Corruption and Public Display of Wealth*

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Abstract
We build a principal-agent-client model of corruption, allowing for heterogeneity of the value of public projects relative to the cost of monitoring their virtuous execution. In an environment in which potential corruptors face uncertainty about the type of project followed by officials, we show under which conditions officials with low-value projects have an incentive to signal their project’s type – and thereby their corruptibility – by means of public display of wealth. We then show that, even though public display of wealth by those officials reduces the offer of bribes to officials following high-value projects, in equilibrium government is better off inhibiting it.

Keywords: Corruption, Incentives, Signaling, Public Display of Wealth

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1 Introduction

In late 2011, “in a morning raid, French police towed away 11 luxury cars, including a Maserati, a Porsche Carrera, an Aston Martin and a Mercedes

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Maybach” from Teodorin Obiang, the eldest son of the President of Equatorial Guinea. At that time, Obiang Jr. held the position of Equatorial Guinea’s agriculture and forestry minister, a job that payed €3,200 per month.\textsuperscript{1} As in the corruption case of President Marcos of the Philippines, by using the blatant discrepancy between his official income and his lifestyle, the courts will attempt to prove that Obiang Jr.’s spectacular wealth had been acquired with dishonest income. In Marcos’ case, prosecutors found “a number of luxury items [...], including 2,300 pairs of shoes in First Lady Imelda Marcos’ closet,” which the prosecution “decided to protect and exhibit ..., together with all of the contents as evidence of corruption on a grand-scale by the Marcos’,” reasoning that, “since Marcos was not a wealthy man before entering politics, these items were probably acquired with dishonest income,” (di Tella and Weinschelbaum, 2008, p. 1553).\textsuperscript{2}

For officials with a wealthy background, proving that (even spectacular) wealth has been acquired with dishonest income is arguably a more difficult task than for those from a poorer background: excessive consumption provides a cleaner signal of dishonest conduct for poor than for wealthy agents. It is for this reason that the initial wealth of public officials impacts on the cost of providing incentives to them, which can make it optimal to select poor agents for public office. This has been shown within a principal-agent framework in di Tella and Weinschelbaum (2008).

In the presence of uncertainty with respect to an official’s corruptibility, however, there is a countervailing force: Consumption beyond the means of the official’s salary may not only be used in an audit as evidence of corruption. It may also transmit information regarding an official’s corruptibility to potential corruptors. Having a cleaner signal of dishonest conduct reduces uncertainty on the side of potential corruptors and thereby facilitates corrupt transactions. As in the case of an audit, consumption beyond an official’s means is especially informative – a cleaner signal – if their wealth has been publicly declared or if it is common practice to select poor agents into public office.

\textsuperscript{1}Reported in The Guardian, February 6, 2012.

\textsuperscript{2}Citing Judge Gherardo Colombo (1997), di Tella and Weinschelbaum (2008, p. 1553) write that “the value of monitoring the assets and lifestyles of public officials is one of the key lessons of the Italian experience” of Mani Pulite. Indeed, monitoring of the assets and lifestyle of public employees has become part of the tools that are regularly employed by governments around the world in their fight against corruption, see Rodrigues-Neto (2010). The OECD, for example, promotes asset declarations for public officials as a tool to prevent corruption (OECD, 2011).
Our premise that uncertainty matters in corruption is realistic. Uncertainty has been shown to affect the overall level of corruption in an economy (Lambsdorff, 2007, Ryvkin and Serra, 2012) as well as the individual propensity to bribe (Herrera, Lijane, and Rodriguez, 2007). Campos, Lien and Pradhan (1999) show that less predictable corrupt regimes are more detrimental to investment than predictable corrupt regimes. Experience in post-communist Russia confirms this: Uncertainty over whom to bribe and how much, was hurting foreign investors. While locals were connected to governors, judges and the police, foreigners lacked such connections, as well as the know-how, to create these ties.3

Obiang Jr. of Equatorial Guinea’s public display of wealth and its level certainly resolved uncertainty about whom to bribe and how much: It sent a clear signal to potential corruptors, one that said, “Open for Business.”4 In this paper, we consider exactly this role of public display of wealth. Public officials publicly display their wealth to potential corruptors, who face uncertainty with regard to the type of project followed by the officials, and thereby advertise their corruptibility to them. We characterize a separating equilibrium in a principal-agent-client model of corruption in which officials managing projects with a relatively low benefit to society, compared to the cost of enforcing virtuous behavior, advertise their corruptibility whereas officials managing projects with a relatively high benefit to society, again compared to the cost of enforcing virtuous behavior, do not.

As compared to an equilibrium in which no official publicly displays wealth, potential corruptors are more inclined to offer bribes to officials who advertise corruptibility and less inclined to offer bribes to officials who do not. We further show that, in equilibrium, the reduced inclination of corruptors to bribe officials who do not advertise their corruptibility is counteracted by an increased probability that these officials accept a bribe if it is offered to them.

Because it increases the equilibrium probability with which corruptors offer a bribe to officials following a low-value project – they signal their corruptibility – signaling induces a negative effect for these projects. For

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3Shlapentokh (2003).
4Likewise, customs officers in post-communist Russia had the reputation of avoiding this uncertainty for potential foreign corruptors by signaling their corruptibility with consumption, the income for which they could not possibly have earned in their regular position. We thank Martin Paldam for this example.
projects of high value we show that the positive effect – the decreased equilibrium probability with which corruptors offer bribes – is outweighed by the negative effect – the increased equilibrium probability with which officials accept bribes, leaving an overall negative impact of signaling on the expected value of public projects to society. As a result, we find that a virtuous government would be strictly better off inhibiting officials from using this signaling device as it increases corruption and decreases the expected value of public projects to society.

The separating equilibrium we describe exists if, in the bargaining between officials and potential corruptors, the officials possess a sufficiently strong bargaining position, giving guidance as to when to expect, and thus when to fight, public display of wealth as a corruption-facilitating device. According to our model, it is public officials dealing with clients who have high “ability to pay” and low “refusal power” who are most prone to facilitating corruption by means of public display of wealth. Indeed, in a sample of Ugandan firms, Svensson (2003, p. 208) shows that bargaining power matters for corruption: firms with higher “ability to pay” and lower “refusal power” pay higher bribes “when dealing with public officials whose actions directly affect the firms’ business operations.” Because the public display of wealth is a cleaner signal if it comes from poor agents, our results caution that the selection of poor agents for public office may backfire if public officials use display of wealth to signal their corruptibility.

Consistent with the extensive literature on the detrimental effects of corruption on economic activity, in our model, corruption lowers society’s expected payoff from public projects. See Shleifer and Vishny (1993) or Bliss and di Tella (1997) for theoretical contributions; Bardhan (1997) and Aidt (2003) for surveys; and Mauro (1995, 1998), Knack (1996), Keefer and Knack (1997), Hall and Jones (1999), Mo (2001), and Pellegrini and Gerlagh (2004) for empirical contributions; or recent articles that highlight a trade-off between market failures and corruption, such as Acemoglu and Verdier (1998, 2000). We abstract from the distributional impact of corruption as studied in Gupta, Davoodi, and Alonso-Terme (2002), and Dincer and Gunalp (2012).

In most empirical studies on the topic, corruption is dealt with as an endogenous explanatory variable, which depends on economic activity, growth, and/or income distribution. The additional gain in economic activity due to reduced corruption, it is argued, pays for ensuring institutional quality, including the incentives to public officials. These incentives have been argued to be crucial to fighting corruption, as in Kaufmann (1997), Bardhan (1997),

Our main policy conclusion combines insights from the principal-agent approach to modeling corruption, as in di Tella and Weinschelbaum (2008), with insights from the literature on decentralization and corruption, as in Shleifer and Vishny (1993), Fisman and Gatti (2002a, 2002b), Arikan (2004) or Dincer, Ellis, and Waddell (2008), and insights from the bargaining view on corruption as evidenced in Svensson (2003) and modeled in the recent literature studying the relation between corruption and lobbying, such as Harstad and Svensson (2011). We find that the beneficial effect from selecting poor agents into public office is counteracted by the officials’ improved ability to signal corruptibility as long as there is little competition between officials. Decentralization would help overcome this negative effect.

2 Baseline Model: Homogenous Projects

We start our analysis with the benchmark case in which there is no heterogeneity with respect to the value of the project to be undertaken.

Assume there to be three types of agents, a government $g$, officials $o$, and corruptors $c$. The government employs the officials to execute public projects of value $V_g \in \{0, R\}$, with $R \in \mathbb{R}_+$ commonly known to all agents in the economy, and pays a fixed wage of $w$ to officials. Denote the probability that the high outcome $R$ is reached by $p$ and the probability that the public project produces zero value by $1 - p$. We assume the officials have some latitude over how to implement the project. On the one hand, they can choose to be virtuous and implement their project such that it succeeds with a high probability $p = p_H$. On the other hand, they can choose to be corrupt and, if a corruptor approaches them with a bribe $B$, implement the project in a way that generates a private value $V_c$ to the corruptor, but lowers the probability of the project succeeding to $p = p_L$.\(^5\) Denote the difference of the

\(^5\) Implicitly, by doing so, we assume that every official is corruptible – if “the price is right.” Our model could easily be extended to account for officials, who are virtuous
technologies in their probability of success by $\Delta p := p_H - p_L > 0$.

The officials’ choice over the technology is their private information, which the government cannot observe unless it monitors their interactions. Monitoring an official’s interaction with a potential corruptor costs $\mu$ and, with probability $\psi$, it enables the government to detect whether the corruptor attempted to bribe the official and whether the official accepted the bribe. We assume that, if the government detects that a bribe is offered, it is able to keep the bribe even if it was not accepted and, if it detects that a bribe has been accepted, it can punish the official by paying a wage of zero.\(^6\) Furthermore, we assume that a government that detected a corrupt act can restore the efficient technology, $p_H$.\(^7\)

We model the interaction between the three players as a simultaneous move game, in which the government chooses the probability $\gamma$ with which it monitors the officials’ interactions, corruptors choose the probability $\sigma$ with which they offer bribes $B$ to the officials, and the officials choose the probability $\nu$ with which they accept bribes. We model the amount of the bribe $B$ as the solution to a Nash bargaining problem between officials and corruptors assuming the officials’ relative bargaining power is $\beta \in [0, 1]$.

Consider the government’s choice whether or not to monitor. Assume first, the government monitors an official’s interaction. In this case, it incurs a cost $\mu$. A corruptor offers a bribe with probability $\sigma$, which the official accepts with probability $\nu$. In case the bribe is offered and accepted, the government finds out with probability $\psi$, in which case it implements the efficient technology $p_H$, does not pay the wage to the official, and keeps the bribe $B$. With the counter probability $1 - \psi$ the government does not find out, the inefficient technology is implemented, the government pays the official’s wage $w$, and cannot appropriate the bribe $B$. Hence, if it monitors, the government’s expected payoff is

$$EU_g(\text{monitor}) = \sigma \left( \nu (p_H R + B) + (1 - \psi)(p_L R - w) \right)$$
$$+ (1 - \nu)(p_H R - w + \psi B) + (1 - \sigma)(p_H R - w) - \mu.$$  \(1\)

irrespective of the size of a potential bribe, without losing any of our insights, but also without gaining additional understanding.

\(^{6}\)An interpretation of this assumption is that officials and corruptors are protected by some degree of limited liability: Officials cannot be paid less than zero, and corruptors cannot be punished beyond the amount of the bribe that was offered.

\(^{7}\)Our results do not crucially depend on this last assumption, we take it for computational convenience.
Assume now that the government does not monitor an official’s interaction. Again, the corruptor offers a bribe with probability $\sigma$, which the official accepts with probability $\nu$. Hence, with probability $\sigma\nu$, the inefficient technology is implemented and the government pays the official’s wage $w$. With the counter probability $1 - \sigma\nu$, the efficient technology is implemented and the government pays the official’s wage $w$. Therefore, if the government does not monitor the officials’ interactions, its expected payoff is

$$EU_g(\text{do not monitor}) = \sigma\nu \left( p_L R - w \right) + \left( 1 - \sigma\nu \right) \left( p_H R - w \right).$$ (2)

Now, consider the corruptors’ choice whether or not to offer a bribe $B$. Assume first, a corruptor offers a bribe $B$. With probability $\gamma$ the government monitors and with probability $\nu$ the official accepts. If the official accepts and the government monitors, the government detects the corruptor’s attempt to bribe with probability $\psi$. In this case the corruptor does not receive the private benefit $V_c$, and loses the bribe $B$ to the government. With the counter probability $1 - \psi$, the government does not detect the attempt to bribe, the corruptor receives the private benefit $V_c$ and pays the bribe $B$ to the official. If the official does not accept and the government monitors, with probability $\psi$ the government detects the attempt to bribe and appropriates the bribe $B$. If the government does not monitor and the official accepts the bribe, the corruptor receives the private benefit $V_c$ and pays the bribe $B$ to the official. Hence, a corruptor offering a bribe, has an expected payoff of

$$EU_c(\text{offer}) = \gamma \left( \nu \left( (1 - \psi) V_c - B \right) - (1 - \nu) \psi B \right) + \left( 1 - \gamma \right) \nu \left( V_c - B \right).$$ (3)

A corruptor not offering a bribe has an expected payoff of

$$EU_c(\text{do not offer}) = 0.$$ (4)

Finally, consider the official’s choice whether or not to accept a bribe $B$. Assume first that the official decides to accept the bribe. Again, the government monitors with probability $\gamma$. If monitoring occurs, the government detects the official’s acceptance of the bribe with probability $\psi$ and, in this case, the official loses both the wage $w$ and the bribe $B$. With the counter probability $1 - \psi$, the government does not detect the acceptance of the bribe and the official receives both the wage $w$ and the bribe $B$. If the government does not monitor, the official receives the bribe that has been offered as well as the wage. Hence, an official accepting a bribe $B$ has an expected payoff of

$$EU_o(\text{accept}) = \gamma \left( 1 - \psi \right) (B + w) + \left( 1 - \gamma \right) (B + w).$$ (5)
An official rejecting a bribe receives the wage \( w \) and has an expected payoff of

\[
EU_o(\text{do not accept}) = w. \tag{6}
\]

To concentrate on interesting cases, in which the government has a meaningful choice about whether or not to monitor the official’s interactions, assume that it is too costly to monitor just to save the official’s wage and to appropriate the bribe. Assume \( \mu > \psi(B + w) \).

Using equations (5) and (6), we find that officials accept a bribe if

\[
\gamma(1 - \psi)(B + w) + (1 - \gamma)(B + w) > w
\]

or

\[
\gamma < \frac{B}{\psi(B + w)}.
\]

Using equations (3) and (4), we find that corruptors offer a bribe if

\[
\gamma(\nu((1 - \psi)V_c - B) - (1 - \psi)\psi B) + (1 - \gamma)\nu(V_c - B) > 0
\]

or

\[
\nu > \frac{\gamma\psi B}{1 - \gamma\psi V_c - B}.
\]

Finally, using equations (1) and (2), we find that the government monitors if

\[
\nu\sigma(\psi(p_H R + B) + (1 - \psi)(p_L R - w)) + (1 - \nu)\sigma(p_H R - w + \psi B) + (1 - \sigma)(p_H R - w) - \mu >
\]

\[
\nu\sigma(p_L R - w) + (1 - \nu\sigma)(p_H R - w)
\]

or

\[
\sigma > \frac{\mu}{\psi(B + \nu(\Delta p R + w))}.
\]

These conditions imply that those projects, for which the value of having a virtuous official is too low (\( \Delta p R \)), are not worth monitoring: Even if corruptors always offer bribes, which officials always accept, that is, if \( \sigma = \nu = 1 \), as long as \( \mu \geq \psi(B + \Delta p R + w) \), \( \Delta p R \leq (\mu - \psi(B + w))/\psi \), the best the government can do is not to monitor, that is to implement \( \gamma = 0 \). In that case, it is easy to verify that \( \sigma = \nu = 1 \) are best responses.
Lemma 1. If $\Delta p R \leq (\mu - \psi (B + w))/\psi$, in equilibrium, the government does not monitor, and corruptors always offer bribes, which officials always accept: $\gamma = 0$ and $\sigma = \nu = 1$.

On the other hand, those projects, for which the gain of inducing virtuous behavior of public officials is sufficiently large, are worth monitoring. In this case, there exists an equilibrium in mixed strategies.

Lemma 2. If $\Delta p R > (\mu - \psi (B + w))/\psi$, in equilibrium, the government monitors with probability $\gamma = B/(\psi (B + w))$, officials accept bribes with probability $\nu = B^2/(w (V_c - B))$, and corruptors offer bribes with probability $\sigma = (\mu w (V_c - B))/\psi B (w V_c + B \Delta p R))$.

Solving the generalized Nash bargaining problem, assuming the official’s relative bargaining power is $\beta$, we obtain the following equilibrium bribe $B^* = \arg \max_B \{((1 - \gamma \psi)(B + w) - w)^{\beta}((1 - \gamma \psi)V_c - B)^{1-\beta}\}$

$$B^* = (1 - \beta) \frac{\gamma \psi}{1 - \gamma \psi} w + \beta (1 - \gamma \psi)V_c.$$

Agreeing on a bribe $B$, officials have a payoff of $(1 - \gamma \psi)(B + w)$, while their outside option is to reject the bribe and keep the wage $w$. Agreeing on a bribe $B$, corruptors have a payoff of $(1 - \gamma \psi)V_c - B$, while the outside option for the corruptor has value 0. For $\gamma = 0$, $B^* = \beta V_c$. Using this equilibrium bribe to define the thresholds given in Lemmas 1 and 2 in terms of the exogenous parameters of the model, we formulate the following result.

Proposition 1. In the mixed strategy equilibrium of the principal-agent-client model with homogeneous projects,

1. if $R \leq (\mu - \psi (\beta V_c + w))/\Delta p \psi)$, the government does not monitor, and corruptors always offer bribes, which officials always accept: $\gamma^*_l = 0$, $\sigma^*_l = \nu^*_l = 1$, and $B^*_l = \beta V_c$.

2. if $R > (\mu - \psi (\beta V_c + w))/\Delta p \psi)$, the government monitors with probability $\gamma^*_l = B^*_h/\psi (B^*_h + w)$, officials accept bribes with probability $\nu^*_l = (B^*_h)^2/(w (V_c - B^*_h))$, and corruptors offer bribes with probability $\sigma^*_l = (\mu w (V_c - B^*_h))/\psi B^*_h (w V_c + B^*_h \Delta p R)$ with $B^*_h = (1 - \beta) \frac{\gamma^*_h \psi}{1 - \gamma^*_h \psi} w + \beta (1 - \gamma^*_h \psi)V_c$.

Assuming $R > (\mu - \psi (\beta V_c + w))/\Delta p \psi)$, and using $B^*_h$ and $\gamma^*_h$, we find that $B^*_h = \frac{w}{2} + \sqrt{\left(\frac{w}{2}\right) + w V_c}$.
3 Heterogenous Projects

We now analyze a model in which there is heterogeneity with respect to the value of the project to be undertaken by officials. We first study this model in an environment in which officials do not publicly display their wealth and then in an environment in which they do.

3.1 No public display of wealth

Assume there to be two types of projects, one with high value and one with relatively low value to society. Denote the projects’ values by $R \in \{R, \overline{R}\}$. Assume that a particular official’s type of project is unknown to the official’s corruptors, but it is known to the government and the official.\(^8\) The corruptors only know that $\Pr (\overline{R}) = \theta \in ]0, 1[$ and $\Pr (R) = 1 - \theta$. Assume $\Delta_p R \leq (\mu - \psi (\beta V_c + w)) / \psi < \Delta_p \overline{R}$.

Denote the probability that the government monitors the high-value project by $\gamma_h$ and the probability that it monitors the low-value project by $\gamma_l$. Given our assumption on $R$, in this environment, the government has an incentive to monitor only high-value projects with positive probability, thus $\gamma_l = 0$.\(^9\) Furthermore, we denote the probability with which officials following the high-value project consider accepting a bribe by $\nu_h$ and that with which officials following low-value projects do so by $\nu_l$. Given the government’s incentives not to monitor the low-value project, we know that $\nu_l = 1$.

Then officials with high-value projects accept bribes if

$$\gamma_h < \frac{1}{\psi} \frac{B}{B + w}$$

\(^8\)The implicit assumption is that the official cannot credibly convey the project’s type to the corruptor. That may be the case because the type is soft information and any communication about it is cheap talk.

\(^9\)Even though at first glance this result seems to resemble those found in the literature on optimal contracts with costly state verification (Townsend, 1979, Gale and Hellwig, 1985, Krasa and Villaniil, 2000), according to which it may be optimal to verify (monitor) only some of the time and not verify otherwise, our mechanism is very different. Contrary to these studies, in our model, state verification does not occur contingent on a report by the agent on the state, but contingent on the project’s type, which is known to both, the principal and agent.
and the government monitors high-value projects if

\[ \sigma > \frac{\mu}{\psi (B + \nu_h (\Delta_p R + w))}. \]

Corruptors have to reason in expectation: They cannot observe the type of the project. They only know that the high-type project occurs with probability \( \theta \). With the counter probability \( 1 - \theta \), the project is of low value, thus, the government monitors with probability \( \gamma \), and the official accepts with probability \( \nu = 1 \). Hence, corruptors offer a bribe if

\[
\theta (\gamma_h (\nu_h ((1-\psi)V_c - B) + (1-\nu_h)(-\psi B)) + (1-\gamma_h) \nu_h (V_c - B)) + (1-\theta)(V_c - B) > 0
\]

or

\[ \nu_h > \frac{\gamma_h \psi}{1-\gamma_h \psi} \frac{B}{V_c - B} - \frac{1}{\theta} \frac{1}{1-\gamma_h \psi}. \]  

Simplifying equation (7), we note that corruptors always offer bribes (\( \sigma = 1 \)) as long as \( \theta \leq 1 - \gamma_h \psi \frac{B}{V_c - B} \). In this case, officials with a high-value projects accept the bribe if \( \gamma_h < \frac{B}{\psi B + w} \) and the government monitors the high-value project if \( \nu_h > \frac{\mu}{\psi (\Delta_p R + w) - \Delta_p R + w} \).

Solve the Nash bargaining problem, keeping the official’s relative bargaining power of \( \beta \), assuming project heterogeneity and that corruptors do not know the projects’ type, while the government and the officials do, we obtain an equilibrium bribe of

\[
B^{**} = \arg \max_B \left\{ \left( (1 - \gamma_h \psi)(B + w) - w \right)^{\beta} \left( (1 - \gamma_h \theta \psi)V_c - B \right)^{1-\beta} \right\}
\]

\[
= (1 - \beta) \frac{\gamma_h \psi}{1 - \gamma_h \psi} w + \beta (1 - \gamma_h \theta \psi)V_c.
\]

For a given monitoring probability \( \gamma_h \), the acceptance probability \( \nu_h \) that makes corruptors indifferent between bribing and not bribing is increasing in the probability that the project is of high value, \( \theta \). For any given acceptance probability \( \nu_h \), the monitoring probability \( \gamma_h \) that makes corruptors indifferent between bribing and not bribing is also increasing in the probability that the project is of high value, \( \theta \).

**Proposition 2.** Assume \( R \in \{ R, \bar{R} \} \) with \( \Pr (\bar{R}) = \theta \in [0,1[ \) and \( \Delta_p R \leq (\mu - \psi (\beta V_c + w))/\psi < \Delta_p \bar{R} \). Then, in equilibrium,
1. corruptors bribe with probability $\sigma^{**} = \mu / \psi(B^{**} + (w + \Delta p R)(B^{**})^2 / (w(V_c - B^{**}))$ and the bribe is $B^{**} = (1 - \beta) \gamma_{h}^{**} \beta \psi(V_c - B^{**})^{-1 - \gamma_{h}^{**}} w + \beta (1 - \theta \gamma_{h}^{**} \psi) V_c$.

2. officials with projects characterized by $R$ accept bribes with probability $\gamma_{l}^{**} = 1$ and the government monitors projects characterized by $R$ with probability $\nu_{l}^{**} = 0$.

3. officials with projects characterized by $R$ accept bribes with probability $\nu_{h}^{**} = (B^{**})^2 / (w(V_c - B^{**})) - ((1 - \theta)(B^{**} + w)) / (\theta w)$ and the government monitors projects characterized by $R$ with probability $\gamma_{h}^{**} = B^{**} / (\psi(B^{**} + w))$.

Using $B^{**}$ and $\gamma_{h}^{**}$, we find $B^{**} = \frac{w + (1 - \theta) V_c}{2} + \sqrt{(\frac{w + (1 - \theta) V_c}{2})^2 + w V_c}$. For $\theta = 1$, the bribe for high-value projects, $B^{**}$, corresponds to the level of the bribe obtained in the homogenous project case for projects of a value such that it is worthwhile monitoring, $B^*$. Note that $\frac{dB^{**}}{d\theta} < 0$. This implies that for $\theta < 1$, $B^* < B^{**}$.

### 3.2 Public display of wealth

Consider a modification to the setup whereby officials can burn a publicly observable amount of money, $\phi \in \mathbb{R}_+$. After observing the officials’ decision whether or not to burn money, corruptors and officials decide whether or not to enter negotiations over a bribe, while the government decides whether or not to monitor.

Let $\phi_l \equiv \phi^*(R)$ and $\phi_h \equiv \phi^*(R)$ be the public officials’ equilibrium amount of money burned as a function of their projects’ value $R$. Let $\sigma^*(\phi)$ be the corruptors’ equilibrium probability of offering a bribe as a function of the amount of money a particular official burned. Let $\pi^*(\phi)$ be the government’s equilibrium probability of monitoring high-value projects as a function of the amount of money burned by public officials following them; and let $\nu^*(\phi)$ be the equilibrium probability with which public officials following a high-value project enters into bribe negotiations as a function of the amount of money burned. Finally, let $\gamma^*(\phi)$ be the government’s equilibrium probability of monitoring low-value projects as a function of the amount of money burned by public officials following them; and let $\mu^*(\phi)$ be the equilibrium probability with which public officials following a low-value project enter into bribe negotiations as a function of the amount of money burned.
Consider a separating perfect Bayesian equilibrium, in which $\phi_l > 0$ and $\phi_h = 0$. In such a separating equilibrium, we must have the complete information values from Section 2, $\sigma^*(\phi_l) = 1$, $\gamma(\phi_l) = 0$, $\nu(\phi_l) = 1$, and $B(\phi_l) = B_l^*$; and we must have $\sigma^*(\phi_h) = \sigma_h^*$, $\gamma(\phi_h) = \gamma_h^*$, $\nu(\phi_h) = \nu_h^*$, and $B(\phi_h) = B_h^*$. This follows because, in a separating equilibrium, corruptors correctly infer the type of project a public official follows. Further, in a separating equilibrium, we must have $\phi_h = 0$. This follows because, in an equilibrium in which corruptors correctly infer the projects’ types, a higher amount burned will not change the probability with which corruptors offer bribes, and, hence, will not change the equilibrium payoff of the public official (net of the amount burned).

For this to be a separating equilibrium, we must find an amount of money, $\phi_l$, burned by public officials following projects of low value and a belief function of corruptors such that (i) beliefs are correct in equilibrium, (ii) public officials with projects of low value are better off burning that amount, and (iii) public officials with projects of high value are better off not burning that amount.

Let the corruptors’ beliefs be such that if an amount of money $\phi_l$ has been burned, they assign probability one to the event that the public official follows a project of low value, otherwise they assign probability zero to this event. It is straightforward to verify that these beliefs satisfy condition (i).

Next, consider condition (ii). If public officials following low-value projects burn $\phi = \phi_l$, they have an expected payoff of $B_l^* + w - \phi_l$. If they burn $\phi = \phi_h = 0$, the government still does not monitor them, hence they accept the offer to enter into negotiations over bribes with probability 1. Corruptors believe the project is of high value and offer to enter into negotiations only with probability $\sigma_h^*$. Therefore, an official who does not burn any money, has an expected payoff of $\sigma_h^* B_h^* + w$. Officials following low-value projects are better off choosing $\phi = \phi_l$ as long as

$$\phi_l \leq B_l^* - \sigma_h^* B_h^* \equiv \bar{\phi}.$$  

Given $B_l^* = \beta V_c$ and $\sigma_h^* B_h^* \geq 0$, for sufficiently small $\beta$, there is no amount of burned money $\phi_l > 0$ that satisfies this condition. On the other hand, for $\beta = 1$, we have $\bar{\phi} = \gamma_h^* \psi V_c > 0$. Hence, officials need to have sufficiently large bargaining power in their negotiations with corruptors for this equilibrium to exist.

Finally, consider condition (iii). If officials following high-value projects choose $\phi_h = 0$, corruptors offer to bribe with probability $\sigma_h^*$, the govern-
ment monitors with probability \( \gamma_h^* = B_h^* / (\psi(B_h^* + w)) \), and the officials accept the offer to enter into negotiations over a bribe with probability \( \nu_h^* = (B_h^*)^2 / (w(V_c - B_h^*)) \). In this case, the public officials have an expected payoff of 
\[
\gamma_h^* (\sigma_h^* \nu_h^* (1 - \psi)(B_h^* + w) + (1 - \sigma_h^* \nu_h^*) w) + (1 - \gamma_h^*) (\sigma_h^* \nu_h^* (B_h^* + w) + (1 - \sigma_h^* \nu_h^*) w).
\]
If the public officials choose \( \phi_l \), corruptors offer a bribe \( B_l^* \) with probability 1. In the ensuing mixed strategy equilibrium, the government monitors with probability \( \nu_l^* = \frac{1}{V_l^*} B_l^* \) and the officials accept the bribe with probability \( \nu_l^* = \frac{\mu - \psi B_l^*}{\nu^* (\Delta p R + w)} \). In this case, the officials have an expected payoff of 
\[
\nu_l^* (\mu (\Delta p R + w)) (\nu_l^* (\Delta p R + w) + (1 - \nu_l^*) w) (1 - \nu_l^*) (\mu (\Delta p R + w) + (1 - \nu_l^*) w) - \phi.
\]
Officials following high-value projects are better off choosing \( \phi_h = 0 \) as long as
\[
\phi_l \geq \nu_l^* (\mu (\Delta p R + w)) (\nu_l^* (\Delta p R + w) + (1 - \nu_l^*) w) (1 - \nu_l^*) (\mu (\Delta p R + w) + (1 - \nu_l^*) w) - \phi.
\]
As long as \( \phi - \phi_l < 0 \), there exists an amount of money to be burned, \( \phi > 0 \), such that officials with low-value projects have an incentive to burn \( \phi \), while officials with high-value projects do not.

**Proposition 3.** For \( 0 < B_l^* - \sigma_l^* B_h^* \), there exists \( \phi_l \in [\phi, \phi_l] \) for which officials following a project with value \( R \) signal their corruptibility by publicly displaying their wealth through burning an amount of \( \phi_l \), while officials following a project with value \( R \) burn \( \phi_h = 0 \). In this equilibrium,

1. corruptors bribe officials who publicly display their wealth with probability one, officials with projects of low value accept the bribe with probability zero, and the bribe is \( B_l^* = \beta V_c \);

2. corruptors bribe officials who do not publicly display their wealth with probability \( \sigma_h^* = (\mu w (V_c - B_h^*)) / (\psi B_h^* (w V_c + B_h^* (\Delta p R))) \), officials with projects of high value accept bribes with probability \( \nu_h^* = (B_h^*)^2 / (w (V_c - B_h^*)) \), and the government monitors officials with projects of high value with probability \( \gamma_h^* = B_h^* / (\psi (B_h^* + w)) \). The bribe is \( B_l^* = (1 - \beta) \frac{\gamma_h^* \psi}{1 - \gamma_h^*} + \beta (1 - \gamma_h^* \psi) V_c \).

For a proof, see the Appendix. Proposition 3 establishes that, whenever officials have sufficient bargaining power vis-à-vis their corruptors, they would find it worthwhile signaling their corruptibility if they have drawn the low-value project.
3.3 Comparison of the equilibria with and without public display of wealth

Comparing the equilibria with and without signaling by means of public display of wealth, we note that corruptors bribe less often than in the equilibrium without signaling ($\sigma^* h < \sigma^{**}$) and officials accept (conditional on having received an offer) more often ($\nu^* h > \nu^{**}$).

Let us first compare the government’s expected payoff from low-value projects with and without signaling. For low-value projects, signaling increases the occurrence of corruption, which decreases the government’s expected payoff. The payoff difference for low-value projects is $\Delta U_g(\mathcal{R}) = -(1 - \sigma^{**})\Delta p\mathcal{R} < 0$. If the share of projects with low value is relatively large, that is, $\theta \leq 1 - \gamma^{**} \psi \frac{B^{**}}{V_c - B^{**}}$, then, even without signaling, corruptors always bribe, that is, $\sigma^{**} = 1$. Thus, if the share of low-value projects is sufficiently low, signaling reduces the government’s payoff coming from low-value projects. Only if the share of low-value projects is sufficiently high does signaling not reduce the government’s payoff from low-value projects.

Now let us compare the payoffs for high-value projects. Noting that the government is indifferent between monitoring and not monitoring, we derive the payoff difference for high-value projects as $\Delta U_g(\mathcal{R}) = -(\sigma^* h \nu^* h - \sigma^{**} \nu^{**} h) \Delta p\mathcal{R}$ and, if the share of projects with low value is relatively large, that is, if $\theta \leq 1 - \gamma^{**} \psi \frac{B^{**}}{V_c - B^{**}}$, we get $\Delta U_g(\mathcal{R}) = -(\sigma^* h \nu^* h - \nu^{**} h) \Delta p\mathcal{R}$. Next, note that despite the fact that the corruptor plays a pure strategy, $\sigma^{**} = 1$, in equilibrium, both the government and the officials still play mixed strategies, leaving the government indifferent between monitoring and not monitoring. The fact that the government is indifferent between monitoring and not monitoring, whether or not signaling occurs, together with the finding that the equilibrium bribe with signaling, $B^{**}$, is larger than that without signaling, $B^*_h$, implies that $\Delta U_g(\mathcal{R}) < 0$ (see the Appendix for a formal proof).

**Proposition 4.** For heterogeneous projects and sufficiently high relative bargaining power of officials, public display of wealth occurs. This public display of wealth is to the detriment of the government’s expected payoff from

1. public projects of high value; and

2. public projects of low value as long as their share is sufficiently low.

If officials have a sufficiently high relative bargaining power, they have an incentive to signal their corruptibility to reduce the potential corruptors'
uncertainty. If they do so, they (weakly) increase corruption for both low- and high-value projects, and they decrease the government’s expected payoff.

4 Discussion

Our separating equilibrium exists if and only if public officials have sufficiently high bargaining power, $\beta$. That may, for example, be the case due to relatively little competition among public officials in issuing permits, which are needed for corruptors to appropriate their private benefits. If officials keep too low a share in the surplus generated by the bribe (or if there is very little surplus to be shared), it is not worth their while to advertise their corruptibility by means of wasteful public display of wealth, violating their incentive compatibility constraint. With this result, our paper relates to the industrial organization of corruption, as introduced in Shleifer and Vishny (1993) and evidenced in the literature on fiscal decentralization and corruption (Fisman and Gatti, 2002a, 2002b, Arikan, 2004, Dincer, Ellis, and Waddell, 2008), which shows that competition among public officials and decentralization reduces corruption. In addition to the result in Shleifer and Vishny (1993), competition among public officials also impairs the profitability of public display of wealth by one group of officials – those with lower-value projects, for which it is not beneficial to monitor whether they behave in a virtuous fashion – which reduces corruption not only for officials who are not worthwhile monitoring, but also for those who are monitored with positive probability.

Ceteris paribus, an increase in the monitoring cost $\mu$ makes it less profitable to monitor either of the projects. This positively affects the corruptor’s probability of offering a bribe to officials who do not publicly display their wealth, $\sigma_0$, and, hence, makes it less profitable to publicly display wealth for officials with low-value projects. Hence, for a given relative bargaining power of officials, the separating equilibrium exists only if the cost of monitoring is not too high.

The share of high-value projects may capture an economy’s degree of development. Economies at later stages of development tend to bring about more public projects with large externalities for society. In these economies, the optimal degree of corruption is smaller, and public display of wealth – advertising corruptibility – is more detrimental to society.

Finally, our analysis assumes that the public display of wealth is costly
to officials. Clearly to some degree, public display of wealth constitutes consumption and as such should not only be costly but also generate utility for the official. Taking this into account, in our model the amount $\phi_l$ captures the cost of public display of wealth that goes beyond the utility created. Indeed, Obiang Jr.’s ownership of more than 10 luxury cars, his having warmed up the engines of four of them in the morning, just to dash off in the fifth\textsuperscript{10}, or First Lady Ismelda Marcos’ 2,300 pairs of shoes, which she presumably displayed to some of her husband’s business partners’ wives, can hardly be justified by the utility created purely from consumption.

\section{Conclusion}

Providing the right incentives to public officials has been argued to be crucial in fighting corruption. In this paper we posit that, if providing such incentives through monitoring their interactions is costly and government implements partial corruption, that is, decides not to monitor officials following projects of low value, those officials – if they have high bargaining power vis-à-vis potential corruptors – will have an incentive to use public display of wealth as a corruption-facilitating device, as evidenced in such high-profile corruption cases as, for example, those of the Marcos’ in the Philippines or Teodorin Obiang of Equatorial Guinea. Our results have shown that such public display of wealth is to the detriment of society, particularly so if projects with large positive externalities to society are very frequent. This implies that competition between officials reduces their bargaining power and thereby their payoff from signaling their corruptibility by means of public display of wealth. This reduces corruption and increases the expected value of public projects to society. Competition between officials could be achieved by employing more than one official to issue a certain kind of permit.

\section{Appendix}

\subsection{Proof of Proposition 3}

\begin{proof}
Existence of the separating equilibrium:

$$\phi - \bar{\phi} = B^*_h \sigma^*_h (1 - \nu^*_h) - B^*_l (1 - \bar{\nu}(\phi_l)) + (B^*_h + w) \sigma^*_h \nu^*_h \gamma^*_h \psi - (B^*_l + w) \bar{\nu}(\phi_l) \bar{\gamma}(\phi_l) \psi.$$ \end{proof}

\textsuperscript{10}Reported in \textit{The Guardian}, February 6, 2012.
Note that $\gamma(\phi_l) = \frac{B^*_h}{v(B^*_h + w)}$ and $\gamma^*_h = \frac{B^*_h}{v(B^*_h + w)}$. Substituting this into $\phi - \bar{\phi}$, we get

$$\phi - \bar{\phi} = B^*_h \sigma^*_h (1 - \nu^*_h) - B^*_l (1 - \psi(\phi_l)) + B^*_h \sigma^*_h \nu^*_h - B^*_l \psi(\phi_l) = B^*_h \sigma^*_h - B^*_l .$$

Note that $\bar{\phi} > 0 \Leftrightarrow B^*_l - B^*_h \sigma^*_h > 0$. Hence, whenever $\bar{\phi} > 0$, $\phi - \bar{\phi} < 0$, which proves the existence of the separating equilibrium. The probabilities of offering and accepting bribes as well as of monitoring in the separating equilibrium follow directly from the text.

A.2 Proof of Proposition 4 Part 2

Proof. In the equilibrium without signaling, the government is indifferent between monitoring and not monitoring if

$$\sigma^{**} = \frac{\mu}{\psi(B^{**} + \nu^{**}_h (\Delta \bar{p} \bar{R} + w))} \Leftrightarrow \frac{\mu}{\psi} = \sigma^{**} B^{**} + \sigma^{**} \nu^{**}_h (\Delta \bar{p} \bar{R} + w) .$$

In the equilibrium with signaling, it is indifferent between monitoring and not monitoring if

$$\sigma^*_h = \frac{\mu}{\psi(B^*_h + \nu^*_h (\Delta \bar{p} \bar{R} + w))} \Leftrightarrow \frac{\mu}{\psi} = \sigma^*_h B^*_h + \sigma^*_h \nu^*_h (\Delta \bar{p} \bar{R} + w) .$$

These two equations imply

$$\sigma^*_h B^*_h + \sigma^*_h \nu^*_h (\Delta \bar{p} \bar{R} + w) = \sigma^{**} B^{**} + \sigma^{**} \nu^{**}_h (\Delta \bar{p} \bar{R} + w)$$

or

$$0 = \sigma^{**} B^{**} - \sigma^*_h B^*_h + (\sigma^{**} \nu^{**}_h - \sigma^*_h \nu^*_h) (\Delta \bar{p} \bar{R} + w) .$$

Using $B^*_h = \frac{w}{2} + \sqrt{\left(\frac{w}{2}\right)^2 + w V_c}$ and $B^{**} = \frac{w + (1 - \theta)V_c}{2} + \sqrt{\left(\frac{w + (1 - \theta)V_c}{2}\right)^2 + w V_c}$, and noting that the probability of offering a bribe without signaling ($\sigma^{**}$) is larger than with signaling ($\sigma^*_h$), we find that $\sigma^{**} \nu^{**}_h - \sigma^*_h \nu^*_h < 0$, implying $\Delta U_g(\bar{R}) < 0$. \qed
References


