**UNIVERSITY OF**
**CAMBRIDGE**

**Department of Land Economy**

# Environmental Economy and Policy Research

## Discussion Paper Series

## Bureaucratic Corruption and Mass Media

**by**

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**2005**

**Number: 05.2005**

# Bureaucratic Corruption and Mass Media

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## Abstract

This paper investigates the relationship between a bureaucracy and mass media industry, and its implications to corruption. We develop a bureaucratic model of corruption with mass media. A representative profit maximizing media firm seeks for corruption news to be printed and sold. Channels through which competition in media industry and press freedom affect equilibrium corruption in a bureaucracy are modeled. Different degrees of media freedom and competition affect production and employment decisions of media firms, and this in turn affects the effectiveness of media in monitoring corruption. Competition and freedom in media sector also have an influence on bureaucratic structure and consequently on equilibrium corruption. We find that the degree of competition in media market plays a significant role in controlling corruption. Freedom of media also reduces corruption. Empirical results support these findings. Media competition appears to be a more important tool to combat corruption than press freedom. The corruption problem in Italy could be reduced to the level experienced by France if the competitiveness of its media industry was to be improved to the same level as that of United Kingdom.

**Keywords:** Corruption, Bureaucracy, Mass Media

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# Bureaucratic Corruption and Mass Media*

## 1. Introduction

The pace of growing attention paid to the study of corruption mirrors the pace of the increasing awareness of the economic and social consequences of corruption around the globe. Even though, there have been speculations as to whether corruption might be beneficial to development in some respects, it is now more of a consensus that corruption is socially undesirable and is harmful to development. The literature on the consequences of corruption gives insights into how damaging corruption can be to a society and an economy. The study of causes of corruption, on the other hand, seeks to find major determinants in the hope to offer answers to the persistence of corruption[1]. This paper generally falls into the latter classification.

There has recently been a consideration that mass media contributes a way to combat corruption. International organizations, such as the World Bank and Transparency International, regard media as one of the major solutions to curb corruption (see, e.g., Stapenhurst, 2000; Transparency International, 2003). They call for plurality of media, media freedom and competition. Nonetheless, the knowledge as to how effective media actually perform to combat corruption is still very limited, albeit growing. This paper gives a systematic understanding on the impact of mass media on bureaucratic corruption. It is the first attempt to formalize the idea of media competition and press freedom being tools to combat corruption. Moreover, it provides new empirical evidence on the effect of media competition on corruption.

It is believed that mass media contribute to policy outcomes. It plays two major roles. First, mass media is the information provider to the voters in elections. It informs voters regarding policy platforms announced by politicians. Second, media monitors and reports on misbehaved government. This paper looks at the latter. We do not consider the information-providing role of media to voters. This is simply because a bureaucracy involves recruitment of public officials and delegation, but not elections. Monitoring is a natural role of media at the bureaucratic level.

We develop a bureaucratic corruption model with a mass media industry to study the relationship between mass media, a bureaucracy and corruption. Bureaucratic model allows us to capture monitoring role of mass media. Besides, this approach permits us to deal explicitly with corruption at implementation level, rather than political corruption caused by high-level politicians or political parties.

In our model, a profit maximizing media firm seeks for corruption news to be printed and sold. Channels through which competition in media industry and press freedom affect equilibrium corruption in a bureaucracy are modeled. Different degrees of media freedom and competition affect production and employment decisions of media firms, and this in turn affects the effectiveness of media in monitoring corruption. Competition

* The author is grateful to Toke Aidt and Unai Pascual for helpful comments and suggestions.

[1] See, Jain (2001) for an extensive review of the study of corruption. See, also Rose-Ackerman (1999) for causes and consequences of corruption.

and freedom in media sector also have an influence on bureaucratic structure and consequently on equilibrium corruption.

We find that an intense competition in media industry and its freedom make the media more effective in finding corruption, and thus discourages bureaucrats from engaging in malfeasant behaviour. It is more difficult for a bureaucrat to gain from corruption and make it easier for him to lose the wage income if he is to be corrupt. The higher degree of media competition and press freedom, at the same time, induces government to choose a higher public wage to control corruption. This incurs a corrupt bureaucrat a higher potential forgone wage income in case he is captured. These effects together reduce corruption. Empirically, we find a strong and significant impact that competition in media industry has on the controlling of corruption. While others have found press freedom an important tool to combat corruption, our results suggest that media competition is economically more important than press freedom in terms of corruption reduction.

The plan of the paper is as follows. The literature related to this paper is discussed in section 2. Section 3 through 4 set up a model and offer theoretical explanations to the relationship between mass media and a bureaucracy, and its implication to corruption. We describe our empirical strategy and data in section 5, while section 6 presents the empirical results. Section 7 concludes.

## 2. Related Literature

The idea that a key role of mass media is to inform the electorate is central to theoretical literature on mass media. There have been two theoretical approaches to modeling mass media. The first considers how media may affect distributive politics. In the context of electoral competition, Stromberg (2001) used probabilistic voting model to analyse how the media can affect the allocation of targeted resources. He analysed the effects of mass media on policy issues including corruption and the effect of media on effectiveness of lobby groups. The less access to media, the lower the share of informed voters, and thus the more we can expect government to set policies that are associated with higher rents and corruption.

The second approach focuses on how political accountability with incomplete information can be affected by the media. Besley and Burgess (2002) adopted the political agency model, and specified the fraction of informed citizens as a function of the extent of media activity and the effort level chosen by the incumbent. A larger extent of media activity leads to higher proportion of informed citizens who will vote for the incumbent, and thus more effort chosen by him. In other words, the government has incentive to be more responsive if it faces a more informed electorate. Besley and Prat (2001) took the same approach; however, they added the possibility that the media may be captured by the government. They predicted that a higher degree of media plurality makes it less likely for media to be captured. Furthermore, they speculated that expected rents decrease, as media is more effective in receiving signal that the incumbent is bad. That is, more effective media should lead to less corruption.

The literature has so far looked at the information-providing role of media. On the contrary, we stress the monitoring role of media, to which little attention has been given. The starting point is the bureaucratic model of corruption [see, e.g., Acemoglu and Verdier (2000); Ades and Di Tella (1999)]. Their model has antecedents in the

literature on the optimal model of corruption. A benevolent social planner is assumed to choose institutional variables to maximize social welfare. He delegates to bureaucrats to carry out some necessary activities with possibility that they may choose to collude and not report truthfully to the planner. Ades and Di Tella (1999) adopted this approach to study the relationship between competition and corruption. Acemoglu and Verdier (2000) demonstrate that corruption may persist as part of an optimally designed institution[2]. We extend the bureaucratic model of corruption to include mass media industry in order to study its influence on a bureaucracy and corruption.

The empirical literature has focused on the relationship between media and several outcomes. Brunetti and Weder (2003) and Ahrend (2002) relate press freedom and corruption in cross-country analysis. Both papers find that press freedom is assocciated with lower levels of corruption. Besley and Burgess (2002) look at evidence from Indian states, and find that state governments are more responsive to droughts and floods where newspaper circulation is higher. This is consistent with their theoretical results. Djankov et al (2001) focused on the effect of media ownership patterns on social and political outcomes. Their main finding is that state ownership of newspapers is negatively correlated with good government. They also obtained the result that level of corruption is associated with state ownership of newspapers. Using Djankov et al (2001) data on ownership of media, Besley and Prat (2001) looked at the effects of media ownership patterns on press freedom and corruption. Their finding is that greater state ownership implies less press freedom. They also find negative relationship between foreign ownership of media and corruption. In contrast to the existing literature, we focus on the impact of competition in media industry on corruption.

## 3. The Model

A static economy consists of a continuum of polluting firms with mass 1 and a continuum of risk-neutral agents with mass 1. Two professions are offered to each agent: They can become government employees (bureaucrats) or reporters/journalists employed in media industry; or will be unemployed otherwise. Let $n$ be the fraction of bureaucrats, and $k$ be the fraction of agents who seek a job in media industry. A fraction $r$ of $k$ is employed as news reporter and a fraction $u$ is unemployed. Thus, $r+u=k$ and $n+k=1$. We consider the situation where $n$ and $k$ are exogenously given; this is to say that there is no movement/allocation of workers between the two sectors.

### 3.1. Government, Bureaucrats, and Polluting Firms

The government imposes an environmental penalty, denoted by $\tau$, $\tau \in (0,1)$, on polluting firms. A polluting firm has to pay a penalty if it is found to be operating illicitly. The government needs to employ some agents as bureaucrats to find polluting firms. For simplicity, we also assume that one bureaucrat is assigned to find one polluting firm. The fraction of polluting firms that is found by bureaucrats is $h(n);\ h'(n)>0$. Polluting firms that have been found by bureaucrats are unknown to the government.

[2] See (Aidt, 2003) for a survey on models of optimal corruption and its theoretical discussions.

A bureaucrat can exploit the informational advantage he has over his principal, the government. He can collude with a polluting firm he has found and report untruthfully back to the principal, in which case the available maximum surplus that can be extracted is $\tau$. Assume that the bureaucrats can get a proportion $\sigma$ of this amount as bribe. If a bureaucrat cannot find a polluting firm, he has no choice but to report truthfully. The public sector wage, denoted by $w$, is the government tool to combat corruption. The government aims at reducing corruption as much as it can, knowing its budget constraint that the wage cost is to be financed by the income from the environmental penalty.

There are two ways for the government to find out whether a bureaucrat is giving a truthful or false report. One is through its own internal monitoring mechanisms. Let $g(e)$ be the probability that the government finds corruption, where $e$ is exogenous institutional aspects of the monitoring technology, and $g'(e) > 0$. $g$ can be interpreted as the effectiveness of internal monitoring given the institutional aspects $e$.

Another way to find out about corruption is to rely on the news printed by mass media. The role of mass media will be discussed in details in the subsequent section. Let $q$ be the probability that corruption is captured by the mass media. We assume that corruption news printed by mass media is verifiable. That is, media print the news regarding false report by a bureaucrat, only if it has in fact occurred.

Assume that there is a personal cost, $m$, associated with being dishonest, and that the personal cost is different across individual bureaucrats. The personal costs are distributed according to uniform distribution $F(\cdot)$ on $[0,1]$. A bureaucrat decides whether he will make the collusion offer to a polluting firm. If he does not make the collusion offer, he is considered honest. He is considered corrupt otherwise.

If honest, a bureaucrat obtains the wage $w$. If corrupt, he incurs the personal cost of being corrupt, $m$, and he will receive both the wage and the bribe $\sigma \cdot \tau$ with probability $(1-q)(1-g)$ in case of not being caught neither by the media nor by the government. If a corrupt bureaucrat is caught, he is fired and receives nothing. We can ensure that being honest is incentive compatible if

(1) $$w \geq (1-q)(1-g)[w + \sigma \cdot \tau] - m$$

Equation (1) can be used to define the level of personal cost $\overline{m}$ such that the bureaucrat with $\overline{m}$ is indifferent between being corrupt and being honest.

(2) $$m(w,q,g) = \overline{m} = (1-q-g+qg) \cdot \sigma \cdot \tau - (q+g-qg) \cdot w$$

Equation (2) establishes the determination of corruption level. The fraction of corrupt bureaucrats is therefore $F(\overline{m})$. The government chooses the public wage to minimize the level of corruption subject to the budget constraint:

(3) $$[1 - F(\overline{m})] \cdot h(n) \cdot \tau = w \cdot n$$

Let the cost function be $w \cdot n$. It is beneficial to the government as raising public wage increases the fraction of honest bureaucrats. We assume that $h(n) = n$. Substitute (2)

into the distribution function $F(\overline{m})$, we can express the probability that a bureaucrat is corrupt (or the fraction of corrupt bureaucrats) as

(4) $$F\{(1-q-g+qg)\cdot\sigma\cdot\tau-(q+g-qg)\cdot w\}=\overline{m}$$

### 3.2. Media Firms

We model mass media as a newspaper industry with a representative media firm. The newspaper firm seeks for verifiable corruption news to be printed, and attempts to make profits by selling the news. The newspaper devotes the fraction of its news space, $s$, per print to the corruption issue. The whole space per print of a newspaper is normalized to 1. Corruption news, $s$, is produced by means of a Cobb-Douglas technology:

(5) $$s=A\cdot r^{\theta},\qquad \theta\in(0,1],$$

where $r$ is the number of reporters employed by the media firm and $A$ is an index of the firm productivity. Let $w^m$ be the media sector wage.

The degree to which the mass media permits free flow of information to and from the public identifies press freedom. To capture this, we assume that press freedom affects and increases media productivity. The media firm possesses productivity $A(f)=f; f\in[0,1]$, where $f$ reflects the degree of press freedom. Thus, the media firm technology becomes:

(6) $$s=f\cdot r^{\theta}$$

The probability that a potential reader spots corruption news is $s$, which is the fraction of the corruption news space in the space of 1 per print. Revenue from selling newspaper with $s$ corruption news is

(7) $$R(s)=s^{\gamma}$$

where $\gamma$ is an indicator of competition in the market for corruption news, such that $\gamma\in[0,1]$. A high $\gamma$ implies that competition is intense[3]. Denote $w^m$ as media wage. The media choose $r$ to maximize its profits per print:

(8) $$\pi=R-w^m\cdot r.$$

[3] Equation (7) expresses the reduced form relationship between the competition in media market and the revenue from selling corruption news. We assume that the media firm faces the demand for corruption news: $p=s^{\gamma-1}$, where $p$ is the price per unit of corruption news $s$. Assume that $\gamma=1-1/\rho$, where $\rho$ is the elasticity of demand and $-\rho>-1$. We thus interpret $\gamma$ as a measure of media market competition. Also, assume that $R=p\cdot s$.

### 3.3. Media Union

Media union represents employees in media industry. The union model developed by Layard *et al* (1991) and the study by Aidt and Sena (2003) provide the basic of our media union model. Media wage is endogenised by allowing employees in media industry, the reporters, to form the media union and bargain over the salary with the employer. The union has $k$ members, $r$ of which will be recruited to the media firm and $u$ of which will be unemployed. Note that $r+u=k$ agents enter media industry. Assume that recruitment is undertaken in a random fashion, and thus the probability of obtaining a job in the firm for each agent is $r/k$. Unemployed members obtain homogenous income *Q* from the unemployment benefit system of the media union. The objective of the union is to maximize the expected wage income of the members:

(9) $$V = \frac{r}{k} \cdot w^m + (1 - \frac{r}{k}) \cdot Q$$

The media union and the media firm bargain over the wage only. We adopt the asymmetric Nash bargaining solution to describe the outcome of the negotiation between the union and the firm. Assume that the firm's fall back option yields zero profit, and the union members are completely unemployed (i.e. $r$ = 0) and obtain $Q$ in case of a breakdown of the negotiation. The asymmetric Nash product can be written as:

(10) $$\Omega(w^m) = \left( \frac{r}{k} \cdot w^m + (1 - \frac{r}{k}) \cdot Q - Q \right)^{1-\beta} \cdot \pi(w^m)^{\beta}$$

$$= \left( \frac{r}{k} (w^m - Q) \right)^{1-\beta} \cdot \pi(w^m)^{\beta}$$

where $\beta$ is the bargaining power of the media firm and $1-\beta$ is that of the union. Note that the bargaining powers of both sides are exogenous. The union and the firm negotiate a wage contract that maximizes the Nash product.

We can summarise the timing of events as follows. First, the government chooses the public wage to minimise corruption subject to equation (3). Second, the media unions and firms bargain over media wage rate and reach an agreement. Third, the media firms decide how many reporters to employ at the agreed wage.

## 4. Equilibrium

We analyse the model by backward induction.

Stage 3: Suppose that a representative media firm chooses $r$ that maximizes its profit. Thus, the reporters demand is determined by

(11) $$\frac{\partial \pi}{\partial r} = \theta \cdot \gamma \cdot f^{\gamma} \cdot r^{\theta\gamma - 1} - w^m = 0$$

and the demand function for reporters is

(12) $$r(w^m) = \left[ \frac{\theta \cdot \gamma \cdot f^{\gamma}}{w^m} \right]^{\frac{1}{1-\theta \cdot \gamma}}$$

It can be noticed that employment in the media firm is decreasing in $w^m$. The profit function can be found by substituting the reporters demand function into the firm's objective function and using the first order condition to simplify:

(13) $$\pi(w^m, r) = \frac{1-\theta \cdot \gamma}{\theta \cdot \gamma} \cdot w^m \cdot r(\cdot)$$

The probability that media can transmit its corruption news to the public is equivalent to the probability that a dishonest bureaucrat is detected by media of taking bribe. The probability that a reader spots corruption news constitutes the probability that media can transmit its corruption news to public. Thus,

(14) $$q = s(r) = f \cdot \left[ \frac{\theta \cdot \gamma \cdot f^{\gamma}}{w^m} \right]^{\frac{\theta}{1-\theta \cdot \gamma}}$$

From the media firm decision, it can be seen that $q$ and $s$ are increasing in $\gamma$ and $f$. That is, more intense competition in media industry and more media freedom induces each media firm to print more corruption news, and thus leads to a higher probability that a corrupt bureaucrat will be caught by media. This is a channel through which media competition influence corruption.

Stage 2: The media union and the firm bargain over the media wage rate. The union and the firm negotiate a wage contract that maximizes the Nash product.

(15) $$\frac{\partial \Omega(\cdot)}{\partial w^m} = \left( \frac{r}{k} \right)^{1-\beta} \left\{ (1-\beta) \cdot (w^m - Q)^{-\beta} \cdot \pi(\cdot)^{\beta} + \beta \cdot \pi(\cdot)^{\beta-1} \frac{\partial \pi}{\partial w^m} \cdot (w^m - Q)^{1-\beta} \right\}$$

$$+ (w^m - Q)^{1-\beta} \cdot \pi(\cdot)^{\beta} \left\{ (1-\beta) \left( \frac{r}{k} \right)^{-\beta} \cdot \frac{1}{k} \cdot \frac{\partial r}{\partial w^m} \right\} = 0$$

Using equation (10) and $\frac{\partial r}{\partial w^m} \cdot \frac{w^m}{r} = \frac{-1}{1-\theta \cdot \gamma}$, we get

(16) $$(1-\beta) w^m - \beta (w^m - Q) \frac{\theta \cdot \gamma}{1-\theta \cdot \gamma} - (1-\beta)(w^m - Q) \frac{1}{1-\theta \cdot \gamma} = 0$$

Solving this equation, we obtain the equilibrium media wage function

(17) $$w^m = \frac{Q(\theta \cdot \gamma + \eta)}{\theta \cdot \gamma(1+\eta)} \qquad \text{where } \eta = \frac{1-\beta}{\beta}$$

We notice that the media wage depends on the media market competition, but not directly on press freedom. From equation (17), $\partial w^m / \partial \gamma < 0$. The media wage is decreasing in media market competition. For given media wage and given employment, a higher degree of competition in media industry leaves the media firm with lower profits (see equation (13)). Accordingly, a lower rent is available to be shared by the firm and the union, and thus drives a negotiated media wage down.

Thus, we can see another channel through which media competition influences the probability that the media detects corruption. This influence channel happens through media union's wage negotiation and employment decision of the media firm. Note that $\gamma$ increases *q* through both of the two channels.[4] From (14) and (17), we summarize effects of $\gamma$ and *f* on $q$ as

(18) $$q = f \cdot \left[ \frac{\theta \cdot \gamma \cdot f^{\gamma}}{w^m(\gamma)} \right]^{\frac{\theta}{1-\theta \cdot \gamma}}$$

Stage 1: the government chooses the public wage to minimize the level of corruption such that equation (3) holds. According to equation (2), it is obvious that the higher the public wage, the less the level of corruption. Given the structure of the benefit and cost of using public wage to reduce corruption, the government therefore does its best to control corruption by choosing the level of public wage that balances its budget. The problem of the government can be formally described as

(19) $$\begin{aligned} \min_{w} \ & \overline{m} = (1-q-g+qg)\sigma\tau - (q+g-qg)w \\ & (1-\overline{m}) \cdot n \cdot \tau \geq w \cdot n \\ \text{s.t.} \quad & m \in [0,1] \\ & w \geq 0 \end{aligned}$$

Substitute equation (2) into (3), we can rewrite the budget as

(20) $$[1-(1-q-g+qg)\sigma\tau + (q+g-qg)w] \cdot \tau = w$$

[4] For certain values of parameters, *q* would not always increases with $\gamma$. In that case, we would find an inverted U-shape – $q$ increases with $\gamma$ up to a point and decreases afterwards. We have no reasons to believe that the quadratic relationship between $q$ and $\gamma$ should reveal in our model. For simplicity, we therefore exclude this possibility from our consideration.

The benefit and cost are increasing in public wage. From (20), The slope of the benefit function is always less than that of the cost function and the intercept term of the benefit function, $1-(1-q-g+qg)\sigma\tau \geq 0$, is non-negative implying that the budget constraint is binding and $w \geq 0$ is satisfied.

**Figure 1**

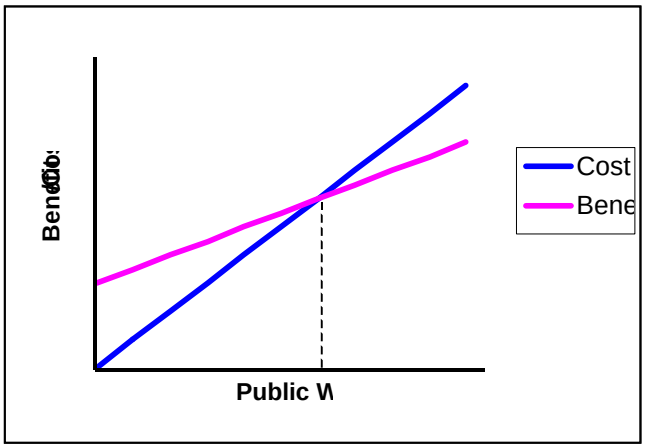



Figure 1 illustrates the structure of benefit and cost function in term of public wage. The government chooses the public wage that satisfies equation (20). Solve equation (20) for the public wage that balances the budget:

(21) $$w = \frac{[(1-q-g+qg)\sigma\tau - 1]\cdot\tau}{(q+g-qg)\tau - 1}$$

Differentiate equation (21) with respect to $q$, we obatain

(22) $$\frac{\partial w}{\partial q} = \frac{\sigma(1-\tau)+1}{[1-\tau(q+g-qg)]^2}(1-g)\tau^2 > 0$$

**Proposition 1.** *The government minimizes corruption by choosing the budget-balancing public wage given by (21). The public wage increases with the effectiveness of media sector in reporting corruption, as given by (22), indicating the complementarity between the public wage and the media effectiveness as corruption-combating instruments.*

An increase in media effectiveness is beneficial to the government. It increases the fraction of honest bureaucrats, thus increases the probability that the government makes higher profits from the penalty imposed on polluting firms. Media effectiveness affect the incentives of potential corrupt bureaucrats by making it less likely for a bureaucrat to gain from corruption, and more likely for him to lose his wage income.

From (14) and (17), we can see that $\partial q/\partial \gamma > 0$ and $\partial q/\partial f > 0$. This demonstrates that the government chooses higher public wage to achieve the lowest possible level of corruption, when the media industry experiences more intense competition and more press freedom, i.e. $\partial w/\partial \gamma > 0$ and $\partial w/\partial f > 0$. Geometrically, as media competition and press freedom increase, the intercept term and the slope of the benefit schedule increase. Thus, the government is allowed to choose a higher budget-balancing public wage to control corruption.

Note that $\partial w/\partial \tau$ is ambiguous. A higher penalty provides adverse incentive for bureaucrats to be corrupt. This effect reduces the fraction of honest bureaucrats shifting the benefit schedule downwards – it is less profitable for government at any public wage level – allowing the government to choose a lower budget-balancing public wage. Nevertheless, a higher penalty, at the same time, is more profitable to the government for each polluting firm an honest bureaucrat captures. This effect allows the government to choose a higher public wage to balance its budget. All in all, the effect of penalty on public wage is ambiguous, and is dependent on parameters. Note also that $\partial w/\partial g > 0$. This effect works in the same way as the effect of $q$ on $w$.

### 4.1. Equilibrium Corruption

The frequency of corruption is given by equation (4), and is restated here.

$$\overline{m} = \underbrace{[1 - q(\gamma, f) - g + q(\gamma, f)g]}_{a} \cdot \sigma \cdot \tau - \underbrace{[q(\gamma, f) + g - q(\gamma, f)g]}_{b} \cdot w(\gamma, f, \tau, g) \tag{23}$$

The effect of media competition on $\overline{m}$ is given by

$$\frac{\partial \overline{m}}{\partial \gamma} = \left[ \underbrace{\frac{\partial a}{\partial \gamma}}_{(-)} \cdot \sigma \cdot \tau - \underbrace{\frac{\partial b}{\partial \gamma}}_{(+)} \cdot w(\cdot) - \underbrace{\frac{\partial w}{\partial \gamma}}_{(+)} \cdot b \right] < 0 \tag{24}$$

It can be observed that $\partial a/\partial \gamma < 0$ and $\partial b/\partial \gamma > 0$. The effects of higher media competition on $\overline{m}$, which work through the probability that media detect a corrupt bureaucrat, *q*, will bring about a lower $\overline{m}$ and less corruption. According to (22), we saw that $\partial w/\partial \gamma > 0$. This effect also results in a lower $\overline{m}$ and thus less corruption, as competition in media industry increases. The effect of press freedom on $\overline{m}$ is:

$$\frac{\partial \overline{m}}{\partial f} = \left[ \underbrace{\frac{\partial a}{\partial f}}_{(-)} \cdot \sigma \cdot \tau - \underbrace{\frac{\partial b}{\partial f}}_{(+)} \cdot w(\cdot) - \underbrace{\frac{\partial w}{\partial f}}_{(+)} \cdot b \right] < 0 \tag{25}$$

The influence of press freedom on corruption is similar to that of media competition. The more intense media competition and press freedom, the higher probability that media catches corruption, and thus the lower equilibrium frequency of corruption. Intense competition and more freedom of press make it more difficult for a corrupt bureaucrat to gain from malfeasant behaviour and make it easier for him to lose the wage income. The higher degree of media competition and press freedom, at the same time, induce government to choose a higher public wage to control corruption, and these effects bring about less corruption.

**Proposition 2.** *The level of corruption decreases with a more intense competition in mass media industry and with a higher degree of press freedom, as given by (24) and (25) respectively.*

This result suggests that mass media can be accounted as an indirect tool to combat corruption. Other things being equal, an encouragement of competition and freedom in mass media industry should bring about less corruption.

### 4.2. Additional Results

Apart from the effects of media competition and press freedom on equilibrium level of corruption, an interesting comparative static is that with respect to the government monitoring mechanism.

(26) $$\frac{\partial \overline{m}}{\partial g} = \left[ \underbrace{\frac{\partial a}{\partial g}}_{(-)} \cdot \sigma \cdot \tau - \underbrace{\frac{\partial b}{\partial g}}_{(+)} \cdot w(\cdot) - \underbrace{\frac{\partial w}{\partial g}}_{(+)} \cdot b \right]$$

When the internal monitoring mechanism is effective, there tend to be less corruption. It is less likely for a corrupt bureaucrat to extract bribe (the first term in the bracket) and more likely that he has to forgo the wage income (the second term). Moreover, the last term in the bracket shows that a more effective government mechanism permits the government to raise its effort to control corruption by the public wage. A comparative static with respect to the level of environmental penalty is also worth considering.

(27) $$\frac{\partial \overline{m}}{\partial \tau} = \left[ \underbrace{\frac{\partial \sigma \tau}{\partial \tau}}_{(+)} \cdot a - \underbrace{\frac{\partial w(\cdot)}{\partial \tau}}_{(+,-)} \cdot b \right]$$

The first term in the bracket of (23) shows positive sign. A higher penalty results in more corruption. A more stringent penalty provides adverse incentive for bureaucrats to engage in malfeasant behaviour due to a higher potential gain from corruption. However, setting higher penalty, in the second term, ambiguously affects the choice of government on public wage. Thus, the effect of penalty level on corruption remains ambiguous.

Government generally sets bureaucratic wages not only with the aim of controlling corruption. The extent to which media competition, press freedom, the government mechanism, and the penalty change may not directly affect the public wage chosen by the government. In which case, the effects of those factors on the choice of public wage are dominated by the other effects. Thus, a higher penalty always increases corruption. An intense competition in media industry, press freedom, and effective internal mechanism still decrease corruption.

**Proposition 3.** *If the government choice of public wage is independent of the change in the level of environmental penalty, then the level of corruption increases with a higher level of environmental penalty.*

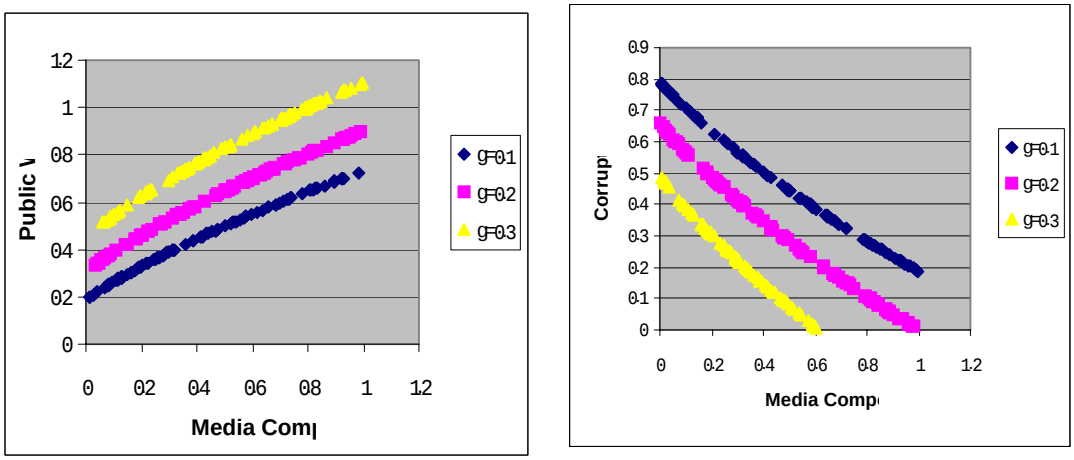
The government faces the dilemma between maintaining a stringent (environmental) penalty and combating corruption. By using media competition and press freedom as a tool, the government can maintain a stringent penalty to achieve environmental outcomes without having to jeopardize combating corruption objective.

### 4.2. Sensitivity Analysis

We perform a numerical exercise to illustrate the interactions between variables and comparative statics of our interest. With certain fixed values of parameters that obey all restrictions set out in the preceding section, we provide an example of a relationship between media parameters (i.e. media competition and press freedom) and the public wage and the level of corruption.

The numerical example fixed every parameter at certain values, while allowing the media competition or press freedom to vary between 0 and 1. Note that consistent behaviours of the relationships of variables examined below exhibit with varying sets of parameters.

**Figure 2**



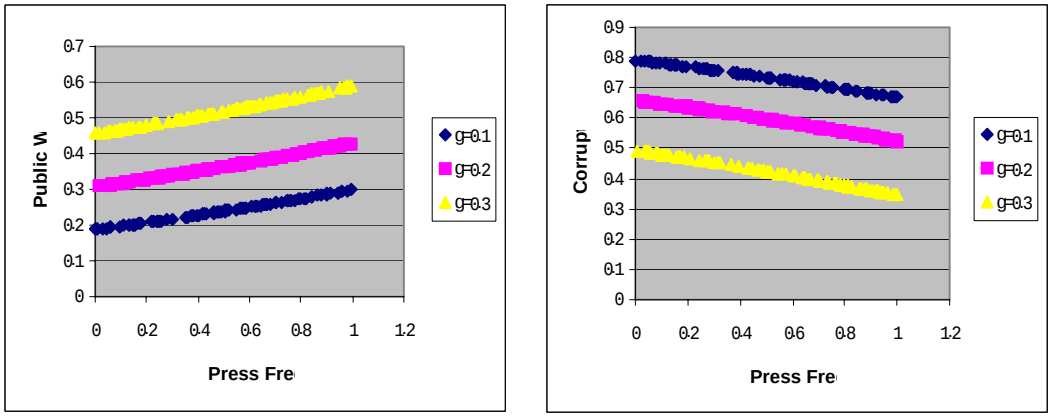

(a) (b)

Figure 2a and 2b shows the relationship between media competition and public wage, and media competition and corruption respectively. Both demonstrate these relationships with different values of government mechanism ($g$ = 0.1,0.2, and 0.3). Figure 2a indicates that the government chooses higher public wage as media competition increases, while Figure 2b shows that, with other parameters fixed, media competition reduces corruption. At every value of media competition, the public wage is shifted higher and the level of corruption is shifted lower, with higher level of the effectiveness of government mechanism. Furthermore, it can be seen from Figure 2b that a decrease in the level of corruption is more sensitive to an increase in the effectiveness of government mechanism when media competition is more intense. A unit increase in $g$ has a larger impact when media competition is high.

Figure 3a and 3b shows the relationship between press freedom and public wage, and press freedom and corruption respectively. Figure 3a demonstrates that a higher level of press freedom leads government to choose a higher public wage. Figure 3b shows that corruption decreases with press freedom, given other parameters. We can see from Figure 3a and 3b that, at every value of press freedom, a more effective government mechanism bring about a higher public wage and consequently less corruption. However, the impact of the government mechanism on corruption seems to be independent of the degree of press freedom.

It can be inferred from Figure 2 and 3 that the government and mass media monitoring capability support each other to allow higher public wage effort to reduce corruption. Moreover, when the government mechanism becomes more effective, its impact on corruption reduction gets larger, at any given value of media competition and press freedom. For instance, corruption falls to a larger extent when *g* rises from 0.2 to 0.3 than when *g* increases from 0.1 to 0.2, measuring at any given value of either media competition or press freedom (see, Figure 2b and 3b).

**Figure 3**

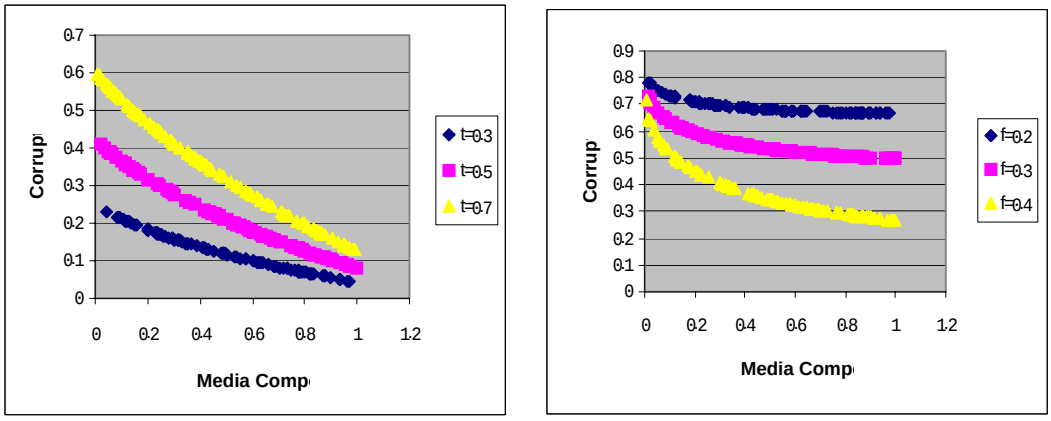



(a) (b)

The relationship between media competition and corruption with different values of the level of penalty and degrees of press freedom is demonstrated in Figure 4a and 4b respectively. Figure 4a shows that the effect of the level of penalty on corruption is dependent upon the degree of media competition. The extent to which a higher level of penalty causes more corruption is decreasing with the degree of media competition. In other words, maintaining a higher degree of media competition alleviates adverse

effect of an increase in the level of penalty on corruption. It is shown in Figure 4b that press freedom helps media competition to better deal with corruption. The impact of press freedom on corruption increases with the degree of competition in media industry. That is, when media market is more competitive, a unit-increase in press freedom decreases corruption more relatively to the situation when media market lacks competition.

**Figure 4**

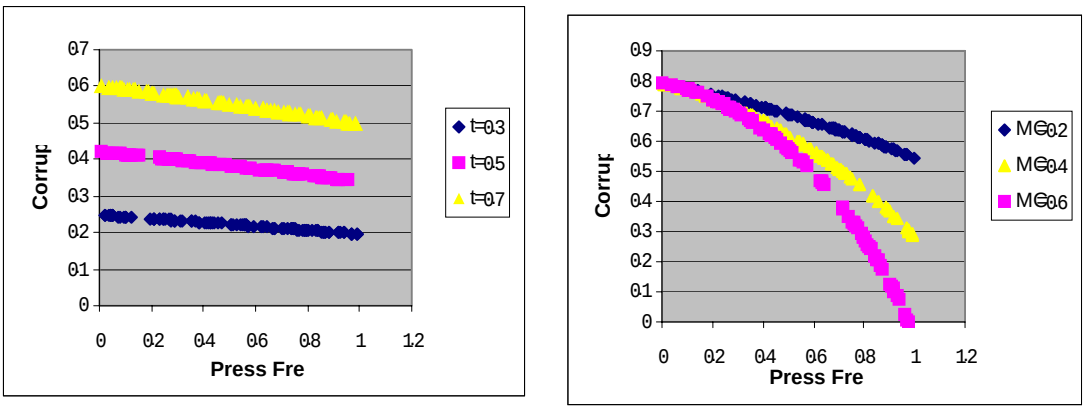



Note: t = the level of penalty, f = degree of press freedom

(a) (b)

Figure 5a shows that, in contrast to Figure 4a, the effect of the level of penalty on corruption seems to be less dependent upon the degree of press freedom relatively to that of media competition. A higher level of penalty however results upward shift of the level of corruption. Figure 5b demonstrates that media competition complements press freedom to combat corruption, and the scale of its impact is larger when the degree of press freedom is high. This is consistent with Figure 4b.

**Figure 5**




Note: t = the level of penalty, MC = media competition

(a) (b)

The analysis above yields a few hypotheses that will be tested in the following section. The model also demonstrates that changes in media industry may affect choice/behaviour of the government, and thus the structure of a bureaucracy. This is to say that media competition and press freedom not only improve the effectiveness of media in reporting corruption, but also have an influence on the change of bureaucratic structure. We expect to empirically observe lower level of corruption with more press freedom and more intense media competition (Proposition 2). Moreover, we should observe a more stringent penalty together with a bureaucracy of widespread corruption (Proposition 3)[5].

## 5. Empirical Strategy and Data

This section examines consistency between empirical evidence and theoretical explanations obtained in the preceding sections. Testable implications will be analysed using both reduced-form and structural form regressions across countries. The model not only suggests relevant determinants of corruption, but also the structure of econometric model we will construct. The empirical work is primarily to find whether there exist systematic relationship between mass media industry and corruption. First, we run the following basic specification:

$$COR_i = \alpha_{1i}\gamma_i + \alpha_{2i}f_i + \alpha_{3i}BS_i + \alpha_{4i}\tau_i + \alpha_{5i}e_i + \varepsilon_i \tag{28}$$

$COR_i$, index for corruption, is dependent variable in our regressions. Our primary explanatory variables include media competition, $\gamma_i$, and press freedom $f_i$. Bureaucratic structures, $BS_i$, including the size of bureaucracy and the level of public wages also determine corruption. $e$ is the vector of institutional variables of a bureaucracy that affect corruption. The level of penalty or stringency of regulation governments impose on private sector, $\tau_i$, is also taken into account.

We use the press freedom index, $PRFDM$, from Freedom House for $f$. It measures the degree to which each system permits the free flow of information to and from the public determines the classification of each countries index. In compiling the survey, Freedom House measures the degree to which law and administrative decisions of the government influence the content of the news media, the degree of political influence or control over the content of the news system, the economic influences on the media exerted either by government or private entrepreneurs, and the degree of oppression of the news media exhibited in many forms. Press freedom index is available online from the Freedom House website[6], and is taken for the year 2000 in our analysis. We rescale the index so that the higher value means more free press.

A proxy for media competition, $MEDCOM$, will be constructed by using an index of media competition and an index of ownership of press. The former is obtained from Kruckeberg and Tsetsura (2003) data on media competition. This data is originally from the Walden's World of Information Business Intelligence Reports. This report gives us

[5] Note that Proposition 1 will not be empirically examined. This is due to lack of data and theoretical ground on the public wage determination. Moreover, the study of the determinants of public wage is beyond the scope of this paper.

[6] www.freedomhouse.org

the number of daily newspapers published in each country. The authors calculate the media competition index by dividing population number by the number of daily newspaper published in each country in 2000. This index will be combined and adjusted with data on media ownership constructed by Djankov *et al* (2001) for the year 1999 to make our $MEDCOM$.

As a proxy for corruption, we will use measures of corruption from different sources. First of which is the control of corruption measure, $COR$, from the Kuafman *et al* (2003) data set on governance. $COR$ measures "the exercise of public power for private gain" in year 2000, and is a perception-based indicator. The higher the value, the less corrupt a country is. Second, we use the corruption perception index, $CPI$, which is developed by Transparency International. This index is constructed based on several other surveys on corruption. It assesses the degree to which public officials and politicians are believed to accept bribes, take illicit payment in public procurement, embezzle public funds, and commit similar offences. $CPI$ is available online and is taken for the year 2000[7]. Note that higher score of $COR$ and $CPI$ means less corruption.

Data on public wages, $GOVWAGE$, and the size of public sector, $GOVSIZE$, will be obtained from the World Bank online dataset on Public Sector Employment and Wage[8], which was initially constructed by Schiavo-Campo *et al* (1997). The data set is taken for the average between 1995 and 2000. $GOVWAGE$ measures the ratio of average central government wage to per capita GDP. $GOVSIZE$ measures the number of central civilian government as percentage of population (excluding health, education, and police). The data set used and constructed by Court, Kristen, and Weder (2000) on bureaucratic wage is also available for developing countries, and will also be used in our analysis. This data captures the relative wage of employees in public sector and private sector, and it extends the database that was previously developed and used by Rauch and Evans (2000).

To capture institutional aspects of a bureaucracy, $e$, we use a dummy variable for industrial country, $DEV$, a dummy variable for legal origin, $LEGAL$, and an index of enthnolinguistic fractionalisation, $ETHNO$. The three control variables are aimed at capturing structural and cultural differences in bureaucratic system across countries[9]. $DEV$ is proxied by membership of the OECD. $LEGAL$ takes the value of 1 if a country's legal origin is from a common law system and takes the value of 0 if it is developed from a civil law system. $ETHNO$ captures the cultural diversity within a society. It measures the probability that two random persons within a society would come from different linguistic backgrounds. $LEGAL$ and $ETHNO$ are taken from Treisman (2000) and initially compiled by La Porta *et al* (1998).

The number of procedures, $PRCD$, data is used to capture the level of penalty or stringency of regulation governments impose on private sector, $\tau_i$, in our model. It measures the number of different procedures that a start-up firm has to comply with in order to obtain a legal status, i.e. to start operating as a legal entity. This index is taken from Djankov *et al* (2002), which collected the information in 1999. The female

[7] www.transparency.org

[8] http://www1.worldbank.org/publicsector/civilservice/cross.htm

[9] The dummy of industrialized countries (as membership of OECD) is expected to better capture structural and cultural differences in bureaucracy than the level of income (GDP).

education, $FEMEDU$, and the number of poplulation, $POP$, are used as instrumental variables in our model. The source of the number of population (millions) in 2000, $POP$, is the World Development Indicators 2001 (World Bank, 2001). The percentage of female tertiary school enrolment in 2000 is used as a proxy for female education, $FEMEDU$. The data is from the World Development Indicator 2004[10].

The bureaucratic delays, $BUREAUD$, the regulatory burdens, $REGBURD$, and the regulations, $REGULAT$, are used to capture characteristics and relative performance of a bureaucracy. The World Economic Forum's Global Competitiveness Survey provides the ratings of $REGBURD$ for the year 1997. It captures the degree to which government regulations impose a heavy burden on business competitiveness. Higher ratings means lower regulatory burden. $REGULAT$ is from the Heritage Foundation, also for the year 1997. The index measures whether a license is required to operate a business and how easy it is to obtain such license. Higher score of $REGULAT$ means more regulations. The data on $REGBURD$ and $REGULAT$ used in our paper are taken from Friedman *et al* (2000)'s data set. $BUREAUD$ is originally from the Business Environment Risk Intelligence's Operation Risk Index. It is an indicator of bureaucratic delays (red tape). The data is the average of the years between 1972 and 1995, and is taken from La Porta *et al* (1998). Higher value of the index means less degree of bureaucratic delays.

Other variables that are utilized in our analysis are also described here. An index of regulatory quality, $REGQUA$, are taken from Kuafman *et al* (2003). $REGQUA$ includes measures of the incidence of market-unfriendly policies such as price controls or inadequate bank supervision, as well as perceptions of the burdens imposed by excessive regulation in areas such as foreign trade and business development. Lack of political right and civil liberty, $LACKPC$, index is used in our work. This is a simple average of an index of political right and an index of civil liberty constructed by Freedom House. This index captures factors such as the right to vote, the right to organize political parties, fair elections, meaningful representation by elected representatives, freedom of assembly and demonstration, an independent judiaciary, and the absence of political terror and torture. Note that higher value of $LACKPC$ means less of political right and civil liberty in a country. The measure of the extent to which the educational system meets the need of a competitive economy, $EDUSYS$, is also used. This measure is taken from La Porta *et al* (1997).

## 6. Results

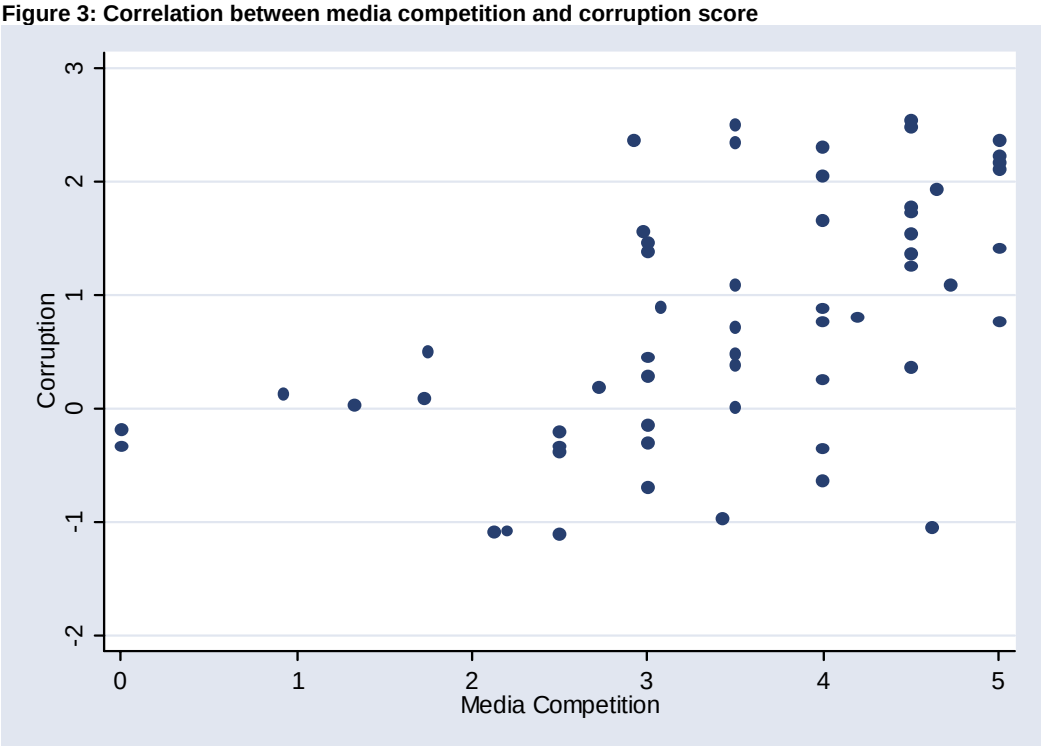
There is a close relation between corruption and media competition across countries in our data set. Figure 3 shows the scatterplot of corruption and media competition. It shows a positive association between corruption score and media competition. That is, we observe lower corruption with higher media competition when no other factors are taken into account.

Table 1 presents the results of OLS regressions. Standard errors are White-corrected to allow for the possibility of Heteroskedasticity. Regression 1 reports the results with $COR$ as dependent variable and media competition and the controls as explanatory variables. The estimated coefficients in regression 1 show that corruption score is

[10] http://www.worldbank.org/data/wdi2004/

increasing in the level of development and industrialisation[11]. Countries that are developed originally from a common law system tend to perform better with less corruption. However, neither *DEV* nor *LEGAL* is statistically significant.

**Figure 3: Correlation between media competition and corruption score**




Ethnolinguistic fractionalisation enters negatively and significantly indicating that a more diverse society is relatively more prone to corruption problem. These findings are consistent with the results generally found in corruption literature [see, e.g. Treisman (2000); La Porta *et al* (1998)]. The number of procedures also enters negatively, as expected by Proposition 3, and is highly significant. This implies that a bureaucracy possessing more cumbersome procedures is likely to experience more corruption.

Media competition is highly significant and enters positively in regression 1. A more intense competition in media industry brings about less corruption. As for economic significance, the coefficient on media competition equals 0.3, implying that a 1-point increase in media competition leads to a 0.3-point increase in the corruption score. Next, we add press freedom in regression 2. Media competition continues to be statistically significant, albeit at 10 percent level. Press freedom reduces corruption as it appears positive in regression 2, but is statistically insignificant. The results on other explanatory variables remain similar to that inferred from regression 1.

[11] Higher score means less corruption.

**Table 1: Corruption Regression – Basic findings**

| | OLS *COR* (1) | OLS *COR* (2) | OLS *CPI* (3) | OLS *CPI* (4) |
|---|---|---|---|---|
| *DEV* | 0.159 | 0.034 | -0.058 | -0.268 |
| | (0.349) | (0.383) | (0.816) | (0.838) |
| *LEGAL* | 0.076 | 0.202 | 0.083 | 0.243 |
| | (0.21) | (0.266) | (0.598) | (0.636) |
| *ETHNO* | -0.013*** | -0.014*** | -0.029** | -0.292** |
| | (0.004) | (0.004) | (0.012) | (0.0129) |
| *PRCD* | -0.166*** | -0.147*** | -0.431*** | -0.397*** |
| | (0.028) | (0.041) | (0.069) | (0.096) |
| *MEDCOM* | 0.316*** | 0.231* | 0.664*** | 0.507* |
| | (0.106) | (0.147) | (0.231) | (0.351) |
| *PRFDM* | | 0.11 | | 0.216 |
| | | (0.131) | | (0.32) |
| Observations | 43 | 43 | 41 | 41 |
| $R^2$ | 0.75 | 0.77 | 0.77 | 0.78 |

Notes: OLS regression. Constants are not reported. Standard errors in parenthesis and are corrected for heteroskedasticity. ***,**, and * denotes significance at the 1, 5, and 10 percent level respectively.

To see the robustness of the results to a different measure of corruption, we adopt *CPI* as the dependent variable in regression 3 and 4. They are the re-estimations of the specifications employed for regression 1 and 2 respectively. Even though, the estimated coefficients for the media competition and press freedom in regression 3 and 4 are somewhat larger than those in regression 1 and 2, their levels of significance are identical. Press freedom again does not appear to be statistically significant. Note that, for every explanatory variable, coefficients estimated with *CPI* are bigger than the ones estimated with *COR*[12]. The degree of statistical significance of the number of procedure remains unchanged, whereas the ethnolinguistic fractionalisation becomes less significant.

More importantly, Table 1 demonstrates the significance of media competition as a determining factor of corruption. With comparison to press freedom, media competition is more economically significant in terms of reducing corruption, although there seems to be a substituting interaction between the two variables.

### 6.1. Robustness Test

As an additional test of robustness, Table 2 employs the two-stage least square technique (2SLS) in order to cope with the possibility of simultaneity problem. Besides, an alternative of corruption measure, *CPI*, is again utilized. We still find a significant relationship between media competition and corruption. Media competition consistently

[12] This is likely to be because *CPI* is measured with the score between 1 and 10, while *COR* is measured between –2.5 and 2.5.

appears to be statistically significant throughout various specifications. The role of media competition in Table 2 is somewhat more important than the earlier findings in Table 1, when the same specifications are compared.

**Table 2: Corruption regression – Robustness Test**

| | 2SLS *COR* (5) | 2SLS *COR* (6) | 2SLS *COR* (7) | 2SLS *COR* (8) | 2SLS *CPI* (9) | 2SLS *CPI* (10) | 2SLS *CPI* (11) | 2SLS *CPI* (12) |
|---|---|---|---|---|---|---|---|---|
| *DEV* | 0.501* | 0.348 | 0.274 | 0.169 | 0.440 | 0.216 | -0.023 | -0.006 |
| | (0.318) | (0.298) | (0.435) | (0.554) | (0.725) | (0.689) | (0.969) | (1.394) |
| *LEGAL* | 0.121 | 0.171 | -0.666* | -0.560 | 0.134 | 0.207 | -1.42** | -1.482 |
| | (0.229) | (0.203) | (0.409) | (0.476) | (0.564) | (0.541) | (0.826) | (1.139) |
| *ETHNO* | -0.038 | -0.036 | 0.074 | 0.063 | -0.103 | -0.099 | 0.146 | 0.162 |
| | (0.055) | (0.044) | (0.119) | (0.111) | (0.134) | (0.120) | (0.257) | (0.286) |
| *PRCD* | -0.115*** | -0.087*** | -0.078 | -0.075 | -0.330*** | -0.289*** | -0.328* | -0.317** |
| | (0.036) | (0.026) | (0.104) | (0.075) | (0.081) | (0.069) | (0.203) | (0.173) |
| *MEDCOM* | 0.641** | 0.333* | 1.226** | 1.062* | 1.332*** | 0.903** | 2.251** | 2.341* |
| | (0.277) | (0.235) | (0.553) | (0.693) | (0.457) | (0.501) | (0.949) | (1.659) |
| *PRFDM* | | 0.251** | | 0.083 | | 0.365* | | -0.002 |
| | | (0.120) | | (0.254) | | (0.268) | | (0.583) |
| *GOV WAGE* | | | 0.085 | 0.075 | | | 0.031 | 0.026 |
| | | | (0.137) | (0.131) | | | (0.248) | (0.280) |
| *GOV SIZE* | | | 0.034 | 0.044 | | | 0.075 | 0.071 |
| | | | (0.158) | (0.154) | | | (0.259) | (0.294) |
| Over-identifying Restriction test (p-value) | 0.214 | 0.0034 | 0.061 | 0.0002 | 0.003 | 0.1972 | 0.008 | 0.0147 |
| | (0.65) | (0.95) | (0.81) | (0.98) | (0.93) | (0.66) | (0.93) | (0.90) |
| Obs. | 34 | 34 | 21 | 21 | 34 | 34 | 21 | 21 |
| $R^2$ | 0.75 | 0.85 | 0.75 | 0.81 | 0.76 | 0.82 | 0.81 | 0.80 |

Notes: Constants are not reported. Standard errors in parenthesis and are corrected for heteroskedasticity. ***,**, and * denotes significance at the 1, 5, and 10 percent level respectively. The female tertiary school enrolment rate, and population variables are used as instruments for media competition in 2SLS. Over-identifying restriction test is distributed as a $\chi^2$ under the null hypothesis of instruments validity[13]

It may be argued that competition in media industry is also simultaneously determined by corruption. Rent seeking bureaucracy gains more by keeping media industry lack of market competition. In this situation, we may encounter endogeneity bias. To correct for simultaneity, regression 5 through 12 employ 2SLS estimates instrumenting for Media competition, *MEDCOM*, with the rate of female tertiary school enrolment, *FEMEDU*, and population, *POP*.

[13] We ran the residuals from 2SLS regression on all of the predetermined variables in the model. The value is obtained by multiplying $R^2$ by the number of observations and is distributed as a $\chi^2$ with *j* degree of freedom; *j* equals the number of exogenous variables excluded from the model minus the number of endogenous variables included in the model.

Table A1, in Appendix A, reveals potential simultaneity problem we encounter between corruption and media competition measure. Table A2, on the other hand, assures that *FEMEDU* does not suffer from the reverse causation. The number of population in each country, *POP*, is surely not influenced by corruption. Apart from the exogenous characteristic, there are reasons to believe that *FEMEDU* and *POP* may be used as instruments for *MEDCOM*. We believe that *FEMEDU* captures the extent to which people in each community are able or are allowed to voice and express their views/opinions. Also, we believe that the degree of media plurality should be influenced by the number of population, *POP*.

The first stage regressions indicate that the instruments are good. A highly significant F-statistics from the first stage regressions also confirm that the instruments perform well. Our assumption for the instruments to be valid is that *MEDCOM* is the only channel through which *FEMEDU* and *POP* affect corruption. We tested this assumption using Hausman test for over-identifying restrictions. The test indicates that we are far from being able to reject the null hypothesis of the validity of the exclusion restrictions. That is, we find no evidence that the *FEMEDU* and *POP* belong in the corruption regression. The statistics of the Hausman test for over-identifying restrictions are reported in Table 2, and the p-value are in parentheses.

Our measure of media competition appears statistically significant throughout all 2SLS estimates. We add the ratio of government wage and per capita GDP and the size of central government in regression 7-8 and 11-12 to capture the possibilities of bureaucratic determinants of corruption. However, both variables are of no statistical significance. Public wage becomes significant when we use the Court, Kristen, and Weder (1999) data set that extends Rauch and Evans (2000) data set. The result is with less than 20 observations and is not reported here[14]. A potential reason that the size of government is insignificant here is possibly because corruption measures do not capture the extent, but the perception of the likelihood of corruption. Table 2 confirms that our results are robust to the conclusion that media competition has a significant role to play in combating corruption.

The coefficients estimated in regression 6 lead us to interesting observations[15]. Measuring at average values of other variables, if a country with a complete lack of media competition (*MEDCOM* = 0) was to become one with highly competitive media industry (*MEDCOM* = 5), this could help reduce its corruption problem to such an extent that the corruption situation in Indonesia would improve to that in South Korea, Nigeria's to South Africa's, Brazil's to Germany's, and Italy's to Finland's[16]. If Italy's media market, with *MEDCOM* = 3.1, could be made to be highly competitive, e.g. with *MEDCOM* = 5, the country's corruption situation would be improved to the level of France. That is, corruption score would be improved from 0.89 to 1.46.

[14] Van Rijckeghem and Weder (2001) also find significant relationship between public wage and corruption. They suggest that higher relative wage reduce corruption in public sector. This result also occurred with Rauch and Evans (2000) data set.

[15] We select regression 6 to perform a cross-country comparison as it presents the highest value of $R^2$, and is corrected for potential simultaneity problem with the highly valid instrumental variables that pass the Hausman over-identifying restriction test.

[16] Finland is the least corrupt country and has the highest-ranking corruption score in 2000.

Also measuring at average values of other variables, if a country with minimum press freedom, $PRFDM$ = 1, was to become one with maximum press freedom, $PRFDM$ = 9.5, then this could reduce corruption, for example, in Brazil to the level of United Kingdom, and could improve the level of corruption in Nigeria, the most corrupt country in Africa, to that of Botswana, which is the least corrupt country in Africa. Furthermore, if press freedom in Saudi Arabia ($PRFDM$ = 1) would be allowed to reach the level of completely free press, then its corruption situation would be improved close to the level in Singapore.

### 6.2. Structural Regressions Analysis

It is anticipated that media competition and press freedom not only affect the level of corruption directly, but also have bureaucratic structure as channels of influence. According to our model, media competition and press freedom affect public wage chosen by the government. The public wage in turn affects corruption[17]. Nonetheless, it would be a trivial exercise relating national data on public wage to media competition and press freedom without theoretical grounds on the determination of public wage[18].

The association between the structure of media industry and characteristics of a bureaucracy is more of our interest. It is, therefore, worth considering whether media industry has an impact, if at all, on bureaucratic structure, and whether the bureaucratic performance consequently works to determine the level of corruption. The bureaucratic delays, $BUREAUD$, the regulatory burdens, $REGBURD$, and the regulations, $REGULAT$, are used as proxies for the bureaucratic structure, $BS$, to capture characteristics and performance of bureaucracy. We therefore estimate the following specification:

$$\begin{aligned} COR_i &= \beta_{1i} BS_i + \beta_{2i} e_i + \eta_i \\ BS_i &= \alpha_{1i} \gamma_i + \alpha_{2i} f_i + \alpha_{3i} \tau_i + \omega_i \end{aligned} \tag{29}$$

We employ the two-stage least square estimator to see the structural relationships between media industry, bureaucratic structure, and the level of corruption. The bureaucratic delays, regulatory burdens, and regulations variables are determinants of corruption. They are in turn endogenously determined by media competition, press freedom, and the level of penalty. It can be argued that the level of penalty affects corruption through bureaucratic performance, as it has an influence on bureaucrats' behaviour.

Table 3 presents the results of the structural regressions. Model 1 and 2 show that media competition and press freedom have significant positive impact on the score of bureaucratic delays, even though media competition appears statistically insignificant in model 2. This shows potential interaction between the two variables as noted above. The bureaucratic delays in turn affect corruption highly significantly in the two models. As bureaucracy becomes more effective, less corruption occurs.

[17] The issue of public wage as a determinant of corruption has been dealt with in the corruption literature [see, e.g. Van Rijckeghem and Weder (2001)]. The relationship between corruption and the size of government is studied, for example, by Fisman and Gatti (2000). Nevertheless, they did not capture the size of government by employment, but expenditure.

[18] The determination of public wage is beyond the scope of this paper.

**Table 3: 2SLS Structural corruption regression**

| | 2SLS Dependent: *BUREAUD* | 2SLS Dependent: *BUREAUD* | 2SLS Dependent: *REGBURD* | 2SLS Dependent: *REGBURD* | 2SLS Dependent: *REGULAT* | 2SLS Dependent: *REGULAT* |
|---|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
| *MEDCOM* | 0.299** | 0.149 | 0.332* | 0.412* | -0.188* | -0.216* |
| | (0.175) | (0.202) | (0.206) | (0.269) | (0.121) | (0.157) |
| *PRFDM* | | 0.187* | | 0.119 | | -0.038 |
| | | (0.129) | | (0.251) | | (0.133) |
| *DEV* | 0.265 | 0.069 | -0.505 | -0.426 | 0.264 | 0.208 |
| | (0.506) | (0.516) | (0.545) | (0.581) | (0.353) | (0.408) |
| *LEGAL* | 0.177 | 0.400 | -0.489 | -0.508 | -0.683** | -0.663** |
| | (0.455) | (0.474) | (0.445) | (0.456) | (0.358) | (0.371) |
| *ETHNO* | -0.072 | -0.084 | -0.027 | -0.040 | 0.088* | 0.091* |
| | (0.073) | (0.073) | (0.088) | (0.094) | (0.061) | (0.063) |
| *PRCD* | -0.178*** | -0.147** | -0.118** | -0.137** | 0.023 | 0.028 |
| | (0.061) | (0.064) | (0.054) | (0.067) | (0.042) | (0.046) |
| $R^2$ | 0.51 | 0.54 | 0.31 | 0.32 | 0.26 | 0.26 |
| | Dependent: *COR* | Dependent: *COR* | Dependent: *COR* | Dependent: *COR* | Dependent: *COR* | Dependent: *COR* |
| *BUREAUD* | 0.971*** | 0.931*** | | | | |
| | (1.856) | (0.159) | | | | |
| *REGBURD* | | | 1.200*** | 1.052*** | | |
| | | | (0.477) | (0.398) | | |
| *REGULAT* | | | | | -1.668* | -1.676* |
| | | | | | (1.219) | (1.186) |
| *DEV* | -0.036 | 0.025 | 1.206*** | 1.243*** | 0.751* | 0.753* |
| | (0.423) | (0.393) | (0.479) | (0.448) | (0.506) | (0.500) |
| *LEGAL* | -0.065 | -0.038 | 0.601 | 0.569 | -1.083 | -1.088 |
| | (0.321) | (0.298) | (0.517) | (0.466) | (0.863) | (0.848) |
| *ETHNO* | -0.061 | -0.063 | -0.072 | -0.065 | 0.014 | 0.015 |
| | (0.052) | (0.050) | (0.110) | (0.099) | (0.150) | (0.148) |
| Over-identifying Restriction test (p-value) | 0.06 (0.97) | 0.472 (0.92) | 0.005 (0.99) | 2.25 (0.52) | 0.95 (0.62) | 0.96 (0.81) |
| $R^2$ | 0.64 | 0.67 | 0.23 | 0.37 | 0.25 | 0.26 |
| Obs. | 40 | 40 | 25 | 25 | 32 | 32 |

Notes: 2SLS regression. Constants are not reported. Standard errors in parenthesis and are corrected for heteroskedasticity. ***,**, and * denotes significance at the 1, 5, and 10 percent level respectively. Over-identifying restriction test is distributed as a $\chi^2$ under the null hypothesis of instrument validity.

Media competition also has positive association with the score of regulatory burdens (see, model 3 and 4). A more intense competition of media causes a higher quality of

government regulations. Media competition enters significantly at 10 percent level in both models, but press freedom appears to be insignificant in model 4. $MEDCOM$ thus seems to have a larger influence, as compared to $PRFDM$, on corruption when the regulatory burdens act as a transmission. The results of the regulations variable exhibit similar to that of the regulatory burdens. The $REGULAT$ appears to be a significant channel through which media competition affects corruption.

We can see from model 4 and 6 that, as for economic significance, media competition continues to be more important than press freedom in terms of enhancing regulatory quality. A 1-point increase in media competition leads to a 0.412-point decrease in the regulatory burdens, while a 1-point increase in press freedom only leads to a 0.119-point decrease in the regulatory burdens. A 1-point increase in media competition also brings about a 0.216-point improvement of the regulations, whereas the same magnitude increase in press freedom causes merely a 0.038-point improvement. Nonetheless, model 2 shows that press freedom is more important in terms of enhancing bureaucratic efficiency.

All in all, the results provide suggestive evidence that changes in media industry have potential impact on bureaucratic structures which in turn act to determine the level of corruption. Note that we perform the over-identifying restrictions test, and cannot reject the null hypothesis of instrument validity at conventional levels for most models except for model 4 and 5. The problem seems to disappear when $PRFDM$ is dropped from the model as an instrument. $REGULAT$ does not perform well as a channel of influence on corruption of the level of penalty, and the instruments becomes valid when $PRCD$ is dropped. The results in Table 3 should be interpreted with caution and deserve scrutiny.

## 7. Conclusion

This paper investigates the effects of mass media on corruption. Profit maximizing media firms seek for corruption news to be printed and sold. Channels through which competition in media industry and press freedom affect equilibrium corruption in a bureaucracy are modeled. Different degrees of media freedom and competition affect production and employment decisions of media firms, and this in turn affects the effectiveness of media in monitoring corruption. Even though, media competition and press freedom play different roles in media industry, both of them enhance the effectiveness of media in reporting corruption.

The model suggests that an intense competition in media industry and its freedom make it more effective in finding corruption, and thus discourages bureaucrats from engaging in malfeasant behaviour. It is more difficult for a bureaucrat to gain from corruption and make it easier for him to lose the wage income. The higher degree of media competition and press freedom, at the same time, induces government to choose a higher public wage to control corruption. This incurs a corrupt bureaucrat a higher potential forgone wage income in case he is captured. These influences together reduce the likelihood of corruption.

There may be constraints for government to use direct tools to combat corruption. Its budget may constrain the use of public wage. An obligation to achieve an environmental outcome may require the government to maintain a stringent environmental penalty, even though this gives adverse incentive for bureaucrats to

engage in corruption due to high potential gain from corruption. Government generally faces these dilemmas. This paper also demonstrates that media competition and press freedom can be used as indirect tools, or as complements to public wage, for government to control corruption.

On the empirical side, we find a strong and significant impact that competition in media industry has on the reduction of corruption. While others have found press freedom an important tool to combat corruption, our results suggest that media competition is economically more important than press freedom in terms of corruption reduction. Even though the results are a good starting point for future empirical research on the relationship between media competition and corruption, they should be interpreted with care due to lack of comprehensive data on media competition and bureaucratic structure. This issue deserves more scrutiny when higher quality data becomes available.

We suspect potential interaction between media competition and press freedom, and its joint implication to corruption. This opens to future research. The relationship between media industry and bureaucratic system also deserve more consideration both from theoretical and empirical aspects. Theoretically, endogenising the number of agents in bureaucracy and media industry (i.e. allowing for the allocation between the two sectors) might be one possible way to capture the interaction between the two sectors. All in all, our findings support the claim that competition in media industry reduces corruption. Policies aimed at making media market more competitive and free could play a role in controlling corruption.

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## Apendix A

**Table A1: 2SLS Media Competition – Heteroskedasticity Robust**

| | 2SLS | 2SLS | 2SLS |
|---|---|---|---|
| Dependent: *MEDCOM* | Model 1 | Model 2 | Model 3 |
| *COR* | 0.738** | 0.739** | 0.588*** |
| | (0.317) | (0.309) | (0.23) |
| *LACKPC* | -0.239** | -0.256** | -0.223** |
| | (0.134) | (0.111) | (0.131) |
| *REGQUA* | -0.309 | -0.3 | |
| | (0.446) | (0.429) | |
| *DEV* | 0.192 | | 0.185 |
| | (0.455) | | (0.452) |
| *LEGAL* | 0.625 | | 0.017 |
| | (0.007 | | (0.40) |
| *ETHNO* | 0.004 | 0.004 | 0.005 |
| | (0.007) | (0.006) | (0.007) |
| *PRCD* | 0.069 | 0.058 | 0.696 |
| | (0.066) | (0.058) | (0.654) |
| $R^2$ | 0.49 | 0.49 | 0.48 |
| Dependent: *COR* | | | |
| *MEDCOM* | 1.06*** | 0.926*** | 1.09*** |
| | (0.29) | (0.264) | (0.305) |
| *DEV* | -0.408 | | -0.435 |
| | (0.494) | | (0.509) |
| *LEGAL* | 0.192 | | 0.197 |
| | (0.318) | | (0.33) |
| *ETHNO* | -0.12* | -0.008* | -0.011* |
| | (0.007) | (0.006) | (0.007) |
| *PRCD* | -0.112** | -0.102*** | -0.109** |
| | (0.054) | (0.038) | (0.056) |
| $R^2$ | 0.35 | 0.47 | 0.31 |
| Observations | 43 | 43 | 43 |

Notes: Constants are not reported. Standard errors in parenthesis and are corrected for heteroskedasticity.

***,**, and * denotes significance at the 1, 5, and 10 percent level respectively.

**Table A2: 2SLS Political Right and Civil Liberty – Heteroskedasticity Robust**

| | 2SLS | 2SLS | 2SLS |
|---|---|---|---|
| Dependent*: FEMEDU* | Model 1 | Model 2 | Model 3 |
| *COR* | 5.309 | 5.88 | 5.205 |
| | (5.81) | (5.77) | (4.936) |
| *POP* | -0.017 | | -0.016 |
| | (0.0172) | | (0.015) |
| *EDUSYS* | -0.607 | -0.67 | |
| | (4.527) | (4.525) | |
| *LACKPC* | -6.85** | -6.365** | -7.085** |
| | (3.907) | (3.875) | (3.072) |
| *DEV* | 3.062 | 2.248 | 3.985 |
| | (8.706) | (8.664) | (7.376) |
| *LEGAL* | 3.995 | 2.695 | 3.74 |
| | (7.507) | (7.391) | (6.69) |
| *ETHNO* | -1.937* | -2.385** | -1.838* |
| | (1.357) | (1.279) | (1.223) |
| *PRCD* | -1.138 | -1.415 | -1.041 |
| | (1.225) | (1.193) | (1.092) |
| $R^2$ | 0.61 | 0.62 | 0.70 |
| Dependent: *COR* | | | |
| *FEMEDU* | 0.059*** | 0.065*** | 0.053*** |
| | (0.209) | (0.023) | (0.015) |
| *DEV* | -0.11 | -0.181 | -0.043 |
| | (0.64) | (0.686) | (0.484) |
| *LEGAL* | -0.159 | -0.187 | -0.071 |
| | (0.487) | (0.523) | (0.379) |
| *ETHNO* | 0.088 | 0.107 | 0.073 |
| | (0.109) | (0.115) | (0.089) |
| *PRCD* | 0.003 | 0.018 | -0.006 |
| | (0.089) | (0.096) | (0.074) |
| $R^2$ | 0.43 | 0.33 | 0.58 |
| Observations | 34 | 34 | 37 |

Notes: Constants are not reported. Standard errors in parenthesis and are corrected for heteroskedasticity.

***,**, and * denotes significance at the 1, 5, and 10 percent level respectively.

**Table A3: Descriptive statistics**

| Variable | Observations | Mean | S.D. | Minimum | Maximum |
|---|---|---|---|---|---|
| *COR* | 82 | 0.38 | 1.19 | -1.4 | 2.54 |
| *MEDCOM* | 43 | 3.46 | 1.16 | 0 | 5 |
| *PRFDM* | 80 | 6.02 | 2.31 | 1 | 9.5 |
| *LACKPC* | 80 | 2.91 | 1.72 | 1 | 7 |
| *GOVSIZE* | 51 | 2.02 | 1.94 | 0.1 | 11.2 |
| *GOVWAGE* | 38 | 1.98 | 1.17 | 0.04 | 4.9 |
| *BUREAUD* | 49 | 4.86 | 1.47 | 2.03 | 7.78 |
| *REGBURD* | 30 | 3.54 | 0.92 | 1.64 | 5.29 |
| *REGULAT* | 47 | 2.81 | 0.79 | 1 | 4 |
| *PRCD* | 77 | 9.60 | 3.75 | 2 | 17 |
| *ETHNO* | 82 | 37.73 | 30.17 | 0 | 90 |
| *CPI* | 65 | 5.30 | 2.53 | 1.2 | 10 |
| *EDUSYS* | 41 | 3.30 | 0.76 | 1.79 | 4.57 |
| *REGQUA* | 82 | 0.48 | 0.93 | -2.87 | 2.27 |
| *POP* | 49 | 66.4 | 149.6 | 3.34 | 1014 |
| *FEMEDU* | 55 | 37.5 | 27.14 | 0.32 | 93.76 |

**Table A4: Correlation matrix**

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *COR* | 1 | | | | | | | | | | | | | | | |
| *MEDCOM* | 0.63 | 1 | | | | | | | | | | | | | | |
| *PRFDM* | 0.73 | 0.68 | 1 | | | | | | | | | | | | | |
| *LACKPC* | -0.68 | -0.61 | -0.91 | 1 | | | | | | | | | | | | |
| *GOVSIZE* | 0.38 | 0.17 | 0.27 | -0.27 | 1 | | | | | | | | | | | |
| *GOVWAGE* | -0.38 | -0.10 | -0.22 | 0.26 | -0.36 | 1 | | | | | | | | | | |
| *BUREAUD* | 0.86 | 0.50 | 0.65 | -0.57 | 0.26 | -0.42 | 1 | | | | | | | | | |
| *REGBURD* | 0.59 | 0.35 | 0.44 | -0.58 | 0.05 | -0.29 | 0.25 | 1 | | | | | | | | |
| *PRCD* | -0.69 | -0.40 | -0.48 | 0.46 | -0.10 | 0.26 | -0.63 | -0.51 | 1 | | | | | | | |
| *ETHNO* | -0.43 | -0.18 | -0.37 | 0.35 | -0.34 | 0.38 | -0.37 | 0.11 | 0.08 | 1 | | | | | | |
| *CPI* | 0.98 | 0.62 | 0.70 | -0.69 | 0.43 | -0.39 | 0.85 | 0.59 | -0.75 | -0.48 | 1 | | | | | |
| *EDUSYS* | 0.62 | 0.35 | 0.48 | -0.43 | 0.26 | -0.05 | 0.58 | 0.42 | -0.55 | -0.16 | 0.62 | 1 | | | | |
| *REGULAT* | -0.58 | -0.25 | -0.15 | 0.16 | -0.21 | 0.11 | -0.61 | -0.29 | 0.44 | 0.15 | -0.58 | -0.44 | 1 | | | |
| *REGQUA* | 0.81 | 0.54 | 0.70 | -0.72 | 0.23 | -0.29 | 0.77 | 0.63 | -0.56 | 0.43 | 0.84 | 0.64 | -0.55 | 1 | | |
| *POP* | -0.23 | -0.20 | -0.09 | 0.06 | -0.28 | 0.62 | -0.31 | -0.27 | 0.18 | 0.35 | -0.28 | -0.23 | 0.08 | -0.25 | 1 | |
| *FEMEDU* | 0.77 | 0.69 | 0.65 | -0.64 | 0.38 | -0.37 | 0.63 | 0.53 | -0.59 | -0.39 | 0.74 | 0.49 | -0.35 | 0.62 | -0.32 | |