations (1) and (2) can be identified as long as these instruments satisfy the rank condition. Second, provided that the instruments Zcorr and Ztrust are not weak, along with the rank condition, the entire system (1)–(2) is identifiable and can be estimated equation-by-equation, using for example the two-stage least squares (2SLS) approach. However, since the endogenous variables are discrete in our framework, methods such as the CF approach is warranted to enable identification.

To see how our strategy is implemented, suppose that we want to identify the structural parameter β_1 in (1). First, we can write (1) along with the reduced-form for corrp^*_{it} jointly as:

$$\begin{aligned} \text{trust}^*_i &= \beta_0 + \alpha_r + \gamma_t + \beta_1 \text{corrp}^*_i + X_i'a_1 + \text{Ztrust}_i'\gamma_1 + u_i \qquad (5) \\ \text{corrp}^*_i &= \pi_0 + \eta_r + \omega_t + X_i'\pi_1 + \text{Ztrust}_i'\pi_2 + \text{Zcorr}_i'\pi_3 + \widetilde{\nu}_i, \\ &= \pi_0 + \eta_r + \omega_t + W_i'\pi + \widetilde{\nu}_i, \qquad (6) \end{aligned}$$

provided that $1 - \delta_1\beta_1 \neq 0$, where $\pi_0 = \frac{1}{1-\delta_1\beta_1}(\delta_0 + \delta_1\beta_0)$, $\eta_r = \frac{1}{1-\delta_1\beta_1}(\rho_r + \delta_1\alpha_r)$, $\omega_t = \frac{1}{1-\delta_1\beta_1}(\phi_t + \delta_1\gamma_t)$, $\pi_1 = \frac{1}{1-\delta_1\beta_1}(a_2 + a_1\delta_1)$, $\pi_2 = \frac{\gamma_1\delta_1}{1-\delta_1\beta_1}$, $\pi_3 = \frac{\gamma_2}{1-\delta_1\beta_1}$, and $\widetilde{\nu}_i = \frac{1}{1-\delta_1\beta_1}(\nu_i + u_i\delta_1)$. Second, we can apply the CF method to (5)–(6) along with (3)–(4) to estimate β_1 following a two-step methodology. In this perspective, we refer to (6) as the first-stage regression and (5) as the second-stage regression. Wooldridge (2015, eq.14) shows that if the dependent variable in the first-stage regression, say y_2, is binary, identifying the structural parameter of the second-stage regression (here β_1) requires adding a term called "generalised residual" to that regression which is a switching function of y_2. This of course can be easily generalised to a first-stage with discrete dependent such as (6). More precisely, we can show under the joint

normality of u_i and v_i that

$$\begin{aligned} & \mathbb{E}[trust_i^* | X_i, Ztrust_i, Zcorr_i, \alpha_r, \gamma_t] \\ = \; & \beta_0 + \alpha_r + \gamma_t + \beta_1 corrp_i^* + X_i'a_1 + Ztrust_i'\gamma_1 + \eta_1 r_i, \end{aligned} \tag{7}$$

where from (4) we have $r_i =: \lambda(\pi_0 + \eta_r + \omega_t + W_i'\pi, v_l, v_{l+1})$ with

$$\begin{aligned} & \lambda(\pi_0 + \eta_r + \omega_t + W_i'\pi, v_l, v_{l+1}) \\ = \; & \frac{\phi(v_l - \pi_0 - \eta_r - \omega_t - W_i'\pi) - \phi(v_{l+1} - \pi_0 - \eta_r - \omega_t - W_i'\pi)}{\Phi(v_{l+1} - \pi_0 - \eta_r - \omega_t - W_i'\pi) - \Phi(v_l - \pi_0 - \eta_r - \omega_t - W_i'\pi)}, \end{aligned} \tag{8}$$

which is the generalised Inverse Mills Ratio (IMR) built from an ordered probit estimation of (4). See also Ormond and Murphy (see 2017, Appendix A). In (8), $\phi(\cdot)$ and $\Phi(\cdot)$ denote the pdf and cdf respectively to a standard normally distributed random variable, and $v_l, l = 1,2,3,4$ are the cut-offs points in (4). As v_l varies across subgroups in the sample, $\lambda(\cdot)$ also varies across individuals and subgroups, i.e., $r_i =: \lambda(\pi_0 + \eta_r + \omega_t + W_i'\pi, v_l, v_{l+1})$ can be viewed as a switching function of the discrete ordered variable $corrp_{it}$, thus generalising Wooldridge (2015, eq.14).

Now, define $\mathbf{I}_l = \{i \in \{1, \ldots, N\} : corrp_i = l\}$, $l = 1,2,3,4$. Then $\mathbf{I}_l$ is the subgroup of respondents in the sample who choose $corrp_i = l$ as corruption level. We can then implement our generalised CF method using the following algorithm.

1. Estimate (6) along with (4) using ordered probit.

2. For each individual $i \in \mathbf{I}_l$ and each $l = 1,2,3,4$, compute the estimated generalised residuals from this regression as:

$$\hat{r}_i \equiv \lambda(\widehat{corrp}_i, \hat{v}_l, \hat{v}_{l+1}) = \frac{\phi(\hat{v}_l - \widehat{corrp}_i) - \phi(\hat{v}_{l+1} - \widehat{corrp}_i)}{\Phi(\hat{v}_{l+1} - \widehat{corrp}_i) - \Phi(\hat{v}_l - \widehat{corrp}_i)}, \tag{9}$$

   where $\hat{v}_l$s are the estimated cut-offs points, $\widehat{corrp}_i = \hat{\pi}_0 + \hat{\eta}_r + \hat{\omega}_t + W_i'\hat{\pi}$, $\hat{\pi}_0$, $\hat{\eta}_r$, $\hat{\omega}_t$, and $\hat{\pi}$ are these parameter estimates from order probit in Step 1.

3. Replace the latent variables $trust_i^*$ and $corrp_i^*$ by the observed $trust_i$ and $corrp_i$ in (5), and $\hat{r}_i$ as an additional explanatory variable to this equation. Then estimate the resulting extended equation by ordered probit again using (3). The estimate $\hat{\beta}_1$ of the coefficient on $corrp_{it}$ in this extended regression identifies

consistently the unknown true population parameter β_1.

4. If the t-statistic indicates a statistically significant estimate for the coefficient on $\hat{r}_i$, then $\texttt{corrp}_i$ is endogenous in (5) and the CF approach is warranted.

5. Compute the marginal effects for the second-stage ordered probit and bootstrap their standard errors to correct for the two-stage procedure.

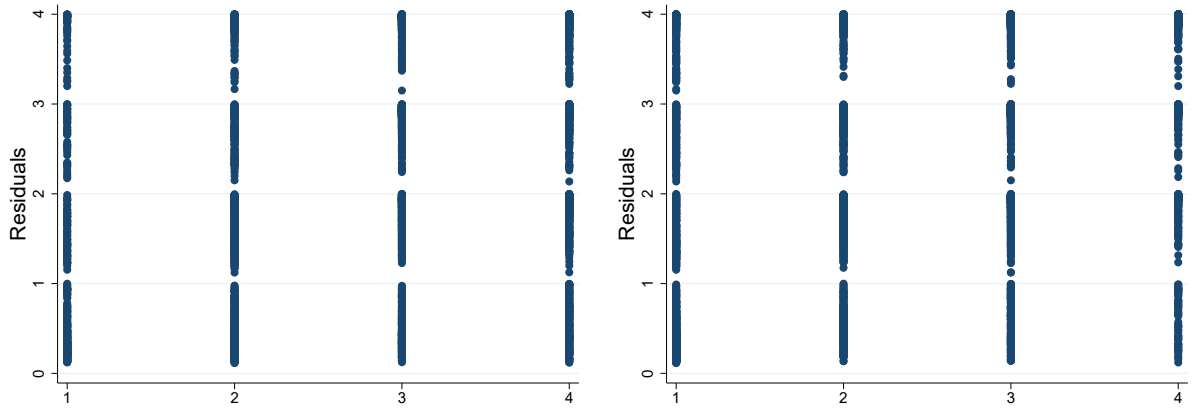
In the same way, we can write (2) along with the reduced-form for $\texttt{trust}^*_{it}$ jointly as done in (5)–(6), then we can follow identical steps as above to estimate δ_1 and compute the marginal effects of different variables.

To enable the identification of model parameters, the instrumental variables (IVS) for trust and corruption must be valid and strong. We use the *performance of the president* and the *government handling water and food supply* as IVs in $\texttt{Ztrust}_i$, while an *indicator for the fair count of votes* and the *government handling crime* are utilised as IVs in $\texttt{Zcorr}_i$. The choice of IVs is motivated by the literature in political science. According to Mishler and Rose (2001), the performance of institutions reinforces political trust, so the performance indicators in $\texttt{Ztrust}_i$ should be correlated with trust. Similarly, Sandholtz and Koetzle (2000) purport corruption violates principals of modern bureaucracy, whereby Gibson and Caldeira (1995) and Dahl (1973) argue corruption fundamentally impairs democratic accountability and equality. Correspondingly, the indicator for the fair count of votes and the government handling crime are likely correlated with corruption.

Regarding the strength of these IVs, the partial correlation between trust and each indicator, performance of the president; government handling food; and government handling water supply, is 0.52, 0.12, and 0.06 respectively which are all statistical significant at 1%. Similarly, the partial correlation between corruption and government handling crime and fair count of votes is -0.28 and -0.07 and both are significant at 1%. Considering the magnitude of these partial correlations, their strength is sufficient to enable identification. A Stock and Yogo's (2005) weak IV test in the first-stage regressions of (1) & (2) confirms that the IVs are strong, though this result should be interpreted with cautious as the first-stage specifications of (1)-(2) are nonlinear.

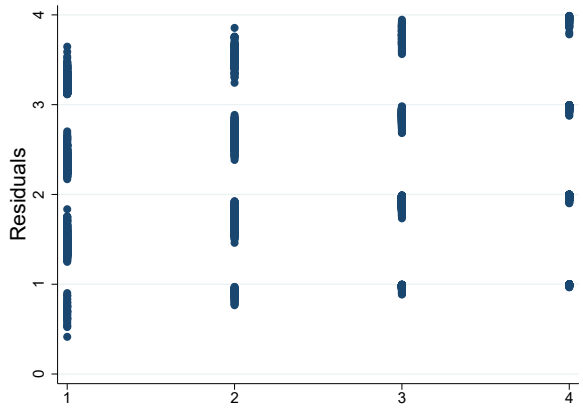
Considering the validity of the IVs, we run a simple ordered probit (OP) regression for each equation in (1)-(2) and filter the residuals. These OP residuals are plotted

against the corresponding IVs as illustrated in Figures 3 & 4. Since all IVs as well as trust and perceived corruption measures are discrete in nature, the scatter plots are represented across discrete values. The scatter plots demonstrate that the indicator IVs, expect of president's performance (Figure 4a), are almost independent of the residuals, as the distribution of residuals are nearly identical for each discrete level. Although Figure 3 seems to indicate that the conditional distribution of the residual given the president's performance varies across levels, meaning that there may be a weak dependence, we retain the indicators as it passes the Sargan test. According to the Sargan test, all instruments are valid since the p-value is above 0.6 in Equation (1) and 0.4 in Equation (2). Note that omitting the president's performance indicator from the IV list does not alter our results.

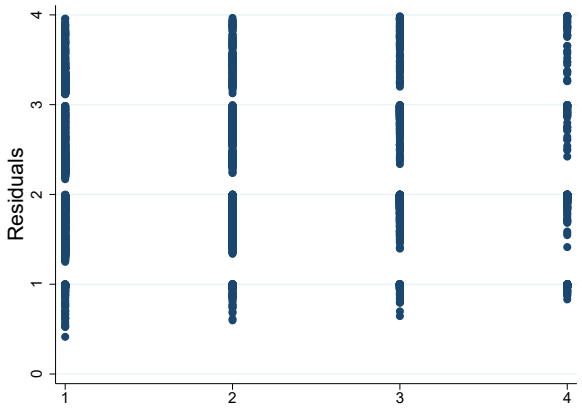


(a) Fair election **(b)** President's ability to handle crime

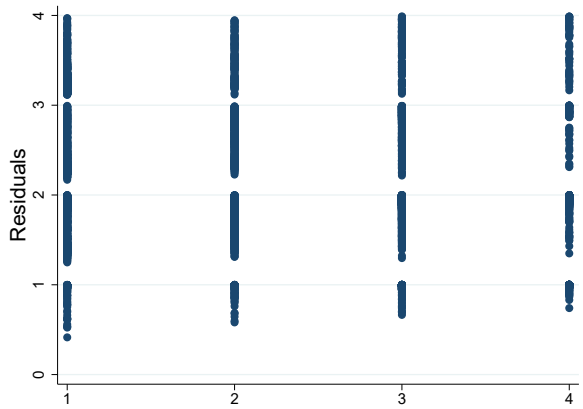
Figure 3: Corruption instrument validity



(a) President's performance



(b) President's ability to handle food



(c) President's ability to handle water and sanitation services

Figure 4: Trust instrument validity

4 Results and discussions

4.1 Political trust and perceived corruption nexus

We present the estimation of the model described by equations (1)-(4) using the algorithm at the end of Section 3. Tables 1 & 2 summarise the marginal effects of perceived corruption on political trust (Table 1) and that of political trust on perceived corruption (Table 2). As both political trust and perceived corruption measures are qualitative information, the marginal effects are presented for each option. The marginal effects of perceived corruption on political trust (Table 1) are compared to the benchmark group "No corruption," while the marginal effects of political trust on perceived corruption (Table 2) are compared to the base group "Not at all." We

also report in columns labelled "OP" the standard ordered probit estimates. Even though the ordered probit estimation is not the appropriate method, reporting it is useful to apprehend the potential simultaneity bias that would have occurred if the CF approach (columns coloured in grey) were ignored. The last column of each table includes the marginal effects on the IMR variable that justifies the necessity of the CF approach. Note, however, that the marginal effects on the IMR have no meaningful interpretation in this framework but their significance indicates the CF method is warranted.

Considering the marginal effects of perceived corruption on trust reported in Table 1, it is evident that perceived corruption arouses political mistrust in Ghana, as higher perceived corruption level increases the likelihood of mistrust of the president. In particular, while mistrusting the president (i.e., trust level "Not at all") only increases by 16% on average for an individual believing some officers in the presidency office are corrupt, it bounces to 89.8% if he perceives all officers as corrupt. Similarly, the perception of corruption decreases trust in the president (i.e., trust level "A lot"), and the intensity of this effect increases with the perceived corruption level. For example, perceiving that "only some officers" in the presidency office are corrupt decreases the likelihood of trusting the president "A lot" by 44.2%, while perceiving that "all officers" are corrupt drastically decreases the likelihood of trusting the president "A lot" by 95.2%. These results highlight that higher perceived corruption exacerbates political mistrust in Ghana.

Table 1: Effects of corruption on trust in the president

Marginal effects of corruption[1]	Some of them		Most of them		All of them		**Marginal effects of IMR**
	OP	CF	OP	CF	OP	CF	CF
Trust levels							
Not at all	0.105***	0.162***	0.154***	0.614***	0.235***	0.903***	-0.463***
	[0.0185]	[0.0076]	[0.0197]	[0.0323]	[0.0308]	[0.0105]	[0.0700]
Just a little	0.034***	0.133***	0.041***	0.123***	0.044***	0.047***	-0.067***
	[0.0107]	[0.0135]	[0.0114]	[0.0311]	[0.0117]	[0.0064]	[0.0136]
Somewhat	-0.007***	0.139***	-0.016***	0.075***	-0.036***	0.006	0.067***
	[0.0017]	[0.0097]	[0.0030]	[0.0114]	[0.0077]	[0.0036]	[0.0163]
A lot	-0.132***	-0.435***	-0.179***	-0.812***	-0.244***	-0.956***	0.463***
	[0.0286]	[0.0147]	[0.0296]	[0.0110]	[0.0334]	[0.0063]	[0.0678]
Others							
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3778	3639	3778	3639	3778	3639	3639

Standard errors are in parentheses (cluster at regional level) and calculated by the "Delta" method; OP: ordered probit estimates; CF: control function. [1] Marginal effects of each corruption level relative to the base group "No corruption". * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 2 illustrates the effects of political trust on perceived corruption. The IMR

variable is statistically significance, thus indicating the importance of applying the CF approach.

Table 2: Effects of trust on corruption in the presidency office

Marginal effects of trust[1]	Just a little		Somewhat		A lot		**Marginal effects of IMR**
	OP	CF	OP	CF	OP	CF	CF
Corruption levels							
None	0.037***	0.042***	0.055***	0.075***	0.087***	0.160***	-0.030***
	[0.0053]	[0.0051]	[0.0086]	[0.0123]	[0.0162]	[0.0172]	[0.0072]
Some of them	0.127***	0.215***	0.158***	0.275***	0.192***	0.323***	-0.045***
	[0.0278]	[0.0247]	[0.0292]	[0.0275]	[0.0380]	[0.0252]	[0.0099]
Most of them	-0.048***	-0.053***	-0.070***	-0.095***	-0.103***	-0.172***	0.026***
	[0.0078]	[0.0052]	[0.0095]	[0.0075]	[0.0202]	[0.0122]	[0.0059]
All of them	-0.116***	-0.205***	-0.144***	-0.255***	-0.177***	-0.310***	0.049***
	[0.0244]	[0.0256]	[0.0253]	[0.0292]	[0.0327]	[0.0277]	[0.0109]
Others							
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3730	3,639	3730	3,639	3730	3,639	3,639

Standard errors are in parentheses (cluster at regional level); OP: ordered probit estimates; CF: control function. [1] Marginal effects of each trust level are relative to the base group "Not at all". * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Similarly to Table 1, the results in Table 2 show sizeable heterogeneous effects of trust on perceived corruption. In particular, the marginal effects for low perceived corruption levels (i.e., "None" and "Some of them") are increasing with political trust level, while marginal effects for high perceived corruption levels (i.e., "Most of them" and "All of them") are decreasing (i.e., increasing in absolute value). This means that individuals who express great trust in the president are more likely to perceive the presidency office as not corrupt, thus corroborating the puzzling result that individuals' perception of the corruption extent in the presidency office is inherently less determined by their trust perspective. Comparing the marginal effects on perceived corruption across political trust level, we see that having "Just a little" trust in the president increases the likelihood of perceiving no corruption by 4.2%, while this likelihood increases to 16% for those trusting the president "A lot." Similarly, trusting the president "Just a little" decreases the likelihood of perceiving all officers as corrupt by 20.5%, while this likelihood decreases to 31.1% for those trusting the president "A lot." As such, failing to differentiate between different degrees of perceived corruption and political trust, as done in many studies using proxy indexes, will hide these heterogeneous effects.

Regarding the direction of causation between political trust and perceived corruption, we see that the marginal effects of corruption on trust (Table 1) are higher in magnitude than that of trust on corruption (Table 2). This suggests that perceived

corruption determines individuals political trust by a greater extent in Ghana, thus corroborating the findings of Uslaner (2005), Chang and Chu (2006) and Morris and Klesner (2010) among others.

4.2 Regional differences

Following Section 2.2, we explore formally the variability of political trust and corruption across different regions. Table 3 shows how trust in the president (Panel A) and perception of corruption in the presidency office (Panel B) vary across regions in Ghana.

Referring to the trustworthiness of the president in Panel A, the results indicate heterogeneous effects of mistrust in the president across regions, whereby we can distinguish between two main blocks. On one hand, in Central, Greater Accra, Volta, Eastern, Ashanti, Upper East, and Brong Ahalo the marginal effects decrease with each trust level (from "Not at all" to "A lot"). Individuals living in these regions are more likely to mistrust the president relative to the benchmark Western region. On the other hand, in the Upper West and Northern regions, the marginal effects increase with trust level compared to the base Western region. Individuals are less likely to mistrust the president (Panel A, columns "Not at all" and "A little"). Within each group of regions, there are substantial variations too. In the first group, for example, an individual in the Central region is on average 3.2% more likely to mistrust the president relatively to the benchmark Western region, while this likelihood rises to 11.6% in Ashanti, and 11% in Volta. In the second group which exhibit negative marginal effects, a respondent from the Upper West region is 2.5% less likely to mistrust the president compared to the benchmark Western region, while this likelihood is only about 1.5% in Northern, with both being statistically insignificant.

The results in Panel A in Table 3 which show no statistical difference between the Northern region and the benchmark Western region strongly substantiates our previous analysis in Figure 2a. President John Dramani Mahama (2012-2016) who was in power when the overall political trust eroded from 2012 to 2014 is original from the Northern region. He succeeded John Evans Atta Mills (2009-2012) who was originally from the Western region (our control group). This might be a justification for a similar sentiment towards trusting the president in Northern and Western regions. In terms

of bordering regions such as Upper West, similar values for president trustworthiness are not surprising. The intriguing result, though, is the difference between the Upper West region and Upper East & Northern regions, as all three share common borders.

Looking at regional differences in terms of perceived corruption (Part B of Table 3), the sign of marginal effects are similar across regions (except for the Northern region where the sign of the marginal effects has flipped) but the magnitude varies. Central, Eastern, Ashanti, and Brong Ahalo regions are statistically different from the benchmark Western region, while all other regions are not statistically different. With that said the magnitude of statistically significant marginal effects are small compared to trust in the president (Panel A of the table, column "Not at all"). For example, on average, an individual is 2.7%, 3.5%, 5.9%, and 4.2% less likely to perceive the presidency office as completely corrupt in Central, Eastern, Ashanti, and Brong Ahalo respectively compared to the benchmark Western region. These results highlight that the perception of corruption in the presidency office unlike trusting the president is not driven by regional appurtenance in Ghana.

As a robustness check, we have also estimated the results with the Upper West region as a benchmark. The results are presented in Table A4 in the Appendix. They confirm our previous analysis that there is no statistical difference between Western, Northern and Upper West in the judgement of distrust the president's trustworthiness (Part A of Table A4). Also, all other regions are more likely to mistrust the president relative to the benchmark Upper West region. Considering the perception of corruption in the presidency office, only Eastern, Ashanti, and Brong Ahafo regions show a statistical difference relative to the benchmark Upper West region (see Part B of Table A4). Except for the Central and Eastern region, the results for the other regions presented in Part B of Table A4) are qualitatively similar to those obtained in Panel B in Table 3.

Table 3: Regional differences

Panel A	**Marginal effects on trust**	Not at all CF	Just a little CF	Somewhat CF	A lot CF
Regions[1]					
	Central	0.034***	0.008***	-0.003***	-0.038***
		[0.0090]	[0.0021]	[0.0011]	[0.0103]
	Greater Accra	0.034***	0.008***	-0.004***	-0.039***
		[0.0092]	[0.0023]	[0.0011]	[0.0106]
	Volta	0.108***	0.017***	-0.016***	-0.109***
		[0.0202]	[0.0022]	[0.0022]	[0.0196]
	Eastern	0.058***	0.012***	-0.007***	-0.063***
		[0.0123]	[0.0029]	[0.0025]	[0.0132]
	Ashanti	0.125***	0.018***	-0.020***	-0.123***
		[0.0147]	[0.0028]	[0.0060]	[0.0126]
	Brong Ahafo	0.063***	0.012***	-0.008***	-0.067***
		[0.0123]	[0.0028]	[0.0027]	[0.0129]
	Northern	-0.015	-0.004	0.001	0.018
		[0.0197]	[0.0060]	[0.0013]	[0.0245]
	Upper East	0.051***	0.010***	-0.006***	-0.055***
		[0.0163]	[0.0018]	[0.0018]	[0.0165]
	Upper West	-0.023	-0.006	0.001	0.028
		[0.0162]	[0.0052]	[0.0010]	[0.0205]

Panel B	**Marginal effects on corruption**	None of them CF	Some of them CF	Most of them CF	All of them CF
Regions[1]					
	Central	0.014***	0.024***	-0.012***	-0.026***
		[0.0020]	[0.0052]	[0.0023]	[0.0047]
	Greater Accra	0.011	0.018	-0.009	-0.02
		[0.0074]	[0.0128]	[0.0061]	[0.0141]
	Volta[a]	0.010	0.017	-0.008	-0.019
		[0.0079]	[0.0142]	[0.0069]	[0.0151]
	Eastern[a]	0.020***	0.031***	-0.016***	-0.035***
		[0.0035]	[0.0071]	[0.0033]	[0.0070]
	Ashanti	0.038***	0.052***	-0.030***	-0.059***
		[0.0063]	[0.0068]	[0.0033]	[0.0079]
	Brong Ahafo	0.024***	0.037***	-0.020***	-0.042***
		[0.0035]	[0.0070]	[0.0030]	[0.0068]
	Northern	-0.004	-0.007	0.003	0.008
		[0.0067]	[0.0126]	[0.0053]	[0.0140]
	Upper East	0.009	0.016	-0.007	-0.017
		[0.0095]	[0.0169]	[0.0081]	[0.0182]
	Upper West	0.005	0.009	-0.004	-0.01
		[0.0076]	[0.0132]	[0.0061]	[0.0147]
Observations		3,639	3,639	3,639	3,639

Standard errors are in parentheses (cluster at regional level) and calculated by the "Delta" method; CF: control function. [1] Marginal effects of each region are relative to the base group "Western". [a] Volta and Eastern have the same coefficients, yet standard errors differ. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4.3 Impact of covariates

Besides analysing regional differences, we as well summarise the impact of other covariates on political trust and perceived corruption in Ghana. The standard set of covariates includes ethnic group, education, gender, age, location (rural versus urban), and employment. In addition, we observe the effects of satisfaction with democracy, the ability of the president to handle: corruption, job creation and living standard as well as the possibility of bribing voters. Also, the effects of instrumental variables such as performance of the president, ability of the president to handle water provision and food (IV's for trust) and fair elections and president's ability to handle crime (IV for corruption) are included. Table 4 shows the marginal effect of all covariates and instruments on political trust, while Table 5 concludes effects for perceived corruption.

Consider first the impact of covariates on political trust (Table 4). In our analysis, the benchmark is Akan (largest in Ghana) for ethnic groups and no schooling for education. Note that other characteristics in the standard covariate set are binary variables. Starting with the impact of ethnicity on the president's trustworthiness (column "Not at all" of Table 4), only the Ewe ethnic group differs significantly from the base group Akan in trusting the president. The estimates of other ethnic groups are not statistically significant, so these groups cannot be discriminated from the Akan group in their trust of the president. An individual belonging to the Ewe ethnic group is 5.8% less likely to mistrust the president compared to benchmark group Akan.

In reference to differences in educational attainment, higher education seems to be a discriminant factor of perceiving the president trustworthy in Ghana which contrasts with developed countries where higher education often leads to higher trust levels as emphasised in Anderson and Tverdova (2003). All levels of education, primary, secondary and post-secondary education, are statistically significant and negative related to the benchmark group. Our results fortify the findings that education increases mistrust in the president (similar to Seligson, 2002; Catterberg and Moreno, 2006; Chang and Chu, 2006) but refutes the finding of Morris and Klesner (2010).

The marginal effects of gender and location are negative for low trust levels, indicating heterogeneity in trust levels among important segments of the Ghanaian

population: women versus men and rural versus urban. In particular, men are more likely to trust the president compared to women, which affirms findings of Seligson (2002) for Latin America, but contradicts studies of (Wang, 2016; Mishler and Rose, 2001) and (Anderson and Tverdova, 2003) in East Asia, the former Soviet Union, Europe, Australia, USA and Canada.

Age increases mistrust in the president but the estimated marginal effects are close to zero and insignificant, thereby counteracting Chang and Chu (2006) who argue that older generations are more likely to express lower levels of trust. However, the negative sign for higher mistrust levels "Not at all" and "A little" aligns with Rothstein and Uslaner (2005) for the United States, Seligson (2002) for Latin America, and Wang (2016) for East Asia. The unemployment variable, satisfaction with democracy, the ability of the president to handle living standard; food and water do not have a significantly impact on the president's trustworthiness, which is somewhat unexpected. Albeit, the president's performance, his ability to handle corruption and job creation are key factors of its trustworthiness.

Focusing on the impact of covariates on the perception of corruption in the presidency office (Table 5) ethnicity, education, age, location, unemployment are not important factors determining the perceived corruption level in the presidency office, as illustrated by the insignificance of their estimated marginal effects. Nonetheless, looking at the extreme levels of perceived corruption (columns "Most of them" and "All of them"), it is clear that higher education marginally reinforces the perception of corruption in the presidency office, and so are age and unemployment. Gender plays an important role. Men are more likely to perceive the presidency office as corrupt compared to women. This might be related to the restricted exposure to political affairs and access to political discussions, as women are less engaged in political decisions, especially in developing countries (Morris and Klesner, 2010). Intriguingly, this result reveals a rather deviating picture, since men tend to perceive the presidency office as corrupt whilst trusting the president. Thereby, the general view that individuals who trust more automatically perceive less corruption is repudiated, at least in Ghana.

In terms of additional covariates, the president ability to handle job creation and corruption have a significant negative impact, while bribe votes (a common practice

in most African countries) has a significant positive effect on higher perceived corruption levels in the presidency office. Other covariates such as fair election, satisfaction with democracy and the ability of the president to handle crime and living standard do not appear to have a statistical significant impact on peoples' perception of corruption. In African countries, this is not surprising as the notion of fair election often does not seem to have a tangible measure which can be easily apprehended, and an increase or decrease in criminality is often not attributed to the party in power. The same conclusion can be drawn for handling living standard. The sign of the marginal effects of these insignificant covariates is negative.

As a robustness check, we change the benchmark group for ethnicity to Ewe, results are shown in Table A5 in the Appendix.[2] Part A of Table A5 demonstrate that an individual in the Akan ethnic group is on average 5.8% more likely to mistrust (column "Not at all") the president relatively to Ewe. Interestingly, they also reveal that relative to Ewe, all other ethnic groups are more likely to mistrust the president but the intensity of this likelihood varies across groups, underscoring the heterogeneous nature of the president's trustworthiness across regions and ethnic groups in Ghana. Part B of Table A5 reinforces results found in Table 5 as ethnicity has no significant impact on peoples' perception of corruption in the presidency office.

[2]Note, the marginal effects of all other covariates are omitted as they are identical to the ones reported in Tables 4–5.

Table 4: Effects of covariates on trust in the president

Marginal effects of covariates	Not at all CF	A little CF	Somewhat CF	A lot CF
Ethnic group[1]				
Ewe	-0.055***	-0.010**	0.007***	0.058***
	[0.0154]	[0.0039]	[0.0023]	[0.0172]
Ga	-0.02	-0.003	0.003	0.02
	[0.0178]	[0.0029]	[0.0026]	[0.0182]
Northern languages	0.01	0.001	-0.002	-0.009
	[0.0179]	[0.0021]	[0.0030]	[0.0170]
Dagaaba	0.013	0.002	-0.002	-0.012
	[0.0278]	[0.0031]	[0.0048]	[0.0261]
Dagomba	0.014	0.002	-0.002	-0.013
	[0.0231]	[0.0026]	[0.0041]	[0.0216]
Others	-0.003	-0.000	0.000	0.003
	[0.0183]	[0.0024]	[0.0029]	[0.0178]
Education[2]				
Primary	0.022*	0.004*	-0.003**	-0.023*
	[0.0132]	[0.0021]	[0.0014]	[0.0139]
Secondary	0.040**	0.006**	-0.006**	-0.040**
	[0.0160]	[0.0028]	[0.0024]	[0.0167]
Post-secondary	0.036*	0.006*	-0.005*	-0.036*
	[0.0196]	[0.0033]	[0.0030]	[0.0200]
Gender[3]	-0.052***	-0.008***	0.008***	0.052***
	[0.0068]	[0.0016]	[0.0019]	[0.0066]
Age	-0.000	-0.000	0.000	0.000
	[0.0003]	[0.0000]	[0.0000]	[0.0003]
Rural	-0.012	-0.002	0.002	0.012
	[0.0128]	[0.0017]	[0.0017]	[0.0128]
Unemployed[4]	0.009	0.001	-0.001	-0.009
	[0.0115]	[0.0017]	[0.0016]	[0.0116]
Satisfaction with Democracy	-0.005	-0.001	0.001	0.005
	[0.0061]	[0.0009]	[0.0009]	[0.0061]
Bribe votes	-0.043***	-0.006***	0.006***	0.043***
	[0.0132]	[0.0023]	[0.0023]	[0.0133]
President's ability to handle				
Job creation	0.014**	0.002*	-0.002*	-0.014**
	[0.0071]	[0.0012]	[0.0012]	[0.0071]
Living standards	0.007	0.001	-0.001	-0.007
	[0.0123]	[0.0018]	[0.0019]	[0.0122]
Corruption	0.048***	0.007***	-0.007***	-0.048***
	[0.0107]	[0.0019]	[0.0019]	[0.0109]
Included instruments				
President's Performance	-0.035**	-0.005**	0.005**	0.035**
	[0.0171]	[0.0024]	[0.0023]	[0.0172]
President's ability to handle				
Water	0.010	0.001	-0.001	-0.010
	[0.0064]	[0.0010]	[0.0010]	[0.0064]
Food	-0.009	-0.001	0.001	0.009
	[0.0093]	[0.0014]	[0.0013]	[0.0093]
Observations	3,639	3,639	3,639	3,639

Standard errors are in parentheses (cluster at regional level) and calculated by the "Delta" method; CF: control function. [1] Marginal effects of each ethnic group are relative to the base group "Akan".[2] Marginal effects of each education level are relative to the base group "No schooling". [3] Gender is a binary variable, Female = 0 and Male = 1. [4] Unemployed is a binary variable, Employed = 0 and Unemployed = 1. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Effects of covariates on corruption in the presidency office

Marginal effects of covariates	None of them CF	Some of them CF	Most of them CF	All of them CF
Ethnic group[1]				
Ewe	-0.005	-0.008	0.004	0.008
	[0.0084]	[0.0142]	[0.0074]	[0.0152]
Ga	0.000	0.000	-0.000	-0.000
	[0.0078]	[0.0120]	[0.0067]	[0.0130]
Northern languages	0.006	0.010	-0.006	-0.010
	[0.0148]	[0.0205]	[0.0126]	[0.0227]
Dagaaba	0.010	0.014	-0.008	-0.015
	[0.0142]	[0.0197]	[0.0126]	[0.0213]
Dagomba	0.007	0.011	-0.006	-0.012
	[0.0069]	[0.0099]	[0.0061]	[0.0107]
Others	0.011	0.016*	-0.010	-0.017*
	[0.0071]	[0.0093]	[0.0061]	[0.0102]
Education[2]				
Primary	0.005	0.008	-0.004	-0.009
	[0.0085]	[0.0133]	[0.0071]	[0.0147]
Secondary	0.009	0.013	-0.008	-0.015
	[0.0095]	[0.0147]	[0.0080]	[0.0162]
Post-secondary	0.005	0.007	-0.004	-0.008
	[0.0086]	[0.0133]	[0.0072]	[0.0148]
Gender[3]	-0.014***	-0.020***	0.012***	0.022***
	[0.0043]	[0.0064]	[0.0035]	[0.0071]
Age	0.000	0.000	-0.000	-0.000
	[0.0002]	[0.0003]	[0.0002]	[0.0003]
Rural	-0.000	-0.000	0.000	0.001
	[0.0101]	[0.0151]	[0.0086]	[0.0166]
Unemployed[4]	0.001	0.001	-0.001	-0.001
	[0.0089]	[0.0132]	[0.0076]	[0.0146]
Satisfaction with Democracy	0.002	0.002	-0.001	-0.003
	[0.0032]	[0.0049]	[0.0028]	[0.0053]
Bribe votes	-0.016***	-0.024***	0.014***	0.027***
	[0.0052]	[0.0081]	[0.0046]	[0.0086]
President's ability to handle				
Job creation	0.009*	0.013*	-0.007*	-0.014*
	[0.0046]	[0.0068]	[0.0039]	[0.0074]
Living standards	0.005	0.008	-0.004	-0.008
	[0.0063]	[0.0098]	[0.0055]	[0.0106]
Corruption	0.019***	0.028***	-0.016***	-0.031***
	[0.0054]	[0.0059]	[0.0037]	[0.0076]
Other included instrument				
Fair election	0.000	0.000	-0.000	-0.001
	[0.0052]	[0.0078]	[0.0044]	[0.0086]
President's ability to handle				
Crime	0.002	0.003	-0.002	-0.003
	[0.0020]	[0.0030]	[0.0017]	[0.0032]
Observations	3,639	3,639	3,639	3,639

Standard errors are in parentheses (cluster at regional level) and calculated by the "Delta" method; CF: control function. [1] Marginal effects of each ethnic group are relative to the base group "Akan".[2] Marginal effects of each education level are relative to the base group "No schooling". [3] Gender is a binary variable, Female = 0 and Male = 1. [4] Unemployed is a binary variable, Employed = 0 and Unemployed = 1. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4.4 Policy implications

Results indicate that, in Ghana, corruption erodes political trust, which in turn, reinforces individuals perception on corruption - establishing a vicious cycle that may impede the efficiency of political institution. The consequences of this vicious cycle on economic development can be detrimental. Generally, corruption and low trust impede economic development through various channels (Algan and Cahuc, 2010; Knack and Keefer, 1997; Putnam, 1993). For example, corruption can lower the quality of public infrastructure and engenders malfunctioning institutions (North, 1990; La Porta et al., 1999; Del Monte and Papagni, 2001) impeding the development of a country.

To boost economic growth in a country which suffers from high perceived corruption levels, it is imperative to implement a variety of anti-corruption programs to foster political trust and in a broader sense, economic development. A commonly prescribed remedy for corruption is the improvement of external monitoring and the implementation of severe punishments. Indeed, increased surveillance whether in terms of external audits or scrutinies by anti-corruption authorities and stricter penalties enhance the likelihood of being caught, thereby attenuating all forms of malfeasance, especially embezzlement. However, it is important to recognise that the efficiency of independent supervision depends heavily on the honesty and morality of the auditors.

Since the degree to which anti-corruption efforts are successful depends strongly on people's disposition, it is critical to ensure citizens participate efficiently in anti-corruption efforts. However, in Ghana, the absence of trust engendered by corruption, could severely impair society's willingness to actively participate in fighting corruption. Two fundamental complements to punishment severity and monitoring are increased social accountability and transparency. Inherent public engagement, co-governance, social empowerment and citizen's involvement are indispensable features of anti-corruption policies (Rose-Ackerman, 2004). Given the presence of citizen's contribution, an easily intelligible complaint mechanism complements the transformation towards a less corrupt environment as it modifies the official-citizen relationship. The predominant accountability and transparency initiatives raise awareness of the detrimental implications of corruption. By providing readily

accessible information on public officials, the quality of service delivery is improved, whilst integrity and honesty amongst the society are promoted. Various media platforms, in the form of either newspapers, television or even social media channels such as twitter, are useful tools to widespread information. In Uganda for example, Reinikka and Svensson (2004) highlight the power of a local newspaper campaign in reducing leakage of education funds. Nevertheless, the success of different media channels is conditional on the public's capacity to digest the information and act accordingly.

The first two policy implications focus primarily on external accountability, however, external surveillance, such as stricter penalties, do not guarantee improved governance. Hence the implementation of internal controls to improve bureaucratic efficiency should not be neglected. Especially if rents are easily accessible, corrupt officers are abundant and demonstrate a low civil service ethic. The most common policy recommendations to deter rent-seeking behaviour are raising salaries, introducing job rotations and adopting meritocratic recruitment methods. Approaching the issue from the other end, potential rent amounts can be reduced by minimising monopoly power and discretion of officers through explicit and more transparent regulations as well as higher staffing levels. These civil interventions should erode corrupt networks, whether in the form of favour-seeking or conspiracy, yet, the rewards are conditional on the surrounding circumstances.

In 2001, the Ghana Anti-Corruption Coalition (GACC) was founded by a group of public, private and civil society organisations and advocates corruption impeding policies and legislative reforms. Besides monitoring and enforcing anti-corruption laws and litigation, the GACC emphasises on social accountability, by promoting public involvement in local governance and increasing transparency on the local level through a local accountability network initiative. Despite the endeavour of GACC to facilitate external monitoring and accountability, Ghana's governmental and institutional services lack in qualitative internal surveillance. To further strengthen social accountability, GACC needs to intensify its efforts to promote honesty and educate the public about the harmful implications of corruption. Once societal accountability exists, the government and institutions should introduce a comprehensible complaint mechanism to report any form of infringement, such as bribery or embezzlement.

Besides, the presidency office should implement some form of civil service reform, whether this includes a rise in wages or a reduction in potential rents.

5 Conclusion

The paper unravels the mystery of the relationship between political trust and corruption in Ghana. Conscious of the simultaneous nature of variables of interest, the paper controls for endogeneity with an innovative CF method introduced by Wooldridge (2015). Despite using a novel estimation strategy, the paper uses, instead of proxies, four different levels for political trust and corruption. This allows for the analysis of previously undisclosed marginal effects of different levels and essentially manifests the inaccuracy of using proxies for both variables. Since corruption has a particularly destructive effect on public institutions, the cross-regional analysis emphasises the political trust and corruption nexus in terms of the presidency office. Results demonstrate the dominance of perceived corruption in determining political trust, which on the other hand reasserts the perception of corruption which is analogous to Morris and Klesner (2010) and Chang and Chu (2006) previous findings for less advanced countries. For instance, citizens who are convinced all decision-makers to engage in rent-seeking are 95.6% more likely to mistrust the president. In contrast, citizens who completely trust the president are 16% more inclined to believe no one in the presidential office is corrupt. In essence, trusting the president does not ultimately indicate that individuals perceive the presidency office as ethical, whereas assuming that all decision-makers engage in corrupt activities strongly infers mistrust in the president.

In respect to marginal effects of different levels, results indicate heterogeneous marginal effects. This substantiates the idea of using proxies for trust and corruption polarises these variables towards extremes, which then distorts the real impact of corruption on trust or vice versa. In line with the prevailing effect of corruption, any dimension of perceived corruption profoundly impacts trust levels, whereas any extent of political trust only slightly affects the perception of corruption.

Fundamentally, the perception of corruption erodes political trust in Ghana and inhibits economic growth. Accordingly, the paper stresses the importance of imple-

menting effective anti-corruption policies in Ghana, which emphasise, firstly, raising citizens involvement in fighting corruption, and secondly, introducing stricter internal measures of surveillance to eliminate corrupt networks. Consequently, trust in political institutions would be strengthened and the efficient operating of political institutions will boost Ghanas economic performance. Since results from Ghana cannot be generalised to other African countries, further research should investigate the political trust and corruption nexus in Africa, especially as individual data for most African countries is available.

Appendix

Table A1: Data collection of key variables

Variable	Question	Answer choices
Trust in the President	How much do you trust each of the following, or haven't you heard enough about them to say: The President?	0 = Not at all, 1 = Just a little, 2 = Somewhat, 3 = A lot, 9 = Don't know/Haven't heard enough, 98 = Refused to answer, -1 = Missing
Corruption in the presidency office	How many of the following people do you think are involved in corruption, or haven't you heard enough about them to say: The President and Officials in his Office?	0 = None, 1 = Some of them, 2 = Most of them, 3 = All of them, 9 = Don't know/Haven't heard enough, 98 = Refused to answer, -1 = Missing
Instruments for trust		
President's performance	Do you approve or disapprove of the way the following people have performed their jobs over the past twelve months, or haven't you heard enough about them to say: president?	1 = Strongly Disapprove, 2 = Disapprove, 3 = Approve, 4 = Strongly Approve, 9 = Don't Know/Haven't heard enough, 98=Refused to Answer, -1=Missing
President's ability to handle	How well or badly would you say the current government is handling the following matters, or haven't you heard enough about them to say:	
Food	Handling ensuring enough to eat?	1 = Very Badly, 2 = Fairly Badly, 3 = Fairly Well, 4 = Very Well, 9=Don't Know/Haven't heard enough, 98 = Refused to Answer, -1 = Missing
Water	Handling providing water and sanitation services?	
Instruments for corruption		
Fair election	In your opinion, how often do the following things occur in this country's elections: Votes are counted fairly?	0 = Never, 1 = Sometimes, 2 = Often, 3 = Always, 9 = Don't Know, 98 = Refused to Answer, -1 = Missing
President's ability to handle	How well or badly would you say the current government is handling the following matters, or haven't you heard enough about them to say:	
Crime	Handling reducing crime?	1 = Very Badly, 2 = Fairly Badly, 3 = Fairly Well, 4 = Very Well, 9=Don't Know/Haven't heard enough, 98 = Refused to Answer, -1 = Missing

.

Table A2: Summary statistics - main variables

	Round 2 - 2002					Round 3 -2005					Round 4 - 2008					Round 5 - 2012					Round 6 - 2014				
	Obs.	Mean	Lin SE	Min	Max	Obs.	Mean	Lin SE	Min	Max	Obs.	Mean	Lin SE	Min	Max	Obs.	Mean	Lin SE	Min	Max	Obs.	Mean	Lin SE	Min	Max
Covariates																									
Gender	1,200	0.50	0.011	0	1	1,197	0.49	0.011	0	1	1,200	0.51	0.003	0	1	2,400	0.50	0.001	0	1	2,400	0.50	0.003	0	1
Age	1,165	40.77	0.997	18	105	1,169	39.84	0.744	18	99	1,184	38.63	0.716	18	110	2,399	37.02	1.06	18	100	2,375	38.38	0.578	18	105
Rural	1,200	0.519	0.074	0	1	1,197	0.529	0.076	0	1	1,200	0.56	0.081	0	1	2,400	0.457	0.728	0	1	2,400	0.455	0.082	0	1
Ethnic						1,197	2.65	0.353	1	24	1,197	6.60	3.088	1	284	2,397	3.16	0.728	1	32	2,400	3.48	0.699	1	33
Education	1,196	1.09	0.082	0	3	1,195	1.24	0.078	0	3	1,195	1.20	0.144	0	3	2,397	1.30	0.139	0	3	2,390	1.55	0.112	0	3
Employment Status	1,184	0.91	0.094	0	2	1,196	1.04	0.088	0	2	1,191	1.00	0.077	0	2	2,394	0.94	0.087	0	2	2,377	1.19	0.061	0	2
Satisfaction with Democracy	772	2.89	0.085	0	4	1,027	3.22	0.079	0	4	1,155	3.32	0.070	0	4	2,370	2.94	0.051	0	4	2,202	2.63	0.087	0	4
Bribe votes						834	0.44	0.077	0	3						2,388	0.10	0.022	0	3	2,093	1.82	0.114	0	3
President's ability to handle																									
Job creation	1,104	2.46	0.089	1	4	1,150	2.29	0.127	1	4	1,163	2.54	0.109	1	4	2,370	2.02	0.134	1	4	2,312	1.68	0.117	1	4
Living standards											1,162	2.42	0.077	1	4	2,369	2.07	0.130	1	4	2,319	1.69	0.123	1	4
Corruption	1,035	2.97	0.089	1	4	1,062	2.62	0.119	1	4	1,114	2.65	0.092	1	4	2,326	2.23	0.148	1	4	2,295	1.75	0.126	1	4
Variables of interest																									
Trust in the president	1,131	2.89	0.128	1	4	1,149	3.26	0.132	1	4	1,175	3.23	0.113	1	4	2,377	2.68	0.131	1	4	2,335	2.28	0.136	1	4
Perceived Corruption in the presidency office	915	1.65	0.092	1	4	909	2.03	0.074	1	4	1,054	2.05	0.083	1	4	2,307	2.33	0.044	1	4	2,175	2.69	0.048	1	4

Each variable excludes missing, refused and "do not know" observations. Sample is weighted with probability weights, correcting the distribution of each sample based on individual selection probabilities. Standard errors are calculated by the "Delta" method.

Table A3: Regions and ethnic groups

Variable	Frequency	Percentage
Regions		
Western	816	9.72
Central	728	8.67
Greater Accra	1,368	16.29
Volta	752	8.96
Eastern	927	11.04
Ashanti	1,598	19.03
Brong Ahafo	784	9.34
Northern	800	9.53
Upper East	376	4.48
Upper West	248	2.95
Observations	8,397	100
Ethnics		
Akan	3,697	51.41
Ewe	1,010	14.05
Ga	582	8.09
Northern languages	279	3.88
Dagaaba	410	5.70
Dagomba	361	5.02
Others	852	11.85
Observations	7,191	100

Table A4: Diagnostic Checks: Regional differences

Part A	**Marginal effects on trust**	Not at all CF	Just a little CF	Somewhat CF	A lot CF
Regions[1]					
	Western	0.023	0.006	-0.001	-0.028
		[0.0162]	[0.0052]	[0.0010]	[0.0205]
	Central	0.057***	0.014**	-0.005***	-0.066***
		[0.0171]	[0.0057]	[0.0018]	[0.0213]
	Greater Accra	0.057***	0.014**	-0.005***	-0.066***
		[0.0179]	[0.0059]	[0.0018]	[0.0223]
	Volta	0.131***	0.023***	-0.018***	-0.137***
		[0.0184]	[0.0054]	[0.0022]	[0.0198]
	Eastern	0.081***	0.018***	-0.008***	-0.091***
		[0.0200]	[0.0064]	[0.0031]	[0.0238]
	Ashanti	0.148***	0.024***	-0.021***	-0.150***
		[0.0248]	[0.0066]	[0.0067]	[0.0257]
	Brong Ahafo	0.086***	0.019***	-0.009***	-0.095***
		[0.0204]	[0.0064]	[0.0033]	[0.0240]
	Northern	0.008	0.002	0	-0.01
		[0.0184]	[0.0052]	[0.0007]	[0.0230]
	Upper East	0.073***	0.017***	-0.007***	-0.083***
		[0.0200]	[0.0050]	[0.0021]	[0.0224]
Part B	**Marginal effects on corruption**	None of them CF	Some of them CF	Most of them CF	All of them CF
Regions[1]					
	Western	-0.005	-0.009	0.004	0.01
		[0.0076]	[0.0132]	[0.0061]	[0.0147]
	Central	0.01	0.015	-0.008	-0.017
		[0.0076]	[0.0131]	[0.0065]	[0.0141]
	Greater Accra	0.006	0.009	-0.005	-0.01
		[0.0071]	[0.0122]	[0.0060]	[0.0133]
	Volta	0.005	0.009	-0.004	-0.01
		[0.0105]	[0.0177]	[0.0088]	[0.0193]
	Eastern	0.015**	0.022**	-0.012**	-0.025**
		[0.0062]	[0.0112]	[0.0056]	[0.0117]
	Ashanti	0.033***	0.043***	-0.026***	-0.050***
		[0.0061]	[0.0094]	[0.0045]	[0.0096]
	Brong Ahafo	0.019***	0.028**	-0.016***	-0.032***
		[0.0059]	[0.0110]	[0.0054]	[0.0113]
	Northern	-0.009	-0.016	0.007	0.018
		[0.0085]	[0.0145]	[0.0065]	[0.0165]
	Upper East	0.004	0.007	-0.003	-0.008
		[0.0091]	[0.0155]	[0.0077]	[0.0169]
Observations		3,639	3,639	3,639	3,639

Standard errors are in parentheses (cluster at regional level) and calculated by the "Delta" method; CF: control function. [1] Marginal effects of each region are relative to the base group "Upper West". * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A5: Diagnostic Checks: Ethnical differences

Part A **Marginal effects on trust**	Not at all CF	Just a little CF	Somewhat CF	A lot CF
Ethnic group[1]				
Akan	0.055***	0.010**	-0.007***	-0.058***
	[0.0154]	[0.0039]	[0.0023]	[0.0172]
Ga	0.035**	0.007**	-0.004*	-0.038**
	[0.0165]	[0.0034]	[0.0023]	[0.0175]
Northern languages	0.065***	0.011***	-0.009***	-0.067***
	[0.0198]	[0.0041]	[0.0032]	[0.0206]
Dagaaba	0.068***	0.011***	-0.009**	-0.070***
	[0.0239]	[0.0037]	[0.0042]	[0.0230]
Dagomba	0.069***	0.011***	-0.009**	-0.071***
	[0.0213]	[0.0041]	[0.0041]	[0.0212]
Others	0.052***	0.009**	-0.006**	-0.055***
	[0.0174]	[0.0038]	[0.0026]	[0.0185]
Part B **Marginal effects on corruption**	None of them CF	Some of them CF	Most of them CF	All of them CF
Ethnic group[1]				
Akan	0.005	0.008	-0.004	-0.008
	[0.0084]	[0.0142]	[0.0074]	[0.0152]
Ga	0.005	0.008	-0.004	-0.009
	[0.0079]	[0.0133]	[0.0071]	[0.0141]
Northern languages	0.011	0.017	-0.01	-0.019
	[0.0163]	[0.0238]	[0.0140]	[0.0260]
Dagaaba	0.014	0.022	-0.012	-0.023
	[0.0168]	[0.0254]	[0.0152]	[0.0269]
Dagomba	0.012	0.019	-0.011	-0.02
	[0.0115]	[0.0186]	[0.0104]	[0.0197]
Others	0.016	0.023	-0.014	-0.026
	[0.0108]	[0.0169]	[0.0096]	[0.0179]
Observations	3,639	3,639	3,639	3,639

Standard errors are in parentheses (cluster at regional level) and calculated by the "Delta" method; CF: control function. [1] Marginal effects of each ethnic group are relative to the base group "Ewe". * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

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