DO HIGHER SALARIES LOWER PETTY CORRUPTION?

A POLICY EXPERIMENT ON WEST AFRICA'S HIGHWAYS[1]

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Draft: May 13, 2015

Abstract

In one of the most ambitious public sector reform experiments in Africa, the Ghana government doubled its police officer salaries in 2010 in part to mitigate petty corruption on its roads. Neighboring countries in the West African region left their police salaries unchanged. Using unique data on bribes paid from over 2,100 truck trips in West Africa and representing over 45,000 bribe opportunities, we evaluate the reform impacts on petty corruption using a difference-in-difference method that exploits the exogenous policy experiment. By following bribes paid by the same trucks in different countries as well as to different civil servants in Ghanaian bribe taking we can identify whether salaries affect both the number of bribes and the amount given by truckers. Rather than decrease petty corruption, the salary policy significantly increased the police efforts to collect bribes, the value of bribes and the amounts given by truck drivers to policemen in total. Robustness checks show the higher bribe amount is robust to alternative specifications. Moreover, we do not find that Ghana policemen collected significantly fewer bribes than other officials in the same country. *(JEL K42, R40)*

[1] We are very grateful to the West African Trade Hub and USAID for providing access to the data. Funding was graciously provided by an International Growth Center grant. We also thank without implicating Daniel Bromley, and participants at University of Wisconsin, Oxford University and the University of California, Berkeley for comments and Srini Vasudevan for data cleaning. The usual disclaimer applies.

Introduction

How can we lower the incidence of petty corruption? Given the weaknesses of institutions in developing countries, reducing corruption has long been a concern to economists and policymakers, and understanding this question is important for improving economic efficiency and outcomes. A recent survey of the emerging literature on corruption and economic incentives (Olken and Pande, 2012) succinctly presents the need for research to tackle the fundamental question confronting policy makers: how to promulgate policies to reduce corruption. Indeed the authors of that review note that in providing policy guidance for an anti-corruption agency they “had more questions to pose than concrete answers.” (Olken and Pande (2012: 481)).

A burgeoning literature suggests that raising the salaries of government officials could reduce their propensity to solicit and accept bribes. At the aggregate country level Van Rijckeghem and Weder (2001) show that countries with higher civil service wages have lower levels of corruption. Recent work on political corruption by Gagliarducci and Nannicini (2013) and Ferraz and Finan (2009) suggests that higher salaries for politicians reduce their levels of corruption. A growing number of laboratory and field experiments have also shown that raising wages or payments to subjects reduces corrupt behavior (e.g., Armantier and Boly (2011) and Van Veldhuizen (2013)). While the political corruption literature is often well identified, the literature on petty corruption of officials suffers from a lack of identification and questions about external validity outside the laboratory setting.

This work exploits one of the most ambitious civil service policy reforms in Africa to ask whether raising salaries for corrupt officials improve or worsen petty corruption outcomes in developing countries. This experiment is important from a policy perspective because officials' salaries in poor countries are low, creating an identification problem on the origins of petty corruption. On the one hand, petty corruption outcomes such as bribery may be only manifestations of low incomes and corruption would reduce significantly if incomes were raised substantially. On the other, corrupt outcomes might occur independently of income levels and be worsened by a higher “appetite” that higher incomes would bring. Classic economic models show that individuals care about both their absolute and relative incomes. These effects are further complicated by the reality that corrupt officials’ incomes, persist in broader environments, so that other agents (e.g. those who must pay bribes to officials) may be aware that certain officials have higher salaries and potentially alter their strategies to reflect changes.

In this work, we use detailed survey data and experimental evidence to study this question in one particular context: bribery and corruption on highways in West Africa. In July 2010, the Ghana Government implemented a “single-spine” salary structure for all police officials (unilaterally doubling their incomes) in an effort to improve officials' living standards and curb highway bribery by said officials. On the other hand, neighboring countries in the West African region left their police salaries unchanged throughout the period, as did other officials within Ghana. Between 2006 and 2012 the United States Agency for International Development (USAID) West African Trade Hub has collected unique data from over 2,100 long-haul truck trips in the sub-region, representing over 45,000 bribe opportunities on the road between Tema, Ghana and Ouagadougou, Burkina Faso. By following bribes paid by the same trucks in different countries as well as aggregate trends in Ghanaian bribe taking using a difference-in-difference methodology, we can identify whether salaries affect both demand for bribes and the amount given by truckers.

We find that due to raised salary impacts for Ghanaian police officers relative to customs agents causes the police to increase the effort they put forth to get bribes by 19 percent, the value of bribes taken at each individual stop by between 25-28 percent (~$0.25), increase the total amount taken on the road, even while they reduce the number times they receive a bribe. In other words, the higher salary translates into petty corruption effort becoming more intense. The experimental results regarding the initiative also suggest that relative to policemen in Burkina Faso, the corruption impacts of higher salaries in Ghana are also positive.

The question of incentive-compatible anti-corruption policy is a growing concern for political and development economists as shown by an increasing number of studies focusing on countries such as Indonesia (e.g. Olken (2007); Olken and Barron, (2009)), India (Bertrand, Djankov, Hanna and Mullanaithan (2007)), and Uganda (e.g. Fisman and Svensson (2007). One study based in Italy highlights the need to disentangle inefficiency from corruption (Bandiera, Prat and Valletti (2009). Such approaches are nested in the need to improve state capacity as outlined in Rose-Ackerman (2010).

Little research has studied the cross-border aspects of corruption. An exception is Zitzewitz, (2011) in which the International Skating Union found that an anti-corruption transparency reform led to more nationalistic bias from within-country judges. No study (to the best of our knowledge) has been able to evaluate polices aimed at lowering petty corruption on highways on an international scale. This gap in the literature persists although Freund and Rocha (2009) show that delays in the time it takes to get goods in and out of ports represents a major deterrent to the level of trade within and among African countries, but especially so for those that are landlocked. This paper also addresses a need to study and evaluate evidence on corruption that occurs across national boundaries. Although, high levels of corruption on the truck routes of

West Africa are most certainly detrimental to the viability of both exports and imports, international highways are becoming more dominant across the countries of Latin America, Asia and the Middle East. Policy on petty corruption at the international level in these areas may similarly benefit from understanding how petty corruption might transpire even in the context of international trade.

We find that the salary reform generally worsened petty corruption outcomes rather than lowering them, empirically diverging from the characteristic rational models of corruption. This outcome is mostly explained by complementary behavioral model environments in which the choices of corrupt officials does not only depend on the material outcome choices, but also on points of orientation to which such outcomes may be compared (e.g. Kőszegi and Rabin 2006). This first observation of reference dependent corruption has implications not only for the discourse on the economic origins of petty corruption, but anti-corruption policy reform. As developing countries attempt to gain from integration within their respective sub-regions, political barriers to trade such as petty corruption may benefit from such behavioral perspectives.

The remainder of the article proceeds as follows. The second section discusses the single spine salary policy experiment implemented in Ghana. The third section presents some descriptive statistics of the data. The fourth section provides a conceptual framework and develops testable hypotheses. Section five discusses the empirical strategy and results and the sixth section concludes.

2. The Single Spine Salary Structure (SSSS) in Ghana

Civil service salary reform in Ghana, though long desired by many, has had a long and tortuous history of fits and starts with little actual reform taking place until recently. Following independence in 1957, corruption in the Ghanaian public service led to both economic and political instability in the 1960s and 1970s and a series of coups into the early 1980s. During that period public pay review interim commissions mandated with harmonizing salary standards in the Ghana Universal Salary Structure (GUSS) post-independence public pay system had difficulties implementing reforms in the context of political unrest.

After returning to democracy in 1992, the Gyampoh Commission met during the rule of President Jerry Rawlings to plan and implement the public sector reforms previously envisioned but disbanded only a year later (Atafor 2012). In 2000, President Kufour's Ministry of Public Sector Reforms constructed a pay policy to correct existing disparities within the public sector, renamed the Single Spine Salary Structure (SSSS) and announced in 2007. Although the President Kufuor's Government had intended to implement these public sector pay reforms, it lost general elections to the NDC in 2008, again calling into question whether these reforms would take place.

The NDC Government issued an announcement in November 2009, pledging to mitigate pay disparities in the public service; implement numerous pay negotiations; and improve productivity through payment channels (Atafor 2012). To facilitate SSSS implementation, public sector workers were categorized by job similarities. Factors influencing categorization include education; skills; training; and career roles. Parliament passed the Fair Wages and Salaries Commission (FWSC) to administer the SSSS in 25 levels. Following negotiations with public sector unions in 2009, the SSSS started implementation in July 2010 with the police service.

2.2 Ghana Police Salary Increases

> Everyone is hoping to see the end of corruption, inefficiency and bribery by the police, now that their salaries have gone up.
>
> --Stephen Owusu (2011) *Can Single-Spine Salary For Police Stop Bribery and Corruption?*

The Fair Wages and Salaries Commission migrated the Ghana Police Service to the single spine structure on July 1, 2010, leading to a doubling of police salaries. Although having other public sectors on the same structure helped harmonize pay standards across sub-sectors, this might have influenced the impression that the SSSS was meant to add more funds to all salaries. When the Ghana Prison Services, Ghana National Association of Teachers, National Association of Graduate Teachers, Civil and Local Government Staff Association Ghana; Ghana Medical Association and others received their pay without the significant increases received by police, they either picketed, demonstrated, threatened strike action or actually took such actions.

Two reasons seem to account for Ghana giving a disproportionate rise in salaries exclusively to the police. Historically, the police service has been the least well-paid of all public sector workers in Ghana. Second, it was thought that this measure could curb corruption, as noted in the above media report. Thus, from a public policy perspective one might consider it both fair and the investment with the highest expected return in terms of lowered corruption to give disproportionate raises to the police.

3. Data

This investigation draws on unique data collected by the USAID-West Africa Trade Hub (WATH) project since 2006 from over 2,500 trucks plying the roads in West Africa. Since 2006 they have been giving surveys to long-haul trucks plying the major truck routes of West Africa. The dataset for this work includes trucks traveling back and forth from Ouagadougou, the capital of Burkina Faso, to the port town of Tema, Ghana. Drivers of trucks on these routes wrote down the delay, amount paid and the official type each time they paid an average of 27 bribes per trip to seven different types of officials spread out along the nearly 1,000 km of road on this corridor.[2]

In the dataset, each checkpoint stop for an individual driver represents a data point, which produces some 40,000 useable stops for more than 2,400 drivers on trips in Ghana and Burkina Faso, with 34,869 stops occurring in Ghana. There are seven different types of stops recorded: Customs, Forestry, Gendarmerie, Health, Other, Police, and Unions on the road from Tema in Ghana to Ouagadougou in Burkina Faso. The data also include information on driver and truck characteristics including country of origin of the driver & truck; truck type (tanker, container, general purpose); truck value; and driver education level. Since over 90% of the stops in Ghana are either customs or police, we use only the data on customs and police stops in both Ghana and Burkina Faso. The results reported are robust to inclusion of the other authority types.

The surveys were given to truck drivers at the beginning of their trips. When the drivers are approached with a survey, an expert in trucking checks their papers and assesses if the papers for the truck and cargo are in order. If they are in correct condition and the truck driver agrees to take the survey, the driver is given a survey to fill out which is then collected at the end of the trip. Only trucks scheduled to drive the whole trip are given surveys to fill out. It is estimated by those that hand out the survey that the trucks with their papers in order represent about one-third of the long-haul trucks on the road. The data therefore represent a selected sample that represents the minimum levels of bribes paid, since the trucks without appropriate papers will be likely to

[2] Due to the poor quality of secondary roads, there are few alternative routes or ways for truckers to drive around checkpoints and barriers.

pay higher bribes. Collecting data from trucks whose documentation are confirmed to be in order also minimizes the possibility that a bribe payment can be warranted.

Our data suggest that the total cost of bribes is between $0.03 and $0.17 per kilometer, implying that bribes are a non-negligible 1-5% of total costs, and between 2% and 10% of variable costs of a long-haul trip. In addition the data show delays due to petty corruption that can add up to an extra day in transit. The average bribe paid in Ghana is just under $1 on average, with the most frequent bribe amount being paid at 1 Ghanaian Cedi.

4. Conceptual Framework: Theories of Bribe Taking

We present simple theoretical models that capture multiple potential outcomes from increasing police salaries, including the three major theories from the literature about how raising salaries might change corruption. The first of those theories is the "crime and punishment" or shirking model from Becker and Stigler (1974), in which government officials choose corruption based on a cost benefit analysis that equates corruption returns to their potential forgone future income. This set up is broadly related to the social norms literature on corruption such as Acemoglu and Jackson (2014) and expresses similar concerns to models of "career concerns", albeit with different mechanisms (e.g., Dewatripont, Jewitt and Tirole, 1999). The second theory, first formalized by Akerlof and Yellen (1990) is the "fair wage" hypothesis in which officials engage in corruption up to the point that their wage rises to what is considered the fair wage. We add a third possibility to our model, developed below from the reference dependent utility and target income literatures. In this reference dependent utility model, the salary change affects policemen's reference income level relative to other civil servants leading to higher levels of corruption.[3]

Let there be an official who receives a salary, B, and can choose to engage in corrupt practices by putting in effort, e, which gets him benefit $g(e)$ but induces a cost to him of $c(e,\overline{B})$ where $\overline{B}$ is the official's permanent income received from salary level B. The function $g(.)$ is quasi-concave and $c(.)$ is convex in effort, e, and $c(.)$ is multiplicative in e and $\overline{B}$ as well as

[3] A fourth possibility is the monopolist model of corruption due to Schliefer and Vishny (1993) and applied to similar truck data as this study by Olken and Barron (2009), in which corrupt officials maximize profits by setting a bribe price to pass on the road. The appendix explores this possibility and finds no empirical evidence to support such a model.

strictly increasing in permanent income $\bar{B}$[4]. While one can think of the benefit *g(.)* as a monetary benefit, the cost *c(.)* will come in the form of social stigma and potential penalties including losing one's future income stream. The official will choose the effort[5] to allocate to corruption to maximize the following utility function:

$$\max_{e} \; U = B + g(e) - c(e, \bar{B}) \;^{6} \qquad (0.1)$$

First, if the cost of corruption is independent of salary levels, as would be the case if there is zero probability of getting caught and losing one's job, i.e., $c(e,\bar{B}) = c(e)$, then the optimal level of effort will be determined by the relative marginal costs and benefits of corruption effort. It is easy to see that the optimal effort to maximize utility will be governed by $\partial g / \partial e = -\partial c / \partial e$ and independent of salary levels, *B.* This establishes our null hypothesis against which we test the other propositions.

Null Hypothesis: Levels of effort and amounts of bribes are independent of changes in salary levels.

In order to demonstrate the crime and punishment model, we solve (1) for the optimal level of effort assuming that the costs of effort are increasing in one's permanent income $\partial c / \partial e \partial \bar{B} > 0$,

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[4] The Becker and Stigler (1974) results are driven by backward induction in a multi-period model. In what follows we use the simplification of using an official's permanent income, which includes the person's discounted future income.

[5] In his work on corruption in Zaire, Gould (1980) makes the point that corrupt practices require a specific effort of the officials. He finds that poorly paid officials will choose between corrupt practices or moonlighting in a different job, depending on the relative value of corruption in the area to which they are posted.

[6] We use a linear utility function to match the principle agent literature as well as ease of exposition. The results and propositions would be the same with some common functional forms such as Cobb-Douglas or exponential utility.

as would be the case if one could lose one's job from corruption effort. The first order conditions for the optimal choice of corruption effort will be:

$$e = \begin{cases} 0 \quad if \quad g(e) < c(e, \overline{B}) \\ e^* \; where \; e^* \; solves \quad \partial g / \partial e = \partial c / \partial e \end{cases} \tag{0.2}$$

This leads to the first of the literature's testable conjectures:

Conjecture 1: (Crime and Punishment) A rise in an official's salary will reduce the effort officials put into soliciting bribes and the overall value of bribes.

Proof: First, since permanent income is rising with current income and $c(e, \overline{B})$ rising with $\overline{B}$, the outcome *e = 0* will be more likely. Second, since $\partial c / \partial e \partial \overline{B} > 0$ then $\partial e^* / \partial B > 0$.

Next we turn to the fair wage hypothesis, which can be illustrated by adding the following constraint to equation (1):

$$s.t. \quad B + g(e) \geq B^{fw} \tag{0.3}$$

where B^{fw} is the fair wage at which an official believes he is receiving adequate remuneration. The first order conditions will now be:

$$e = \begin{cases} 0 \quad if \quad g(e) < c(e, \overline{B}) \\ 0 \quad if \quad B \geq B^{fw} \\ e^* \; where \; e^* \; solves \quad \partial g / \partial e = \partial c / \partial e \end{cases} \tag{0.4}$$

This leads to the following testable conjecture.

Conjecture 2: (Fair Wages) If the salary increase is large enough to move from an unfair wage to a level above the fair wage, the level of corruption effort and amount of bribes collected will go down.

The reference dependent utility (Kőszegi and Rabin, 2006) and income targeting (Camerer et al., 1997) literatures provide a third potential explanation for how civil servants might change their corruption seeking effort due to salary level changes. In a reference dependent utility framework, civil servants have a kink in their utility function at their income target. If civil servants received an income level that was less than their reference income level then this would impose a utility cost on them that is higher than levels above the reference income. Since the object of interest is total income, salary plus corruption earnings, this distinguishes the reference dependent utility explanation from a fair wages explanation. In addition as set out in Koszegi and Rabin (2006), the reference points may change over time and space.

We modify equation (1) to account for the reference dependence as follows. Let realized income be: $y = we + B$, where we is the monetary returns to corruption (bribe value times effort) and B is salary and for simplicity let the cost of corruption effort be $c(e,\bar{B}) = c(e)$. Civil servant utility will be:

$$\underset{e}{Max}\ V = \begin{cases} \lambda[u(y) - y^r] - c(e), & y \le y^r \\ [u(y) - y^r] - c(e), & y > y^r \end{cases} \qquad (1.5)$$

where y^r is the target income level and $\lambda > 1$ captures worker aversion to being below their reference utility. First order conditions for this problem produce the following marginal substitution rates:

$$\begin{cases} \dfrac{c'(e)}{u'(y)} = \lambda w, \ \ y \le y^r \quad (a) \\ \dfrac{c'(e)}{u'(y)} = w, \ \ y > y^r \qquad (b) \end{cases}$$

Reference dependent civil servants receive utility benefits of λw for each unit of effort they expend below their income target and a lower value w once their income is above the target level. Solving these equations (a) and (b) in the framework used above gives us three possible regimes for corruption effort depending on corruption effort's returns relative to costs:

$$e = \begin{cases} 0 \ \ if \ \ we + B < c(e) \\ e^* \ \ if \ \ y > y^r \qquad \text{with } e^{**} > e^* > 0 \\ e^{**} \ if \ \ y \le y^r \end{cases}$$

In the above model if reference income levels y^r are left unchanged by changes in salary, the effects of salary increase should reduce levels of corruption effort in a manner similar to the fair wage hypothesis. Reference dependent utility with no change in the reference income level by civil servants would produce the same result as Conjecture (2) above. We would see that increases in salary that raised civil servants above their reference dependent utility levels would decrease bribe-taking effort. If, on the other hand, the salary increase also increases the reference income level of the civil servants who received the salary increase, then we would expect to see an increase in corruption effort by civil servants who received a raise.[7]

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[7] We thank an Accra, Ghana taxi driver named Kofi who outlined the ideas and intuition behind this reference dependent utility model for us during fieldwork. As Kofi described it, the salary increase made policemen "more important" people and therefore they needed the kind of high incomes that important people received. Policemen therefore asked for higher bribe amounts after the salary increase in order to receive the type of high income they

Conjecture 3: If there are two civil servants and one has a higher reference income level than the other, the one with the higher reference income level will allocate more time to corruption effort.

It is worth noting two features of the above models that are consistent throughout. First, there is in all models scope for the zero bribe effort outcome in which the utility costs of collecting bribes is strictly more than the utility benefit of collecting bribes. We thus should expect to see some situations in which no bribe is collected, irrespective of which model is correct. Second, across all models, the optimal effort to collect a bribe is increasing in the monetary returns to bribe effort, w in our third model. This means that lower returns to bribe efforts by civil servants will reduce their bribe collection effort. This leads to the following conjecture:

Conjecture 4: If a salary increase reduces the monetary returns for an individual civil servant's corruption effort, then we should expect to see the salary increase decrease corruption effort.

A first possibility on how this might happen is that drivers might bargain harder after they heard about the higher civil servant salaries, reducing, w relative to its previous level. A related possibility that might affect monetary returns to bribe effort is if the civil servant on the road has to pay some percentage of his corruption take to a superior officer. If the higher salaries increased this rental rate[8], then we should see a version of Conjecture (4) that is a higher salary

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expected as newly important people. In a bargain between a driver and civil servant, higher initial bribe amounts asked for increase bargaining time, but generally lead to higher bribes paid.

[8] Note that since the higher salaries in question affect all policemen from top to bottom, it would have to be that the superiors operate with a reference dependent utility for them to raise the rental rate on a road stop on their underlings. Thus this outcome would require superiors to act according to conjecture (3) while underlings acted under conjecture (4).

might increase rental rates, reduce the monetary returns to corruption effort, and reduce corruption effort.

4.2 Policy Experimental Design

The above four conjectures of the effects are neither mutually exclusive, nor are they necessarily separable. If there is a distribution among officials on the road of different utility functions or different values to the benefit and cost functions, *g(.)* and *c(.)*, then we may observe different versions of the propositions or an average of them. Nonetheless we can test them using the Ghanaian policy experiment of raising police salaries on July 1, 2010 and leaving other worker's salaries unchanged.

In our policy experiment set up we have civil servants (Ghanaian policemen) who have received a treatment (higher salaries) and other civil servants (e.g., Ghanaian customs agents or Burkinabé policemen) who did not receive such a treatment. We observe these treated and control populations in multiple interactions (~45,000 bribe "opportunities") with truck drivers across 6 years: 4 years before the experiment (2006 – June 30, 2010) and two years afterwards (July 2010 – 2012). This unique experimental set up allows us to use a difference-in-difference and triple difference approach making use of the variation across civil service type, country and year (Wooldridge, 2010) to test the effects of raises in police salaries on bribes. We can test the effect of the treatment (salary increase) on the amount and levels of bribe taking at both individual stop and national levels, while controlling for truck, truck driver, road, time, and country characteristics.

The key outcome (dependent) variables we will be testing are: effort (the amount of time an official used to ask for a bribe), the amount paid at each stop, the number of stops where no bribe is paid, and the total amounts paid on a road. It is worth noting that effort, bribe values and no-bribe outcomes are all correlated, but not as highly correlated as one might expect. The elasticity of bribe value with respect to effort is between 0.19 and 0.13 depending on specifications. In addition while effort and having no-bribes to pay might logically be negatively correlated, they in fact have a 0.034 statistically significant positive correlation. Specific hypotheses to be tested with this methodology are that the rise in police salaries has: 1) Reduced the effort that policemen put into collecting bribes, 2) Reduced the amount paid in bribes to policemen in Ghana compared to other countries and other civil servant types. 2) Reduced the number of times a truck is stopped and asked to pay a bribe by policemen in Ghana compared to other countries and other civil servant types. 3) That 1) and 2) combined have reduced the overall cost and delays associated with bribery on the roads of Ghana.

4.3 Econometric Model

Our econometric strategy uses a difference-in-difference method to test the effects of the salary policy change for policemen relative to other civil servants. We have three dependent variables of interest, effort expended to collect a bribe (measured in minutes), the value of a bribe collected (measured in CFA francs), and a dummy variable for when no bribes are paid. Focusing on effort, let Y_{ijt} be the effort expended by a civil servant on truck *i* at checkpoint *j* at time *t*, and let X_{ijt} be the characteristics of a truck, *i*, stopping at checkpoint *j* at time *t*. Our basic equation of interest will then be:

$$Y_{ijt} = \alpha + \beta_1\, Police_{ijt} + \beta_2\, Salary\_Policy_t + \beta_3\, Police_{ijt}\ X\ Salary\_Policy_t + \gamma X_{ijt} + T + \eta_j + \varepsilon_{ijt}\ , \quad (6)$$

where β_3 is our difference-in-difference parameter of interest, *T* is a series of time dummies (month and year), η_j are checkpoint specific fixed effects, and ε_{ijt} is a standard error term which we cluster at the truck level in the estimations.[9] The equation (6) is first estimated with data from Ghana and provides the difference between effort and bribes paid between policemen and customs officers. We also estimate (6) as linear probability and probit models in which the dependent variable is the number of times a truck is stopped at a roadside checkpoint and leaves without paying a bribe. Versions of (6) are also estimated with the bribe amounts aggregated across j so that Y_{it} represents the average effort or bribe a truck pays on the road in total. Similar estimates are done with the number of stops with no bribe and the total number of stops. All of the aggregated estimates have robust standard errors, rather than clustered errors at the truck level as in the baseline equation.

We then expand the dataset to include the bribes that the trucks paid Burkina Faso, which allows us to estimate (6) as a panel data fixed effects model with truck level fixed effects. Our equation will now be:

$$Y_{ijt} = \alpha + \beta_1\, Police_{ijt} + \beta_2\, Salary\_Policy_t + \beta_3\, Police_{ijt}\ X\ Salary\_Policy_t + T + \eta_j + \mu_i + \varepsilon_{ijt}\,, \quad (7)$$

where μ_i is a truck specific fixed effect that controls for differences between trucks. Here the results we obtain will be driven by differences of the bribes paid within a single truck trip, although the difference-in-difference will be driven by the checkpoint civil servant and policy changes. This fixed effect regression will control for any changes in truck "quality" between before and after the policy change as might happen if the policy change induced truckers to improve the quality or compliance of their trucks with police checkpoints. It also addresses potential biases in the data collection across time. We also estimate a linear probability and

[9] We choose to cluster at the truck level because it is likely to be the source of the greatest heteroskedasticity due to unobservable characteristics. Results presented here are robust to other assumptions about the appropriate clustering of the error term.

random effects probit version of (7) with the probability of zero bribe paid as a dependent variable.

5. Results

Table 1 shows descriptive statistics for the variables used in the main regressions for the Ghana part of the dataset. As shown across all years the average bribe was paid in 8 minutes and the average bribe was the equivalent of 473 CFA, just under $1 at the exchange rates of the period.[10] The average truck had 16 stops in the Ghana portion of the trip, with 6.5 stops in Burkina Faso. About 13% of the stops involved no bribe paid and 53% of the stops are with police while the other ones are with customs officers. More than 90% of the drivers are Ghanaian, with half of the trucks having Ghanaian registry, and 15% are oil tanker or container trucks, which are less likely to be carrying illegal cargo than general-purpose trucks.[11] The parallel trend tests showing the experimental environment are in table A1 of the Appendix.

The difference-in-difference effort regressions with the number of minutes that an official spent arguing for a bribe as the dependent variable are shown in table 2 with standard errors clustered at the level of the 2,147 trucks. The first column with our baseline specification shows that police increased their effort asking for bribes by 1.6 minutes after the salary change relative to customs agents, which is a 19% increase in bribe solicitation effort. The estimate is unchanged by adding in truck characteristics and a dummy variable for whether the day is a

[10] We use CFA francs which are pegged to the Euro, 1 Euro = 655.957 CFA, as a way to account for differences in inflation across two different countries with different inflation rates. Results are in fact stronger if the Ghana regressions are done in Ghanaian cedis.

[11] In the appendix we show that the results hold if we restrict the sample to container and oil tanker trucks, which would be less likely to be victims of corruption and therefore potentially less likely to be affected by this salary change.

holiday as done in column 2. We thus have evidence for the reference dependent utility Conjecture (3), that the salary change raised police income expectations in excess of the income change.

The baseline difference-in-difference regressions measuring the amount paid of each bribe (including non-payment at a stop) are presented in table 3, with standard errors clustered at the truck level. They show that the interaction of police and salary policy dummy variables produces about a 119 CFA increase in bribes at each stop across the whole time period. We extend the baseline to include variables describing the truck and driver, whether the particular day the bribe is paid was a holiday, and whether the truck was coming from the port, since many of the return trips are mostly empty trucks. The basic results shown in column 1 hold up with these additional controls and our point estimate of the effect goes up to 126 CFA. Among the control variables, only trucks coming from the port has a significant negative effect, lower bribe values likely due to the empty trucks going to the port having higher propensities to carry illicit goods.[12] The higher magnitudes in bribes, 25-27% higher, are consistent with the baseline that the higher salaries caused higher corruption levels. Thus we find continuing evidence in the bribe value regressions for Conjecture (3) relative to the first two Conjectures.

We then proceed to investigate the number of times that a truck is allowed to pass through a road-stop without paying a bribe using linear probability and probit regression frameworks, which provides some measure of the amount of bribe taking. Recall that the models suggest that the incidence of bribes might go down with a rise in salaries, even while effort might go up. Also it is possible that drivers will negotiate more vociferously with civil servants who

[12] Full regressions are available from the authors on request. In both Ghana and Burkina Faso, long-haul trucks such as these are not allowed to pick up goods or people along the way to either bring to another intermediate point or to the end point. Thus even normally legal goods such as charcoal or pineapples might be illicit for these trucks.

they know received a recent raise, increasing the possibility that they are let go without paying a bribe. Table 4 shows significant positive effects of the salary policy on whether a policeman allows a truck to pass without paying a bribe. In contrast to our results on the level of payment, these results show that policemen were more likely to let a truck pass without paying a bribe than before the change. The raw data show that before the salary change policemen allowed 10% of the trucks to pass without taking a bribe and that this level increased to 19% of the trucks after the salary policy change. These results are potentially consistent with all of the conjectures set out above in our modeling.

While the above estimates provide evidence for how bribe taking changes within Ghana, it is possible that there are unmeasured trends that could be confounding our data within Ghana. We therefore turn to a triple difference fixed effects estimate in which we estimate the effects of the policy in Ghana relative to the amounts paid to customs agents and policemen in the neighboring country of Burkina Faso, who were not affected by the change. In addition, with the truck fixed effects, we are able to control for potential confounding effects of truck characteristics unobservable in the data, but readily observable to a policeman (e.g., a broken headlight). This can also account for any endogenous differences in the truck fleet that might have occurred after the salary policy change. If for example truck fleets changed the quality of their trucks due to the salary change, the OLS regressions would not be robust to this effect, but the fixed effects would be.

Table 5 shows the panel fixed effects results for the effort and bribe value regressions. The three models with the full dataset show significant effects of the police salary policy relative to Burkina Faso and non-policemen. For the effort regressions we find a consistent estimate of 1.7 extra minutes of effort, although it is only significant at the 10% level. For the bribe value regressions, the extra bribe costs per stop are 159 CFA, which represents a 34% increase in the level of bribes after controlling for truck and country effects. Overall, the panel data results across the board confirm the support for Conjecture (3) that the salary increases will increase both bribe seeking effort and bribe values.

In order to test the number of stops without a bribe in the panel dataset, we estimate linear probability fixed effects and random effects probit models, which is shown in table 6. In all models we find corroborating evidence that the salary change increased the number of trucks that policemen allow to pass without paying a bribe went up after police salaries went up. Thus the evidence is that for each stop, the probability a truck did not have to pay a bribe went up for Ghanaian policemen after the salary change relative to customs officers or Burkinabé policemen. Again, these results are consistent with all the conjectures from the modeling.

While the previous estimates are done at the level of each individual time a truck is stopped on the road, they do not tell us about how the aggregate price to travel on the road and number of total stops might change with the Ghanaian police salary change. In order to test those effects the regressions in tables 7 and 8 use data aggregated at the level of a truck trip through Ghana. Table 7 shows the effects of the salary policy on the average effort expended at each stop, the average amount paid in bribes at each stop on the road in Ghana and the percent of stops with no bribe. Consistent with our previous findings, we see that the salary policy increased the average effort at each stop by more than a minute and average amount of bribes paid to each policemen by a statistically significant 109 CFA. This represents a 23% increase in the amounts of bribes paid on the road due to the policy change. We also find that the number of stops without a bribe goes up significantly after the salary policy change.

In order to test the most anomalous of the results, that the number of bribes with no bribe paid went up, we test whether this effect is just at the individual stop level or holds true for the full truck trip. Table 8 shows how the salary policy changes the total number of stops on the road and the total number of stops at which a bribe is paid. The first two columns show that the police salary change increased the number of stops on the road by 0.7 stops, which is an 8% increase over the average of 8.5 stops by policemen in Ghana. This suggests that while the salary increase encouraged policemen to be more likely to let trucks go without paying a bribe, the higher salary also increased the number of police stops. Both of these effects could be interpreted as evidence of policemen doing their job better after the salary increase. It is just that doing the job "better" may also mean collecting higher bribes. The last two columns of table 8 show that the total number of bribes paid on the road, which equals the total number of stops minus the number of stops with zero bribes paid, is unchanged by the increase in police salaries. Thus the result seen at the individual stops in which policemen were more willing to let trucks pass without a bribe after police salaries increased, did not mean truckers paid a smaller number of bribes. The 8% increase in the number of police stops completely offset the reduction in the number of bribes paid due to policemen letting some trucks pass without paying a bribe. This gives corroborating evidence for conjecture (3): that a salary increase increases bribe effort and bribe values.

The net effect appears to be policemen allocating more effort to collecting bribes and asking for higher bribe values, but also increasing the number of truckers let go without a bribe. To demonstrate that there has been an increase in zero bribes and a reduction of low level (1 cedi) bribes for policemen relative to customs officers in Ghana, figures 1 and 2 show kernel density estimates of the bribe amounts in Ghanaian cedis, with values truncated at 10 to focus the analysis. Figure 1, which shows policemen's bribe taking behavior before and after the policy change, shows an increase in mass at zero and two cedis, with a reduction in one cedi bribes after the policy change. Figure 2 shows that customs officers have a different behavior with bribes reduced after July 2010 and more of them being one cedi rather than two or three. This provides corroborating evidence that the effect of the salary policy change was to increase the effort and value of bribes asked for by policemen, but to slightly increase the number of trucks they let go without paying a bribe.

6. Robustness Checks

The appendix provides robustness checks on estimates presented here. We first check whether our difference-in-difference set up exhibits parallel trends. We test parallel trends using year time trends and their interaction with the police dummy. Results for data from 2008 forward or 2010 forward show no significant difference in effort between police and customs. Bribe values are significantly different from 2008 forward, showing a positive trend, while 2010 shows a strong non-parallel trend in the opposite direction of our results post July 1, 2010. Results using monthly trends instead of yearly ones, show a similar pattern of non-significance for effort and non-significant trends for bribe values in 2009, but not the first half of 2010 as also shown in table A1 below.

We take these results as strong evidence for the validity of our difference-in-difference for the effort regressions. The potentially non-parallel trend in bribe values suggests some caution is needed in interpreting the bribe value regressions from Ghana only. One should note, however, that if the post-salary raise higher bribes merely follow an existing trend of higher police bribe values then it would still be the case that the salary raise did not reduce bribes. Also the panel regressions with both Burkina Faso and Ghana corroborate the fundamental findings.

A second robustness check presented in the appendix is to limit the sample to container and tanker trucks. Container and tanker trucks are in general “cleaner” in terms of being newer trucks and having fewer violations relative to general-purpose trucks. We therefore re-run the key regressions of the paper with just container and tanker trucks. The results suggest our main results are robust to using only the “best” trucks on the road.

A third robustness check is to test whether the results could be described by the model used in Olken and Barron (2009) in which the price paid at each stop is determined in part by the total price paid on the road. As detailed in the appendix we find no evidence that this model is the correct model for bribes in West Africa.

7. Conclusions

This work has used a policy experiment in Ghana to show that increasing salaries of civil servants can have multiple different effects on bribe taking by those civil servants. The work shows that policemen who received the single spine salary increase in Ghana increased the effort they allocated to colleting bribes in time spent asking for bribes, in the number of checkpoints they operated, the value of bribes they took, the total amount that truckers had to pay on the road, all while they increased the number of trucks let go without a bribe. Their decreasing the number of times they succeeded in getting a bribe could be related to career concerns in which the more often one asks for a bribe, the higher the probability of losing one’s job. On the other hand the increased effort and value of bribes taken is consistent with the idea that higher civil service salaries induce civil servants to demand higher bribes.

Since the Ghanaian salary increase experiment took place without a commensurate increase in enforcement of anti-corruption laws, the results here suggest that merely raising salaries without changing the context and incentives within which reference dependent civil servants operate may not have the desired effects on corruption. We demonstrate that raising salaries of corrupt officials can have the consequence of worsening petty corruption, in contrast to many theoretical predictions from the literature. The results also call into question the relevance of cross-country studies and laboratory based studies, which have shown that higher salaries or payments reduce corruption. The empirical results presented here suggest that fighting corruption cannot be done by salary policies alone. Further work is warranted to investigate how widespread the effects shown here are or whether they are specific to West Africa. Investigations of corruption may need to consider salary raises with potentially complementary factors such as enforcement as well as more cohesive institutions as part and parcel of the same equation.

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Table 1: Descriptive Statistics for the Ghana data

Variable |	Obs	Mean	Std. Dev.	Min	Max
Effort (Minutes per stop)	34869	8.343	22.92	0	1440
Bribe value in CFA (500 ~ = $1)	34869	472.40	1307.46	0	150289
No bribe paid at a stop	34869	0.1313	0.3378	0	1
Police	34869	0.5276	0.4992	0	1
Salary Policy	34869	0.3936	0.4886	0	1
Police X Salary Policy	34869	0.2114	0.4083	0	1
Container or Tanker Truck	34869	0.1477	0.3547	0	1
Holiday	34869	0.1663	0.3723	0	1
Ghanaian Vehicle	34869	0.5780	0.4939	0	1
Ghanaian driver	34869	0.9114	0.2841	0	1
Coming from the port	34869	0.7891	0.4080	0	1

Table 2:

Baseline Effort Regressions

Variables	(1) Effort	(2) Effort
Police	-1.700***	-1.606***
	(0.408)	(0.413)
Salary Policy	-0.618	-0.719
	(0.645)	(0.651)
Police X Salary	1.592***	1.592***
	(0.325)	(0.330)
Constant	4.758***	6.410***
	(1.583)	(1.659)
Year & Month effects	Yes	Yes
Checkpoint fixed effects	Yes	Yes
Truck characteristics	No	Yes
Observations	34,869	34,869
R-squared	0.242	0.244

Robust standard errors clustered at the truck level in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Truck characteristics: tanker or container dummy, driver and truck home country, holiday dummy

Table 3: Baseline Bribe Value Regressions

Dependent variable is real CFA value of bribe paid at each stop

Variables	(1) Bribes	(2) Bribes
Police	-197.5***	-202.9***
	(32.47)	(31.90)
Salary Policy	-28.57	-28.57
	(33.46)	(32.49)
Police X Salary	119.0***	125.6***
	(28.71)	(28.88)
Constant	555.1***	679.0***
	(60.56)	(87.85)
Year & Month effects	Yes	Yes
Checkpoint fixed effects	Yes	Yes
Truck characteristics	No	Yes
Observations	34,869	34,869
R-squared	0.036	0.038

Robust standard errors clustered at the truck level in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Truck characteristics: tanker or container dummy, driver and truck home country, holiday dummy

Table 4: Probability of paying no bribe (Linear probability & Probit)
Dependent variable = 1 if no bribe paid

Variables	(1) Linear Probability	(2) Linear Probability	(3) Probit
Police	0.0111**	0.00471	0.0600**
	(0.00541)	(0.00627)	(0.0295)
Salary Policy	-0.0120	-0.0116	-0.115
	(0.0172)	(0.0171)	(0.0798)
Police X Salary	0.0494***	0.0462***	0.181***
	(0.0102)	(0.00998)	(0.0458)
Constant	-0.00114	-0.0632*	-1.251***
	(0.0320)	(0.0368)	(0.134)
Year & Month effects	Yes	Yes	Yes
Truck characteristics	Yes	Yes	Yes
Checkpoint fixed effects	No	Yes	No
Observations	34,862	34,862	34,866
R-squared	0.038	0.083	
Log Likelihood			-12968

Driver Cluster Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Panel Fixed Effects using data from Ghana and Burkina Faso

Dependent variables are minutes of effort or real CFA value of bribe paid at each stop

	(1)	(2)	(3)	(4)
Variables	Effort	Effort	Bribe value	Bribe value
Ghana	-2.652	-2.650	179.0	179.2
	(9.506)	(9.506)	(241.8)	(241.8)
Ghana X Police	1.449	1.450	-337.9***	-337.6***
	(1.351)	(1.351)	(34.36)	(34.35)
Police	-2.372**	-2.374**	93.23***	92.90***
	(1.106)	(1.106)	(28.12)	(28.12)
Salary Policy	-2.479**	-2.484**	-318.1***	-318.9***
	(1.177)	(1.177)	(29.94)	(29.94)
Ghana Police X Salary	1.723*	1.723*	158.6***	158.5***
	(1.036)	(1.036)	(26.36)	(26.36)
Holiday		0.620		97.83**
		(1.668)		(42.43)
Constant	10.13	9.240	82.92	-57.70
	(33.52)	(33.61)	(852.6)	(854.7)
Checkpoint fixed effects	Yes	Yes	Yes	Yes
Observations	47,499	47,499	47,499	47,499
R-squared	0.071	0.071	0.163	0.163
Number of truck trips	2,147	2,147	2,147	2,147

Includes police, customs and in Burkina Faso gendarmerie stops. Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Panel Data No bribe paid

Dependent variable = 1 if no bribe paid

Variables	(1) Linear Probability fixed effects	(2) Linear Probability fixed effects	(3) Random effects Probit
Ghana	0.0541***	-0.101*	0.422***
	(0.00464)	(0.0586)	(0.0339)
Ghana Police	0.0261***	0.0189**	0.339***
	(0.00731)	(0.00832)	(0.0647)
Police	-0.0126**	-0.00568	-0.247***
	(0.00612)	(0.00681)	(0.0588)
Salary Policy	0.0414***	0.0425***	0.352***
	(0.00710)	(0.00727)	(0.0488)
Police X Salary	0.0501***	0.0472***	0.191***
	(0.00637)	(0.00638)	(0.0391)
Constant	0.740**	0.918***	-2.127***
	(0.295)	(0.337)	(0.0785)
lnsig2u			-0.824***
			(0.0508)
Year effects	Yes	Yes	Yes
Checkpoint effects	No	Yes	No
Observations	47,499	47,499	47,496
Number of trips	2,147	2,147	2,147
Log likelihood			-14091

Includes police, customs and in Burkina Faso gendarmerie stops

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Aggregate per trip total bribes and number of stops with no bribe in Ghana

Variables	(1) Effort: Duration at each stop	(2) Values: Avg. Bribe costs on road	(3) Number of stops with no bribe
Police	-0.613	-95.49***	0.0853
	(0.448)	(26.68)	(0.0554)
Salary Policy	-4.110	-969.2***	0.261
	(4.716)	(170.1)	(0.448)
Police X Salary	1.127**	109.1***	0.600***
	(0.571)	(42.23)	(0.109)
Constant	11.17***	515.8***	1.321***
	(0.872)	(45.68)	(0.243)
Year & Month dummies?	Yes	Yes	Yes
Observations	4,238	4,238	4,238
R-squared	0.101	0.075	0.156

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Aggregate per trip number of stops and bribes paid in Ghana

Variables	(1) Number of stops	(2) Number of bribes paid (Stops – No bribe stops)
Police	0.585***	0.497***
	(0.153)	(0.161)
Salary Policy	0.540**	0.0973
	(0.221)	(0.223)
Police X Salary	0.709***	0.109
	(0.223)	(0.235)
Constant	8.435***	7.549***
	(0.379)	(0.411)
Year dummies?	Yes	Yes
Observations	4,236	4,236
R-squared	0.055	0.038

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 1. Graph of Police GH Cedi bribe amounts before and after the salary change

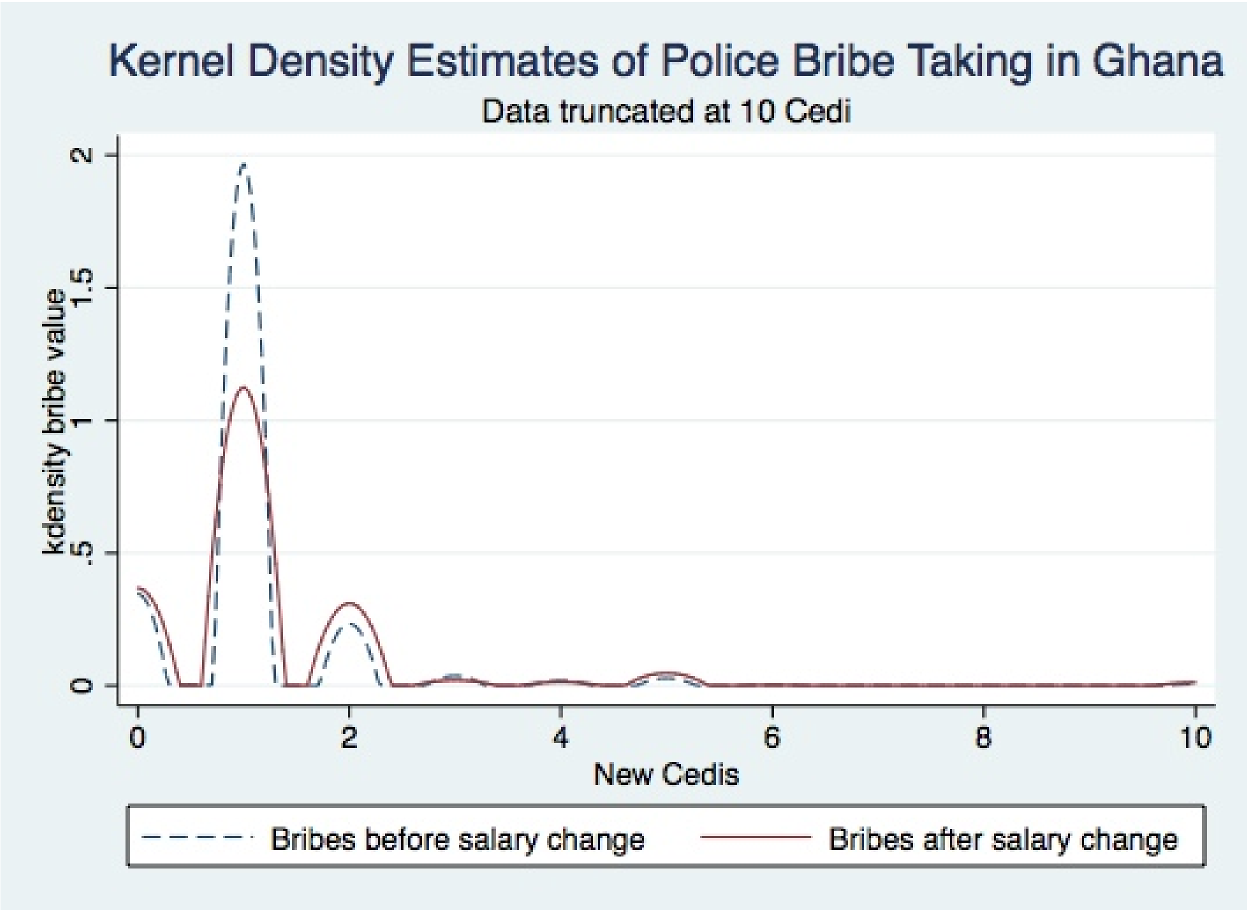
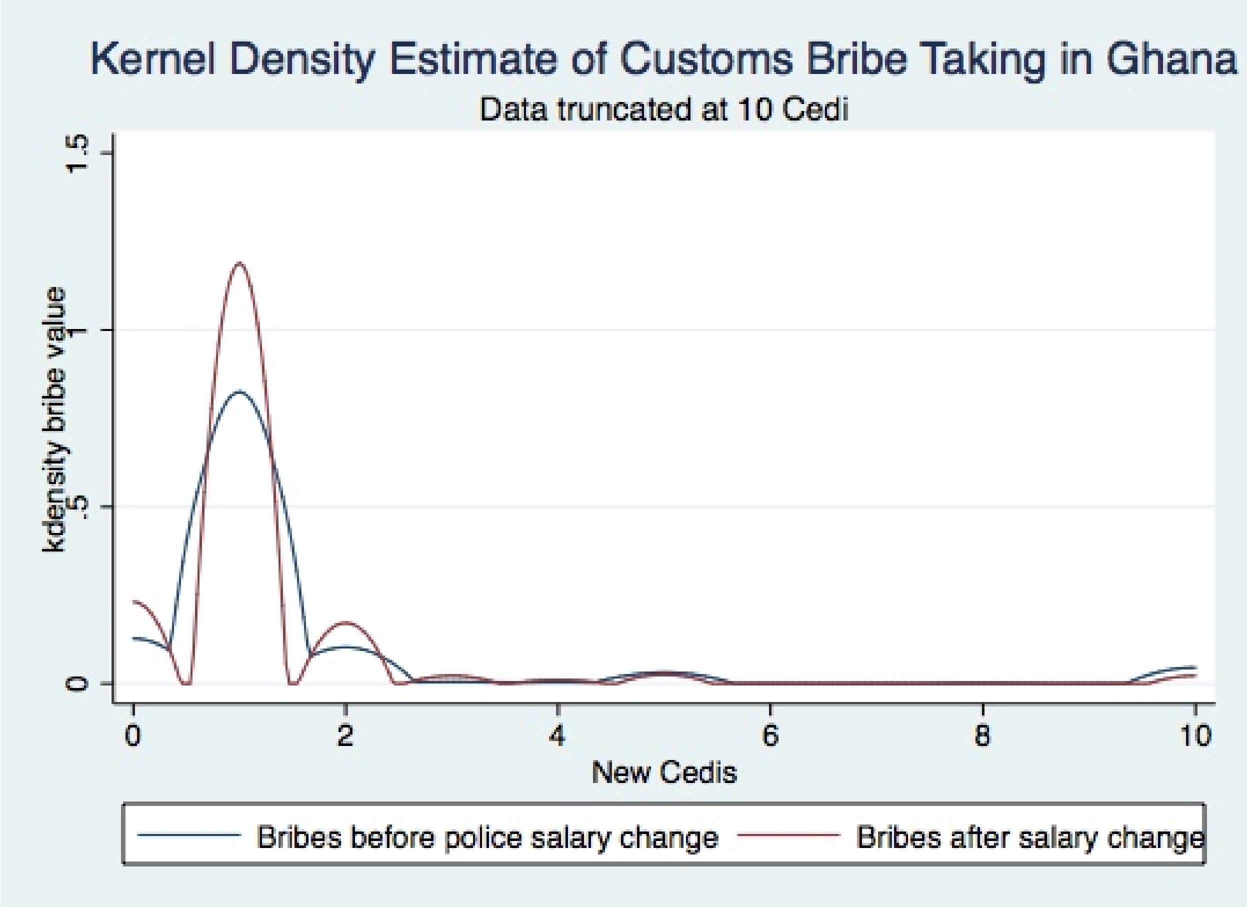


Figure 2 Graph of Custom GH Cedi bribe amounts before and after the salary change



Appendix

Parallel Trends Tests

For the validity of the difference-in-difference specification we need there to be parallel trends in the data prior to July 1, 2010 between effort and bribe values in customs and police stops. Unlike most studies with little "burn in" period, we have 3 years of data before the policy change.

We test parallel trends using year time trends and their interaction with the police dummy. Results for data from 2008 forward or 2010 forward show no significant difference in effort between police and customs. Bribe values are significantly different from 2008 forward, showing a positive trend, while 2010 shows a strong non-parallel trend in the opposite direction of our results post July 1, 2010. Results using monthly trends instead of yearly ones, show a similar pattern of non-significance for effort and non-significant trends for bribe values in 2009, but not the first half of 2010 as also shown in table A1 below.

We take these results as strong evidence for the validity of our difference-in-difference for the effort regressions. The potentially non-parallel trend in bribe values suggests some caution is needed in interpreting the bribe value regressions from Ghana only. One should note, however, that if the post-salary raise higher bribes merely follow an existing trend of higher police bribe values then it would still be the case that the salary raise did not reduce bribes.

Table A1

Variables	(1) Effort (2008-policy change)	(2) Effort (2010-policy change)	(3) Bribe value (2008-policy change)	(4) Bribe value (2010-policy change)
Police	-1,057	-1.906	-99,894***	-163.7***
	(718.6)	(2.822)	(38,477)	(54.22)
Police X Year	0.525		49.54***	
	(0.358)		(19.14)	
Year	-2.610***		-224.3***	
	(0.420)		(22.35)	
Constant	5,250***	3.138***	450,984***	385.8***
	(843.5)	(0.521)	(44,900)	(63.37)
Month effects	Yes	Yes	Yes	Yes
Checkpoint effects	Yes	Yes	Yes	Yes
Observations	16,231	2,948	16,231	2,948
R-squared	0.342	0.182	0.154	0.068

Robust standard errors clustered at the truck level in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Robustness to the Olken and Barron specification

The Olken and Barron specification suggests that log of bribes paid would be a function of the average bribe paid on the road, with an expected coefficient (elasticity) of close to 1 if the pricing of bribes at individual sites responded to the total price to pass on the road (coordinated system). In such a system, unless the salary rise affects the number of trucks on the road we should expect no effect of higher police salaries on the bribes paid.

The corrupt official as monopolist model is a special case of (1) above in which $c(e, \bar{B}) = 0$ and the function *g(e)* takes a special form, *g(e, Q)* that is a pricing function quadratic in the number of "customers", *Q*. It is easy to see that the optimal effort to maximize utility will be governed by *g(e, Q)* and independent of salary levels, *B*[13]. In the Olken and Barron model the log of the price paid in bribes will be a decreasing function of the log of the expected number of stops on the road. If the road stops work as a coordinated monopoly the coefficient on the log of the expected number of stops should be -1, if they are completely uncoordinated then the coefficient would be zero. In addition the results using the aggregate (total) level of bribes on the road would have a zero coefficient on the log of the number of stops if perfectly coordinated or a value of 1 if uncoordinated.

The results in table A2 mimic those in Olken and Barron, with added variables to test the salary policy. We measure the expected number of stops on the road as the number calculated by authority (police or customs), so that an observation at a police stop uses the expected number of stops by police. We then interact this with our key salary policy variable to see if coordination might have changed with the salary change.[14] They show extremely low levels of coordination in "pricing" and a significant effect of the salary policy on bribe values in columns 1, 2 and 3. In column 4 we do not find a significant effect of the salary policy except in its interaction with the number of stops. In columns 1-3 we find an effect of the policy of a between 13% to 29% increase in bribe values, which is consistent with our other results.

Overall, the results in table A2 show that (i) the Olken and Barron model does not fit well with our data and (ii) controlling for the overall expected number of stops on the road does not change our basic result.

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[13] Olken and Barron (2009) also have a bargaining model of price setting, which would also have bribe effort and value levels independent of the official's salary. A number of other models, such as ones with costs of bribe taking unrelated to future income (e.g., fixed fine rates without loss of employment), would also produce our null hypothesis, that bribe taking is independent of salary levels.

[14] Note that there are some endogeneity concerns with using the number of stops since we do show above that the number changes with the salary change, which would bias us in favor of finding an expected stop effect. Since this is a robustness check of our paper's main result, we do not concern ourselves with this potential endogeneity.

Table A2
Olken & Barron tests

VARIABLES	(1) Log Bribe costs	(2) Log Bribe costs	(3) Log Total bribe costs	(4) Log Total bribe costs
Salary Policy	0.0176	0.0178	-0.0631**	-0.0626**
	(0.0238)	(0.0238)	(0.0278)	(0.0280)
Police	-0.176***	-0.178***	-0.0699***	-0.0699***
	(0.0132)	(0.0132)	(0.0138)	(0.0138)
Police X Salary	0.134***	0.286***	0.160***	0.129
	(0.0143)	(0.0821)	(0.0189)	(0.114)
Ln(E[Stops per month])	-0.0205**	-0.0151	-0.0631***	-0.0645***
	(0.00832)	(0.00931)	(0.0120)	(0.0148)
Ln(E[Stop/mo])X Police X Salary		-0.0268*		0.00555
		(0.0144)		(0.0198)
Constant	5.992***	5.959***	6.496***	6.504***
	(0.0762)	(0.0806)	(0.0975)	(0.114)
Year, Month Effects	Yes	Yes	Yes	Yes
Checkpoint Effects	Yes	Yes	No	No
Observations	30,290	30,290	4,146	4,146
R-squared	0.250	0.250	0.190	0.190

Ln(E[Stops per month]) is the average number of stops on the road that month for the particular authority (police or customs). Results are similar if done with the expected total number of stops on the road instead. Standard Errors clustered at the truck level in (1) & (2) and White's robust SE in (3) & (4). (*** p<0.01, ** p<0.05, * p<0.1)

Containers and Tankers

Container and tanker trucks are in general "cleaner" in terms of being newer trucks and having fewer violations relative to general purpose trucks. We therefore re-run the key regressions of the paper with just container and tanker trucks. The results suggest our main results are robust to using only the "best" trucks on the road.

Table A3

Variables	(1) Effort	(2) Bribe value	(3) No stop Probit	(4) Panel FE bribe value
Police	-1.179***	-288.5***	-0.110*	-307.6***
	(0.427)	(106.5)	(0.0665)	(45.59)
Salary Policy	4.649***	189.3	-0.413**	-594.0***
	(1.154)	(131.5)	(0.179)	(164.7)
Police X Salary	1.278*	155.7***	1.081***	269.5*
	(0.719)	(55.03)	(0.192)	(144.9)
Constant	12.97***	188.4	-1.247***	1,318***
	(2.789)	(336.5)	(0.0714)	(454.8)
Year, Month, Checkpoint fixed effects	Yes	Yes	No	Yes
Observations	5,149	5,149	5,148	6,856
R-squared	0.376	0.082		0.034
Number of trucks				295
Log-likelihood			-1662	