

# Corruption: Data Analysis and Novel Solutions Using the Internet

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## Abstract

Internet-based information storage and retrieval has great potential for fighting corruption, especially in developing countries. I briefly review some of the micro and macro theory of corruption and relate it to various socio-economic and political variables. To quantify the burden of corruption I use Harrison and Vinod's (1992) 95% confidence interval for the marginal excess burden of taxation. In developing countries one dollar of corruption is estimated to impose a burden of \$1.67, which becomes very large when compounded over time. Corruption's economic harm is widely underestimated because the compounding is ignored. Cross sectional data analysis reveals the importance of "red tape" and "efficiency of judiciary." I also use the  $C_p$  statistic and Akaike information criterion (AIC) to choose a subset regression. This suggests the importance of economic freedom, income inequality and the size of the government variables. I suggest a small subsidy by the IMF, the World Bank and private organizations for a judicious use of the Internet to fight corruption. Since the current system offers almost zero reward to those who expose corruption, I propose a scheme of "honor points" to reward such informants. Corresponding "dishonor points" awarded on the Internet can focus attention on corrupt entities.

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# 1 Introduction and Dimensions of the Corruption Problem

This section introduces the dimensions of the corruption problem by noting that corruption hurts all countries and almost everyone. The points covered here are well summarized by the titles of following sections. (2) Theoretical models of corruption: A review. (3) Measuring the burden of corruption: A new approximation. (4) Description of interdisciplinary data. (5) Cross-sectional correlations and subset regressions. (6) New legal tools for incentive and jurisdiction problems. (7) Brain trust against hidden corruption and the Internet. (8) Main Internet proposal with honor and dishonor points. (9) Conclusions.

The corruption scandal in International Olympic Committee shows that it takes media attention and other pressures to expose and remove at least some of the corrupt individuals. Many such examples can be used to show that corruption hurts both rich and poor countries and nearly everyone from big investors to peasants. There are numerous stories of corruption breaking out weekly in almost every major newspaper around the world. The corrupt entities include building or safety inspectors, police, stock market insiders, various contract-awarding authorities, high-level political and military persons, etc. The entire executive commission of the European Union resigned on March 16, 1999 on charges of fraud and corruption. This commission had vast Europe-wide powers, distinguished members including former high ranking ministers who were paid over \$200,000 per year. As the old dictum goes, "Power corrupts, and absolute power corrupts absolutely." This corruption was revealed only after the European parliament sought to check the powers of the commission. Corruption is obviously an international problem requiring checks and balances and an international solution.

This paper argues that corruption in poor countries deserves far greater international attention and exposure than it receives. Corruption in private and government sectors of third world countries is more rampant and pernicious. Even nonprofit, religious and educational sectors are not immune to corruption. A huge barter economy and black market cash payment system is created to evade taxes. Many economic calculations are distorted to launder illicit cash incomes, while giving an appearance of legitimate business transactions. The ill effects of a choice of the Salt Lake City instead of a possibly more deserving city are less pernicious. When a corrupt official in a poor country chooses an economic development project simply because someone

gives him a large (undetectable) bribe, this involves serious waste of scarce resources. Corruption can mean favoring incompetent domestic monopolists with high tariffs. Such high tariffs can cause unemployment and reduced markets for exporting countries. Also, continued poverty in poor countries reduces the world economic growth. High costs, continued poverty, disease and slow economic growth in poor countries are terrible burdens indirectly affecting almost everyone.

A fight against corruption involves fighting human nature, which requires powerful incentives. A bribe occurs when both parties benefit and it is difficult to balance a large potential benefit with appropriate punishments and incentives. In 1977 US passed the Foreign Corrupt Practices Act. On May 21, 1997, the European Commission (EC) criminalized bribery of foreign public officials and removed a tax deduction for bribes. However, these laws have so far failed to reduce corruption in poor countries. Three fundamental problems with corruption are: (a) It is hidden, (b) Incentives for fighting it are improperly aligned, and (c) International jurisdiction is missing. This paper claims that all three problems can be simultaneously attacked by using the Internet. Details are discussed later in Sections 6 to 8.

The World Bank President James D. Wolfensohn and the IMF chief Michel Camdessus have recently begun to hold up disbursements of approved loans to corrupt countries. The World Bank now concedes that ignoring rampant corruption in Suharto's regime contributed to the economic implosion of Indonesia. There are similar corruption problems in Asia, Latin America and former Soviet block countries.

This paper claims that the international agencies have mostly ignored the potential of the Internet. The international community and private charitable foundations can help develop a repository of unbiased, fair and reliable information about corrupt entities. Also, information regarding innovative anti-corruption reforms can be placed on the web and copied elsewhere. A small subsidy by the IMF, the World Bank and private organizations can create several web sites to disseminate reliable corruption information. Even though international institutions have no direct jurisdiction to apprehend corrupt foreign entities, the olympics example shows that fighting corruption is not a hopeless task.

Dissemination of information about human rights abuses by Amnesty International and others has recently helped reduce human rights abuses. Similarly, the burden of corruption can be reduced by dissemination of information. Compared to human rights abuses, corruption information tends to be complicated. However, the Internet can readily handle such information, and provide further insights on hidden

corruption (see Section 7). Section 8 below describes how to reward those who expose corruption by crediting them with “honor points.” We also debit corrupt entities with “dishonor points,” both posted on the Internet. The honor/dishonor points may be viewed as Hall of Fame/Shame.

## **2 Theoretical Models of Corruption: A review**

Corruption is sometimes defined as selling of government services or property by bureaucrats (bribe-takers) for personal gain. Since private and nonprofit sectors can also have corruption, it is better to include unauthorized selling or waste of property in other sectors also. In general, any criminal behavior has several facets including social, economic, racial, psychological, political, legal, moral, religious, sexual, and medical. Hence, an interdisciplinary approach is generally followed in criminology, as can be seen from various criminology journals. However, since corruption as a form of criminal behavior involves exchange of property, it has attracted the attention of many economists. The corruption literature in economics is also large and a comprehensive survey remains outside the scope of this article.

In the corruption literature there is a general agreement among various disciplines that corruption hurts economic progress, human rights and the moral fabric of any society. It is generally agreed that free market competition and democracy will bring peace and prosperity. However, bringing true competition in traditional societies of poor countries is not easy. Corruption and unfair enforcement of contract laws seriously hurts the honest entrepreneur. Equality of opportunity to all entrepreneurs and good government are needed for true competition to take root in these societies. There is a need for measurement of the cumulative economic burden of corruption, for an empirical ranking of most relevant action variables, and for new web-based solutions. This paper hopes to fill that need.

### **2.1 Microeconomic Game Theoretic Viewpoint**

We start with the micro viewpoint of the individual bribe-taker. Becker (1968) considers a rational individual choosing between criminal and legal behavior in light of the probability of being detected and punished. Although bribery and corruption belong to the realm of nonmarket behavior, there is some evidence that criminals do behave rationally, even though explicit markets are absent. The criminal acts as

if her choice depends on expected costs and benefits. Some refinements to Becker's model in the literature incorporate: (i) utility functions, (ii) risk neutrality associated with being caught, and (iii) the effect of the wealth of the rational individual on the decision. Game theory provides powerful tools for situations when some bargaining between economic agents is involved. For example, we can assume that there is recursive "Nash bargaining" between the bribe-taker and bribe-giver. A game-theoretic computation of an equilibrium bribe is made in Basu *et al* (1992).

In general, these approaches do not lend themselves easily to empirical work. However, the viewpoint of individual bribe-taker can be used for certain kinds of empirical work as in Rijckghem and Weder (1997). They use Becker's (1968) model to formalize the choice of the bribe-taker in the context of his current wages. Their cross section study finds a negative relation between corruption and wages, implying a need to raise wages of bureaucrats. However, potential bribes are huge compared to civil service wages. A pay of \$200,000 mentioned earlier was apparently not enough to prevent corruption among the members of the executive commission of the European Union.

**Result 1:** (Absentee Owner Hazard): A failure of incentives occurs because the cooperative Nash equilibrium between the bribe-taker and the bribe-giver ignores the public interest. The public is the absent third party which owns the asset, not represented by anyone in the Nash bargain.

This is similar to the "moral hazard," arising from asymmetric information (See Sandmo, 1999), and agency costs arising from the "principal-agent problem." Mookherjee and Png's (1995) theory of "delegated enforcement" is also similar. To avoid confusion, I call this the "absentee owner hazard," where the public gets the worst deal. The bribe-taker is "selling" something that belongs to the absent third party. Unless detected, his cost is near zero. The bribe-giver gets a resource at a fraction of the real cost. Hence, there is a great incentive among both to keep the deal secret at the cost of the absent third party owner. The hazard merely summarizes all such reasons which make a fight against corruption difficult.

## 2.2 Can Corruption Be Beneficial?

It seems intuitively plausible that a bribe-taking bureaucrat will work harder on his job. Hence a question to the economist is whether costs associated with bribes exceed

these potential benefits. During the Kennedy administration, J. K. Galbraith, the economist ambassador to India, is quoted as saying, in jest, that “corruption is the oil that lets the giant wheels of India’s bureaucracy move smoothly.” Later, Leff (1964) suggested that corruption may help economic growth, since it may be the “speed money,” which reduces bureaucratic delays and induces hard work by bribe-taking government workers. However Santhanam (1964) notes that, in practice, the opposite is true. The bureaucrats deliberately cause delays to extract the largest bribes that the “market” can bear. Susan Rose-Ackerman (1996) provides a recent overview of this literature. For examples of regressive impact, see Susan Rose-Ackerman and Andrew Stone (1996).

Mookherjee and Png (1995) use an economic theory model of “delegated enforcement and strategic interaction” to conclude that it is in the social interest to “wipe out” corruption. A necessary condition for the bribe to occur is that both the bribe-giver and the bribe-taker must benefit. When a potential benefit exists, the potential fines and other punishments must exceed the benefit to reduce corruption. This implies that the penalty on the bribe-giver must exceed his benefit, which is rarely true. From the viewpoint of pure economists, Mookherjee and Png (1995) start with the assumption of no social cost of bribery, ignore all transfer payments and still are able to prove the following proposition. “For every outcome when bribery is profitable, there exists another in which bribery is not profitable, that yields higher welfare.” Thus, corruption can be proved to reduce social welfare, and cannot be beneficial in the long run.

### **2.3 Arguments for Compounding the Burden of Corruption**

The aggregative dynamic macroeconomic view of corruption in this subsection hopes to show that compounding of burden is appropriate. We first establish that capital accumulation is the main engine of growth. Consider an aggregative closed economy producing output  $Y(t)$  at time  $t$  using two homogeneous inputs: capital  $K(t)$  and labor  $L(t)$ . We let these inputs include the input of government services and public capital. The income identity states that the income can be either consumed or invested:  $Y(t) = C(t) + I(t)$ , where  $C(t)$  denotes consumption, and  $I(t)$  denotes investment.  $I(t) = (d/dt)K(t) + \delta K(t)$  is called the investment identity which states that economic investment  $I(t)$  equals change in capital stock measured by the time derivative  $(d/dt)$  of  $K(t)$  plus a depreciation term  $\delta K(t)$  proportional to the capital stock. Besides the two identities above, production function is the third pillar of neo-

classical growth theory. It is customary to define  $y(t) = Y(t)/L(t)$ ,  $k(t) = K(t)/L(t)$  and  $c(t) = C(t)/L(t)$ , which leads to a univariate production function  $y = f(k)$ , by measuring output and capital, per unit of labor and omitting the postscript (t). The fundamental differential equation of neoclassical economic growth, Intriligator (1971, p.402) or Barro and Sala-i-Martin (1995, p.18), is:

$$(dk/dt) = sf(k) - (n + \delta)k, \quad (1)$$

where  $n$  denotes the growth rate of population (labor force) and  $s$  is the savings rate. Dividing both sides by  $k$  gives  $(d \log k / dt)$  on the left side. The solution of the differential equation is

$$k = \exp[stf(k)/k - nt - \delta t]. \quad (2)$$

where the *compounding* over time arises because of raising to the power of  $e$  ( $= 2.7183$ , approximately) in the solution (2). To verify (2) take the log of both sides and differentiate with respect to  $t$ .

**Result 2:** Corruption reduces savings rate, efficiency of capital in producing output per employee and increases depreciation of inputs. This exponentially reduces the rate of capital accumulation over time. Hence the burden of corruption, should be compounded.

Economic growth refers to growth of output  $f(k)$ , which depends on capital accumulation  $k$ , the capital per employee. Equation (2) shows that accumulation of capital  $k$  is exponentially related to savings rate  $s$ ,  $f(k)/k$ , and  $\delta$ . One can verify the Result 2 by considering these three terms as follows. The bribe money needs to be hidden or quickly spent on conspicuous consumption. Only a small fraction is saved. It diverts productive resource from the entrepreneur to the corrupt official. Hence bribes reduce the savings rate  $s$ . Misappropriation of property by bureaucrats reduces the efficiency of both labor and capital inputs. This degradation reduces the efficiency of capital term  $f(k)/k$ , and increases the depreciation term  $\delta$ .

The above growth theory arguments use several simplifying assumptions, which are relaxed at the cost of more complicated models in the literature surveyed in Barro and Sala-i-Martin (1995). For example, optimization by economic agents, open economies, multiple sectors, endogenous growth, etc. can all be adjusted for the effects of corruption. Such extensions can provide greater realism to the basic result that the harm from corruption is large should be compounded.

A further extension is to use a simple modification of the usual theory for input augmentation by technological change, (See Barro and Sala-i-Martin, 1995, p.34). The modification is that corruption causes abridgment or contraction of inputs instead of augmentation. A still further extension for “open” economies is to note that corruption discourages foreign direct investment in poor countries. This can cause misallocation of trading patterns and inefficient prices paid for internationally traded goods and services, hurting both the rich and poor countries.

A bribe can saddle a poor country with a white elephant project, where economic costs far exceed the corrupt payment. A corrupt policy environment makes a value-subtracting investment appear nominally profitable, but ultimately reduce capital accumulation. Mauro’s (1995) international cross sectional study also finds that corruption lowers investment and hence economic growth.

## **2.4 Corruption As Illegal Taxation**

We have already listed several sources of the burden of corruption. This subsection continues that discussion and develops the theory needed for the numerical estimation of the burden developed in the following section. Shleifer and Vishny (1993) take an interdisciplinary view of corruption suggesting a vital role of government institutions and political processes, and focus on the effect of corruption on resource allocations. They consider a simplified model of a government produced good, such as an import license or a passport. Next, they assume that a corrupt official can restrict the supply of the good without being detected. Shleifer and Vishny use familiar diagrams from microeconomic theory of monopoly pricing to establish the analogy between commodity taxes and bribes. Wei (1997) considers bribery as a tax from the viewpoint of international investors.

Shleifer and Vishny suggest that we should introduce competition between bureaucrats to reduce corruption. This would involve giving jurisdiction to more than one bureaucracy to issue permits, perhaps with free entry. Although it is hard to imagine completely free entry of official permit-givers, it is always possible to introduce more open record keeping and greater supervision of permit-givers.

If a particular agency is found to be corrupt, I suggest that we should require that everyone must use only Fax, telegraph or E-mail for all contacts with such an agency. Then it is not difficult for law enforcement to monitor all communications made by the target agency to assess corruption. Reducing secret contacts between potential bribe-taker and bribe-giver is an obvious deterrent to all secret corrupt

deals. Another similar approach for cleaning a corrupt agency is to require only web-based relatively open processing of all permit applications. A still another tool for monitoring of corrupt agencies is web-based record-keeping of all complaints against permit-givers. If corruption is rampant, anonymous posting of complaints can be encouraged. The idea that anyone can read complaints on the web should deter even the most entrenched crony.

The graphics from economics textbooks describing Chamberlin's theory of monopolistic competition may be used to extend Shleifer and Vishny's (1993) results. The extension shows that corruption imposes layers of monopolies or quasi monopolies creating contrived scarcities leading to higher average costs, misallocation of resources and inefficiencies. Shleifer and Vishny also note the following very important result.

**Result 3:** Since corruption must be kept secret to avoid detection and punishment, it is "more distortionary than taxes."

Shleifer and Vishny give specific examples of distortions, where the official encourages substitution in favor of those items which yield a larger and/or less easily detected bribes. Bribe-takers can sometimes favor domestic monopolists by imposing tariffs and taxes on imports, follow rent-seeking activities to waste resources and capital in money laundering activities, demand fancier equipment than needed, and so forth. Since secrecy is important, Shleifer and Vishny argue that corrupt officials try to minimize the number of elite officials and suppress innovation by refusing the entry of newcomers. Sections 7 and 8 show how to make the Internet a valuable tool for tracing the corrupt transactions, and for removing the secrecy, respectively.

### **3 Measuring the Burden of Corruption: A New Approximation**

This section exploits Shleifer and Vishny's (1993) model, establishing the analogy between commodity taxes and bribes, to estimate the marginal excess burden (MEB) of corruption defined later in equation (3) of this section. Since neoclassical growth theory is too aggregative, a more comprehensive and detailed empirical study of distortions due to corruption can be based on a careful computation of the MEB. Following Browning (1987) and Stuart (1984) let us define MEB as the "per dollar surcharge that must be borne due to reduction in social welfare when tax revenue

increases by one dollar.” Any tax system imposes some distortions and other burdens on the productive economy. The welfare loss to the household sector occurs when taxation forces the consumer to a lower utility level.

Let  $T_m$  denote household’s total labor time of which  $L_n$  is devoted to taxed uses in normal employment and let  $H_m$  refer to home production or leisure. Thus, by definition,  $T_m = L_n + H_m$ . Let  $w$  denote the average wage rate and let  $\tau$  denote average tax rate on labor income  $wL_n$ . The government budget is assumed to balance with revenue equal to expenditures. That is,  $\tau wL_n = G + R$ , where  $G$  denotes government consumption and  $R$  denotes government transfer payments. Further assume that we have a linear relation:  $G = a + b(\tau wL_n)$ , whose slope  $b$  is used later in eq. (3).

An equilibrium is defined by Stuart (1984) from a numerical solution of ten equations of his complete model involving production and utility functions and first order conditions for static utility maximization. Let  $\Delta C$  denote the numeraire value of the reduction in household utility because taxes transfer money from the household sector to the government, leaving less for the household to consume. The  $\Delta C$  is measured as the amount of taxed-sector output that would just restore the household to the original utility level. Let  $\Delta(\tau wL_n)$  denote a change in tax revenue. Stuart then defines a static general equilibrium measure of the burden from legal taxation as

$$\text{MEB} = \Delta C / \Delta(\tau wL_n) - b. \quad (3)$$

Browning (1987) uses extensions of his own earlier static models to suggest that the benefits from taxation should be in the range of \$1.15 to \$1.50 to justify a one dollar of distortion caused by every additional (perfectly legal) tax dollar. Stuart’s general equilibrium calculations are essentially similar and consistent with Browning’s estimates.

Applied general equilibrium (AGE) analysis models, surveyed by Shoven and Whalley (1984), can obviously refine the MEB calculation with much greater detail, richer choice of functional forms and superior dynamic optimization algorithms. Accordingly, Ballard *et al* (1985) developed a more sophisticated AGE model to estimate the MEB of the US tax system. A typical AGE model considers the effects of a 1% increase in all tax rates, determine the resulting increase in government revenues and reduction in household welfare. These are measured relative to a common numeraire. Ballard *et al*’s (1984) estimate is 0.332.

A comparable estimate in Harrison and Vinod (1992) is 0.45 along with a 95% confidence interval from 0.33 to 0.67. Recall Result 3 that due to secrecy, corruption is

“more distortionary than taxes.” Hence I calculate a lower limit on the distortion cost of corruption by measuring corruption in numeraire units of government tax income. Then, a one dollar increase in corruption will create a burden equal to \$1.45. This result, using Harrison and Vinod’s ‘point estimate’ for US data, gives a conservative lower limit on the economic cost of corruption for the US, and seems to be reasonable for developed countries. In developing countries the burden of corruption is known to be much larger. Hence, I propose using Harrison-Vinod’s upper limit of their 95% confidence interval. Ideally we need a separate AGE study of each poor country’s corruption burden. However, such studies are too expensive, if at all possible; since they require data about secret activities where no records are kept.

Thus, a dollar reduction in corruption will benefit developing countries at least \$1.67. These AGE estimates of the burden suggest a numerically important negative impact of corruption. Result 2 of Section 2.3 has shown that we must use compounding to assess the long term effect of the burden of corruption. Compounding raises \$1.67 to a huge burden in just a few years. The estimation of the burden with reference to AGE models for MEB and its compounding are new concepts in this paper.

Recently, *The New York Times* (Jan. 13, 1999, page A8) reported a major crack-down in China against corruption by hauling out one high profile corrupt official after another every week. The report mentions harsh punishments for the leader of the largest tobacco company or deputy minister of public security. China’s transition to a market economy will succeed better if it avoids Soviet-style heavy corruption burden.

## 4 Description of Interdisciplinary Data

This section describes my interdisciplinary international data for an empirical study of corruption. I include all relevant variables suggested by researchers in various fields. As with most empirical work in the social sciences, one cannot avoid using some proxies and indices, which only approximate the true underlying concepts.

Measuring corruption is a difficult task, since it is an illegal activity and records of such activities are never kept, and besides, if any information does surface, the bribe-takers try to quickly destroy and discredit it. Some even proceed to punish any informant, his family and his business interests. Corruption must be measured indirectly. I use Transparency International’s corruption perception index released in Berlin on September 22, 1998. The index reports perceptions of the degree of corrup-

tion as seen by business people, professional risk analysts and the general public. It ranges from 0 (highly corrupt) to 10 (highly clean). At least three surveys are used and larger countries receive up to twelve surveys. It is convenient to think of this as a corruption ‘purity index,’ rather than stick with the Transparency International’s CPI terminology, which is confused with the consumer price index. My term purity index “PI” is consistent with the intuition that a higher number (10) is associated with greater purity or less perceived corruption.

For descriptive statistics, I follow the convention of reporting six items in parentheses separated by commas: (Q1, Median, Mean, Q3, N and Standard deviation), where  $Q_i$  denotes  $i$ -th quartile and N is the number of data points. For “PI” I have (2.925 4.05, 4.778, 6.4, N=78, 2.403). For brevity, I adopt the convention of explicitly identifying N only. For example  $Q_1=2.925$  is the first number and  $Q_3=6.4$  is the fourth number for PI.

Now I list fifteen variables which are potentially related to corruption. The list is influenced by the availability of data, and follows the convention of briefly reporting the six descriptive statistics (Q1, Median, Mean, Q3, N and Standard deviation) in a fixed order. I use UNDP (1998) data for my first ten variables.

- 1) **Lpcgnp**=log of per capita GNP in 1997.(1118, 2965, 9108, 16310, N=78, 11490)
- 2) **Grwth**=average annual growth rate between 1996 and 1997. (0.975, 2.8, 2.944, 4.825, N=68, 3.459)
- 3) **Lgnp2**=log of per capita GNP in 1997 measured in purchasing power parity (PPP) exchange rates and units of 100. (33.55, 64.2, 98.34, 168, N=76, 83.19)
- 4) **Govt**=general government consumption as a percent of GDP. (10, 14, 14.71, 18, N=77, 5.304)
- 5) **Trade**=trade as a percent of GDP. (46, 62, 75.49, 92.5, N=78, 52.85). Note that this number can be larger than 100. For Hong Kong it is 356.
- 6) **Exports**=exports as a percent of GDP. ( 22, 30, 36.56, 43.5, N=78, 26.42)
- 7) **Litrcy**=adult literacy rate. (81.58, 92.95, 85.66, 99, N=78, 17.15)
- 8) **School**=mean years of schooling. (4, 6.45, 6.553, 9.2, N=78, 3.393)
- 9) **Urban**=urban population as a percent of total population. (45, 63.5, 61.56, 77, N=78, 21.25)
- 10) **Ineq**=percent of income (or consumption) enjoyed by the richest 20% earners. (39.3, 44.7, 45.83, 51.8 N=69, 8.894)
- 11) **EcFree**=index of economic freedom defined over the range 0 to 10 where 10 means most free based on 1996 rankings of countries in the *Wall Street Journal*, Dec.

3, 1998. The index goes from 1 for Hong Kong to 152 for the least free Vietnam. Descriptive statistics for the original data are (25.5, 54, 57.41, 88.75, N=78, 38.14). I make them comparable to my dependent variable purity index “PI” as follows. I use a linear transformation to obtain a new index  $y = ax + b$ , where  $x$  denotes the original index. Now  $y$  should range from 0 to 10. I simply solve two equations in two unknowns  $a$  and  $b$  such that, for example,  $y = 0$  for Vietnam and  $y = 10$  for Hong Kong. The solution is:  $a = (-10/151)$  and  $b = 10 + (10/151)$ . In short, the data are such that EcFree=10 for the country having the greatest economic freedom from Government controls and EcFree=0 for the controlled economy. The descriptive statistics become (4.189, 6.49, 6.264, 8.377, N=78, 2.526)

The following data are from Mauro (1995), and detailed descriptions are omitted for brevity. The descriptive statistics are reported as before.

12) **Redtp**= red tape or the degree to which regulatory environment forces approvals and permits and the degree to which it is an obstacle to business. (4.5, 6.33, 6.434, 8.5, N=53, 2.275)

13) **Effjud**= efficiency of the judiciary, as it affects business. (6, 7.25, 7.548, 10, N=53, 2.031)

14) **PolStb**= political stability and the degree to which the process becomes violent or tends to disintegrate. (6, 7.25, 7.548, 10, N=53, 2.031)

15) **EthLF**= ethno-linguistic fractionalization index, which equals

$$\mathbf{EthLF} = 1 - \sum_{i=1}^I (n_i/N)^2 \quad (4)$$

where  $i = 1, \dots, I$ ;  $n_i$  is the number of people in the  $i^{th}$  ethno-linguistic group, and  $I$  is the number of such groups. One of the novelties in Mauro (1995) is the use of eq. (4). This index equals 89 for a diverse country like India, 75 for Canada, 50 for United States, 32 for UK, 7 for Brazil and only 1 for a homogeneous society like Japan. The descriptive statistics are: (4.5, 6.33, 6.434, 8.5, N=53, 2.275)

It is convenient to use the above abbreviations throughout the paper. Note that the relevance of some of the fifteen variables in a study of corruption is already discussed or obvious. For example, the first three per capita income and growth variables are obvious choices for economists and have been used before in the literature. However, some further discussion is appropriate at this point.

From the discussion of MEB, it is clear that “Govt” belongs in the list. The trade and export variables are included partly because economic literature suggests that “open” economies promote competition and improved allocation of resources

across national boundaries. The empirical results in Rodrik (1998) suggest that open economies with greater participation in international trade tend to have bigger governments. Rodrik argues that greater reliance on international markets involves greater risks to the national economy and bigger governments are needed to reduce this risk. The presence of foreign competition encourages efficiencies, the need for risk reduction requires a larger bureaucracy, and greater dealings with foreigners offers greater opportunities for easily concealed bribes in a foreign currency paid abroad. Thus, it is an empirical question whether open economies have greater or less corruption.

I include the “Litrcy, School and Urban” as sociological variables and there are references to them in the popular discussion of corruption. Recall that I have defined corruption as a property crime somewhat similar to burglary of government resources. Chiu and Madden (1998) have several theoretical arguments showing that increases in income inequality lead to increases in burglary. Since one hypothesis of interest is whether income inequality is positively correlated with corruption, it is useful to include the “Ineq” variable in my list. The inclusion of “EcFree” variable is motivated by references in the popular press including the Wall Street Journal that economic freedom leads to greater efficiency, transparency and hence reduced corruption. The “Redtp” variable is analogous to “EcFree”.

The “Effjud” is included since it affects the probability that a bribe-taker is caught and punished, which is important in the micro economic discussion above. The World Bank (1997) report discusses why “separation of powers” between the executive and judiciary is needed, and how anti-corruption laws have been abused in some Latin American countries for party politics. The same report also discusses management and procedural reform, reducing of *ex parte* communication between judges and litigants, availability of small claims courts, alternative dispute resolution methods, legal aid to the poor, support of legal education, prevention of bribes extracted by court staff who are gatekeepers to the legal process, etc.

The “PolStb” variable is a proxy for political legitimacy of the current government, which in turn depends on equity, fairness and whether the rules of the game and transaction costs of rent-seeking are known beforehand. Political leaders can use corruption to reward supporters, buy the support of key groups, silence some opponents, manage ethnic diversity, or simply as a resource to fight elections. If this is the case, only a popular outcry against corruption, which challenges the power structure can reduce it.

## 5 Cross-sectional Correlations and Subset Regressions

Having chosen the list of variables to be included, I first study the simple correlation coefficients between all pairs of variables with special emphasis on correlations with the corruption purity index “PI”. If  $N$  denotes the number of observations, define the sample correlation coefficient with the denominator  $(N-1)$ . In the available international data sets we acknowledge the common problem of missing data for different countries and for different variables. For computation of correlation coefficients it is possible not to waste any information by using information from all available pairs of data. Of course, this means that different country pair correlations are based on different  $(N-1)$  values in the denominator.

Countries have a unique history, geography and various special circumstances. Hence international data are often subject to a serious problem of “outliers.” The presence of outliers can hide or distort more important general relationships which hold for the majority of countries excluding the outliers. However, generally accepted characterization of individual observations as outliers is not available. The object of “trimming” is to eliminate the influence of a certain pre-specified percent of extreme observations from the computations, without explicitly calling them as outliers. Such trimming does focus attention on the main relationships. I trim respectively 5, 10 or 20 percent of extreme observations. I use the S-Plus software (Version 4.5) which does the trimming only after removing missing data, to ensure that the sample size  $N$  for different variables is the same.

Table 1 reports ranked correlation coefficients between PI (corruption purity index) and 15 listed variables. There are separate columns for correlations after 5%, 10% and 20% trimming. Note that these simple correlations suggest the most important bivariate relations. From the largest to the smallest absolute values of correlation coefficients the listing of the variables from the most important to the least important in this sense is: Redtp, Effjud, Lpcgnp, Lgnp2, EcFree, School, PolStb, Urban, Litrcy, Govt, EthLF, Ineq, Export, Trade and Grwth. Each column of Table 1 has the superscript (1) for the variable with the highest correlation with PI. Superscripts (2), (3) and (15) are respectively for the second highest and third highest and the lowest absolute correlations. The correlation rankings and values change from one column to the next. For example, economic freedom (EcFree) has a correlation of 0.72 with the corruption purity index (PI), which increases to 0.88 upon trimming of

20% of extreme data values.

**Table 1 Correlation Coefficients Between PI and Other Variables.**

Variable	All data	5% trim	10% trim	20% trim
EthLF	-0.4125	-0.5250	-0.5680	-0.7240
Ineq	-0.3843	-0.5230	-0.5748	-0.6905
Grwth	0.0469 <sup>(15)</sup>	0.2442	0.2272	0.2167
Trade	0.2609	0.0969 <sup>(15)</sup>	0.0856 <sup>(15)</sup>	0.1422 <sup>(15)</sup>
Export	0.3090	0.1962	0.1578	0.1817
Govt	0.4756	0.5705	0.6415	0.7090
Litrcty	0.4827	0.6686	0.7321	0.8274
Urban	0.5422	0.7625	0.7917	0.7548
PolStb	0.6319	0.7015	0.7092	0.7324
School	0.7101	0.8861 <sup>(3)</sup>	0.9087 <sup>(2)</sup>	0.9371 <sup>(1)</sup>
EcFree	0.7168	0.8428	0.8626	0.8761
Lgnp2	0.7895	0.8616	0.8795	0.9066
Lpcgnp	0.8268 <sup>(3)</sup>	0.8925 <sup>(2)</sup>	0.9083 <sup>(3)</sup>	0.9269 <sup>(3)</sup>
Effjud	0.8541 <sup>(2)</sup>	0.8655	0.8953	0.9224
Redtp	0.8947 <sup>(1)</sup>	0.9123 <sup>(1)</sup>	0.9229 <sup>(1)</sup>	0.9330 <sup>(2)</sup>

Superscripts (1), (2), (3) and (15) indicate within column ranks.

A clear policy implication of Table 1 ranking is that countries could reduce corruption by reducing redtape, making their judiciary more efficient and increasing economic freedom and schooling. It is also tempting to conclude that increasing per capita GNP will reduce corruption, except that previous studies, including Mauro (1995), have shown that income may be an endogenous variable. Another way of thinking about this is that there is a vicious cycle, where corruption cannot be reduced without increasing the income, and the income cannot be increased without reducing corruption. A structural model for corruption would have to regard income and corruption as jointly dependent variables, subject to the endogeneity problem. In any case, the data suggest that rich countries tend to have less corruption.

**Table 2a Complete Correlation Matrix**

Variable	PI	EthLF	Ineq	Grwth	Trade	Export	Govt	Litrcy
PI	1.000	-0.722	-0.690	0.218	0.141	0.181	0.710	0.829
EthLF	-0.411	1.000	0.410	0.098	0.118	-0.252	-0.362	-0.527
Ineq	-0.384	0.178	1.000	-0.179	0.238	0.210	-0.590	-0.751
Grwth	0.047	-0.181	0.084	1.000	0.314	0.396	-0.131	0.163
Trade	0.261	-0.103	-0.053	0.173	1.000	0.974	0.210	-0.316
Export	0.309	-0.101	-0.091	0.177	0.985	1.000	0.368	-0.079
Govt	0.476	-0.268	-0.414	0.018	0.034	0.018	1.000	0.130
Litrcy	0.483	-0.522	-0.334	0.081	0.166	0.192	0.384	1.000
Urban	0.541	-0.590	-0.282	0.151	0.221	0.261	0.319	0.609
PolStb	0.631	-0.310	-0.502	0.119	0.307	0.369	0.149	0.362
School	0.710	-0.532	-0.559	0.021	0.021	0.062	0.496	0.794
EcFree	0.717	-0.308	-0.162	-0.015	0.245	0.267	0.210	0.462
Lpgnp2	0.790	-0.570	-0.369	0.111	0.201	0.261	0.330	0.702
Lpcgnp	0.827	-0.609	-0.400	0.085	0.178	0.242	0.378	0.687
Effjud	0.854	-0.310	-0.453	0.055	0.333	0.360	0.453	0.409
Redtp	0.895	-0.210	-0.304	0.093	0.358	0.410	0.392	0.514

Lower triangle has all data correlations.

Upper triangle has correlations after 20 % trimming.

See Table 2b for the remaining columns.

Note that “School, PolStb, Urban and Litrcy” have a higher correlation with “PI” than “Govt, Ineq, Export, Trade and Grwth.” This hints at some interesting results. For example, social and political variables deserve greater attention than some economic variables. A big government *per se* may not necessarily encourage corruption, if it is well run, with an efficient judiciary and reduced red tape. At first glance, these low correlations cast doubt on Chiu and Madden’s (1998) theory showing that increased income inequality leads to increased burglary, since corruption is also a property crime. However, we shall see later that “Ineq” contributes important independent information to the set of variables in my subset regression model.

The correlation between “PI” and “School” is 0.7101 for the entire data and 0.9371 (or the largest) for the 20% trimmed data. This suggests a great potential importance of schooling in reducing corruption, and that this relation is subject to outliers or major exceptions. In general, 20% trimming seems to increase the absolute

value of correlation coefficients, except that the correlation with “Trade and Export” decreases after trimming.

**Table 2b Complete Correlation Matrix**

Variable	Urban	PolStb	School	EcFree	Lpgnp2	Lpcgnp	Effjud	Redtp
PI	0.750	0.731	0.940	0.880	0.908	0.929	0.921	0.930
EthLF	-0.738	-0.578	-0.728	-0.669	-0.805	-0.822	-0.565	-0.648
Ineq	-0.410	-0.721	-0.660	-0.490	-0.659	-0.722	-0.578	-0.580
Grwth	0.192	0.228	0.281	0.181	0.175	0.128	0.240	0.259
Trade	-0.160	-0.057	0.161	0.111	-0.134	-0.084	0.092	0.288
Export	0.122	0.292	0.308	0.261	0.000	0.055	0.291	0.322
Govt	0.370	0.329	0.680	0.370	0.440	0.520	0.412	0.540
Litrcty	0.720	0.808	0.940	0.852	0.857	0.876	0.804	0.702
Urban	1.000	0.649	0.820	0.870	0.830	0.831	0.758	0.800
PolStb	0.450	1.000	0.839	0.839	0.813	0.839	0.890	0.740
School	0.708	0.522	1.000	0.900	0.939	0.958	0.921	0.900
EcFree	0.511	0.472	0.606	1.000	0.909	0.883	0.923	0.880
Lpgnp2	0.730	0.600	0.819	0.758	1.000	0.991	0.898	0.889
Lpcgnp	0.748	0.671	0.840	0.769	0.968	1.000	0.936	0.892
Effjud	0.548	0.643	0.702	0.502	0.621	0.677	1.000	0.923
Redtp	0.601	0.609	0.708	0.627	0.691	0.735	0.787	1.000

Lower triangle has all data, upper triangle has correlations after 20 % trimming. See Table 2a for the remaining columns.

Tables 2a and 2b report a 16 x 16 matrix of correlation coefficients among the “PI” and the 15 variables listed above. These matrices are symmetric and this wastes space in reporting. Hence the lower triangular matrices in Tables 2a and 2b have simple correlation coefficients using all available data for each pair, where the calculations are made to ensure unbiased estimators. The upper triangular portions of Tables 2a and 2b contain 20% trimmed correlation coefficients. These are reported for completeness and for the convenience of the reader who may be interested in other pairs of relationships.

## 5.1 A Subset Regression Model

Now I propose a more sophisticated subset regression model for these data. Since these are interdisciplinary data, the theory from any particular discipline is not likely to be appropriate. Hence, a formal search for a reasonable regression model is based on Mallows' (1973)  $C_p$  statistic, which is popular among scientists and engineers, but much less frequently used in social sciences. Akaike Information Criterion (AIC) is related to the likelihood version of  $C_p$  by the relation:  $AIC = s^2(C_p + N)$ , where  $s^2$  is the usual unbiased estimate of  $\sigma^2$  in the regression model. The intuition behind AIC is to maximize the 'information content' of the final subset, and impose a penalty for including too many regressors. The  $C_p$  criterion seeks a subset regression which is closest to the true regression in terms of "mean squared error," or expected squared Euclidean distance between estimates and the true values of a parameter vector  $\beta$ .

Before using subset methods, Section 4 has already discussed why the fifteen variables are relevant. Only after including relevant variables I let a subset algorithm help choose a model according to certain well established criteria and steps. Clearly, these criteria do not favor one discipline over another.

The most general (encompassing) model for the algorithm is:

$$PI = f \{ Lpcgnp, Grwth, Trade, Export, Litrcy, School, Urban, Govt, Lgnp2, EcFree, Effjud, Redtp, PolStb, EthLF, Ineq \}.$$

Given the encompassing set, the subset selection algorithm chooses the optimal subset, by the  $C_p$  and AIC criteria, leading to the "best" model, generally making sure that the chosen regressors do not have too low t-values.

The initial  $AIC = 38.5924$ . The algorithm reports  $C_p$  for each step and the term with the lowest  $C_p$  is dropped first. In this case, "Urban" had degrees of freedom ( $df=1$ ), Residual sum of squares = 16.93833 and  $C_p = 37.25011$ , which is the lowest. Single term deletions and additions are attempted and extreme versions where only one or two variables are present (besides the intercept) are also considered. The "Trade and Urban" variables are deleted early. The algorithm deletes and adds regressors until it finds the "best" model.

The "best" model parsimoniously explains the variation in the dependent variable "PI" and reported in the first four columns of Table 3. The regressors in the first column yield  $AIC = 30.5316$ , which is the lowest achieved by any subset from the complete set of fifteen regressors listed in Section 4.

One problem with this subset is that it includes the “Lpcgnp” (income level) variable as a regressor, which is not exogenous. Hence I consider a second encompassing set, which excludes “Lpcgnp and Lpgnp2” variables:

$$PI = f \{ \text{Grwth, Trade, Export, Litrcy, School, Urban, Govt, EcFree, Effjud, Redtp, PolStb, EthLF, Ineq} \}.$$

The “best” model for this encompassing set is similar to the earlier one, except that the “PolStb” is now excluded. The reduced encompassing set raises the ultimate AIC by 0.818 to 31.3496. The resulting coefficients, standard errors and  $t$  values are reported in the last three columns of Table 3. If we interpret the absolute size of  $t$  values as indicating the importance of the variable, the top three are “EcFree, Redtp, Govt” from the last column.

**Table 3: Regression of Purity Index On Other Variables**

Variable	Coeff.	Std.Error	t value	Coeff.	Std.Error	t value
Intercept	-1.4820	1.6081	-0.9216	-1.1173	1.2796	-0.8732
Lpcgnp	0.3954	0.1785	2.2152	–	–	–
Grwth	0.1014	0.0504	2.0127	0.1258	0.0517	2.4324
Ineq	-0.0390	0.0177	-2.2020	-0.0422	0.0178	-2.3783
Govt	0.0922	0.0296	3.1159	0.1125	0.0296	3.8012
EcFree	0.2203	0.0959	2.2979	0.3529	0.0769	4.5894
Effjud	0.2685	0.1280	2.0969	0.1838	0.1155	1.5911
Redtp	0.3913	0.1034	3.7828	0.4347	0.1054	4.1229
PolStb	-0.2885	0.1759	-1.6402	–	–	–

Left Panel: Residual standard error= 0.7571, R-Squared= 0.9357,  
 $F(8,32)= 58.25$ ,with the p-value=0.0  
Right Panel: Residual standard error=0.7952, R-Squared= 0.9247,  
 $F(6,34)=69.57$ , p-value=0.0

It is interesting that after including the top two socio-political variables (Effjud and Redtp), other socio-political variables such as “School, Urban, EthLF” do not contribute independent additional explanatory power. Similarly, international trade variables “Trade and Export” are eliminated. The respective correlations of “Grwth” with “Lpgnp2 and Lpcgnp” are only 0.111 and 0.085, in Table 2a. This may be because a poor country with low per capita income *level* can grow faster than a rich

country. Hence, I do not initially treat “Grwth” as an endogenous variable. However, when I do exclude “Grwth,” the optimal subset of regressors in decreasing order of absolute t-values has “Redtp, EcFree, Govt, and Ineq,” where “Effjud” is now absent. For brevity, I do not report further details.

Thus the subset regression model supplements the results of correlation analysis. Simple correlation of “Govt” with “PI” is 0.4756, which becomes 0.7090 after 20% trimming in Table 1. This suggests that bigger government can be helpful in reducing corruption. The optimal subset regressions also include the “Govt” variable. Rodrik (1998) explains the positive role of “Govt.” It is interesting to note that “Trade and Export” variables do not enter the optimal regression model and whose simple correlations with “PI” *decrease*, rather than increase after 20% trimming. Some authors have argued that international trade and export-oriented “open” economies have to compete in world markets, and are therefore less corrupt. My empirical results do not support this view.

## 5.2 Implications For a Fight Against Corruption

After combining the results of both correlation and regression analyses the top five actions recommended for reducing corruption in order of importance are: (1) reduce red tape, (2) increase efficiency of the judiciary, (3) increase per capita GNP, (4) increase economic freedom and schooling, and (5) reduce income inequality.

To reduce red tape one requires elimination of all unnecessary regulations, government licenses, and permits. Poor countries suffer from chronic shortages of almost everything, and it is tempting to impose rationing, so that most vulnerable people do not unduly suffer from shortage of vital supplies. Unfortunately higher prices are needed to match supply with demand, to create incentives for greater production and for reduced waste. Rationing becomes politically expedient and creates several regulations that last far too long, and actually end up hurting the most vulnerable, as well as, the honest. A recent World Bank report mentions how well-intentioned policies can produce unintended opportunities for corruption. Wherever possible, increased competition among bureaucrats should be injected to reduce red tape.

The second action item above is improving the efficiency of the judiciary. This requires better enforcement of existing laws. That is, the probability of being punished has to increase for both the bribe-giver and bribe-taker. Sections 6 and 7 below discuss specific recommendations creating proper incentives by using some old and some new legal tools. It suffices to mention here that the current system, which offers rare

punishments to the corrupt and almost zero reward to those who expose corruption must change, if we are to succeed in fighting corruption. Active support to those fighting corruption in poor countries, including investigative journalists, can be in the form of modern surveillance equipment: precision cameras to copy documents, easily hidden video or still cameras, hidden tape recording devices, etc.

The third action item in fighting corruption is raising the per capita GNP. I have noted above a vicious cycle when low per capita income itself causes corruption and makes the burden of corruption even greater. A well designed foreign aid program which incorporates above actions can break the vicious cycle. The Internet subsidy proposed later in Section 8 can help the action items 1 and 4 of this section as follows. Foreign aid focused on the internet and information processing technologies can improve organizational efficiency and reduce red tape, and the web can obviously help improve education in numerous ways.

## **6 New Legal Tools for Incentive and Jurisdiction Problems**

This separate section emphasizes legal tools for fighting corruption. Kaufman (1997) laments that all the corruption analyses so far has merely inspired international conferences, rather than action in the international arena. However, the World Bank and the IMF did withhold some loans to the most corrupt countries. Klitgaard (1988) also had made useful and specific suggestions for setting up anti-corruption agencies within the jurisdiction of a country. He refers to the important work by Justice Efren Plana of the Philippines' Bureau of Internal Revenue.

Modern social sciences agree that if a desired human behavior fails to materialize despite efforts, we need more effective and consistent stimuli or incentives. The evidence that corruption is getting worse in developing countries suggests that we need the following legislative reforms designed to create more effective and consistent incentive structures.

**Incentives for Corruption Informants:** As mentioned earlier, the current system offers almost zero reward to those who expose corruption at the risk of personal and family safety, job and business interests. In the US there are "whistle blower" protection laws to help those who risk their jobs when they expose illegal actions of their superiors, and "bounty-hunter" laws, which reward those who apprehend

dangerous fugitive criminals. With minor modifications, similar legislation should be passed, especially in poor countries, to reward and protect corruption informants.

**Incentives for Honest Officials:** Another incentive failure occurs in a lack of moral support and encouragement to the honest official who refuses to accept bribes. In countries where corruption is too widespread, the honest official is ostracized and made a scapegoat by the corrupt culture of the majority in the bureaucracy. The current laws against offering bribes do not reward the official who exposes the bribe-givers. A new kind of bounty law is needed, which will involve payment of small percentage of bribe offered to the honest official, in exchange for solid proof that a bribe was offered. Beyond money rewards the bribe-refusers should also be honored in public to raise their status.

**Corruption Deterrence:** The current system in poor countries clearly fails to punish the corrupt. An important reason for this failure is that the prosecutors responsible for punishing the corrupt are often subordinate to the corrupt superior officers. For example, no prosecutor could have controlled Ex-President Marcos of the Philippines, who stole millions of dollars from the national treasury. In the current system, all legal sanctions such as fines or jail terms against corrupt entities depend exclusively on the location where corruption takes place. Since there is no incentive for the prosecutor to punish a corrupt superior officer, US law has 'special prosecutors.' Developing countries need to use similar legal tools.

**International Corruption Tribunal with Limited Powers:** The current international organizations (World Bank, IMF, UN) have no jurisdiction in the matter of corruption. Groups like the Amnesty International also have no jurisdiction to bring human rights abusers to justice. However, they can reduce such abuses by publicly exposing the abusers. Similarly groups like Transparency International are exposing corruption. To support such work, I suggest establishment of an international 'corruption tribunal.' It can be less powerful than the 'war crimes tribunal' initiated after the second world war. Since corruption is only a property crime, sovereign countries cannot be expected to grant to any international tribunal the power to fine or jail its (allegedly corrupt) citizens. If such sweeping powers are sought, the problem of checking the powers of the tribunal itself will become important. The tribunal needs limited powers to collect and evaluate evidence, hold hearings and formally dishonor any corrupt entity. Once established, the tribunal may be given the additional powers to order the corrupt party to 'cease and desist' the corrupt acts, and provide restitution to the victims of corruption. More importantly, the tribunal should have the

power to protect (*e.g.* from libel litigation) those who expose corruption without malice. To achieve respect and credibility, the tribunal should have the power to punish those who maliciously accuse innocent parties of corruption. Such a tribunal with limited budget, responsibilities and powers can indeed earn international respect, and help create a new deterrent for corruption.

Since the corruption burden compounds, we cannot wait until full details of the proposed tribunal are worked out. In the meantime, one can use the Internet, as explained in Section 8 below, to create a limited deterrent for corruption. This is a relatively inexpensive way to help the suffering masses in poor countries, who must ultimately bear the unfair share of the burden of corruption.

## **7 Brain Trust Against Hidden Corruption and the Internet**

Since corruption is intrinsically hidden, this section proposes creation of an international brain trust of professional accountants, statisticians and other technical experts to exploit the Internet and uncover hidden corruption. Such a brain trust is a low cost way of helping poor countries fight corruption. It should suggest how to modernize audit laws, train staff, and create watchdog public accounts committees.

My arguments for creating the brain trust are as follows. A number of tasks and services provided by the bureaucrats around the world are quite similar across countries. For example, tax collection, safety inspections, grant of visas for travel, passports, building permits, banking, insurance, buying of supplies, etc. It is possible to compare the effectiveness of these services across countries and learn from comparative data. Some of the comparative data can be collected on the web.

The brain trust can use computer-based tools for finding discrepancies in these comparative data. For example, an inter-regional and international cost and price benchmarking is possible. Any discrepancies can help locate hidden corruption. For example, comparing customs revenue receipts with internationally available bank data on money transfers can reveal hidden corruption.

Information about innovative anti-corruption reforms in one country are often worthy of replication elsewhere. Recall that reducing red tape is given top priority by our correlation and regression models. Specific instances of unnecessary regulations and permits should be exposed by the brain trust. We have mentioned the possibil-

ity of processing of permits on an open and transparent medium like the web, and possible tools for reducing secret contacts between potential bribe-taker and bribe-giver. The brain trust should disseminate information about successful methods of fighting corruption on the Internet. It can also compile information about anonymous corruption complaints.

## **8 Main Internet Proposal With Honor and Dishonor Points**

In this section I describe the details of my main proposal for using the Internet to fight corruption. Some references to the use of the web have already been made above. Internet-based information storage and retrieval has a great potential for fighting corruption, especially in developing countries.

I propose that we create several web pages around the world to post reliable information regarding bribe-giving individuals and corporations, and bribe-receiving bureaucrats. This would require a small subsidy by the IMF, the World Bank, private organizations and/or charitable foundations. The web will provide a very long shelf-life, quick updating, world-wide reach and easy access to all factual information about corruption. The local newspaper stories of corruption need to be classified and compiled at convenient Internet locations for easy reference.

The Internet can be used in a novel way to increase incentives for better law enforcement as follows. In light of the ‘absentee owner hazard,’ (See Result 1) fighting corruption needs consistent and adequate incentives discussed earlier. To create such incentives we can reward those who expose corruption by honoring them right on the Internet. For every dollar of graft we credit the informant with one “honor point,” and debit the corrupt entity with a “dishonor point.” The honest official who is offered a bribe, but refuses to take it, should also be rewarded with “honor points,” if she provides documentary evidence against bribe-givers.

Ideally, those who earn honor points on authorized web sites should get tangible rewards from an international charitable fund, possibly replenished by a small percentage of the fines paid by the corrupt entities. If the fund is too small, a lottery can be used to publicize, honor and reward at least those few individuals who accumulate a large number of honor points. When the honor/dishonor points are properly established in public’s mind, I expect the local media to use honor and dishonor points in

headlines of their stories on corrupt entities and corruption fighters. In traditional societies of most poor countries honor can be a powerful motivator. The false accusers should also be charged “dishonor points,” and corruption informants should have the option to remain anonymous.

The unit of measurement of honor/dishonor points on the web should be: one point for one US dollar worth of corruption, for convenient international comparisons. The local web sites can keep track of these points. For discussion purposes one can compound the dishonor points by multiplying them by 1.67 raised to a power, to measure the dynamic burden of corruption. The dishonor points from the web sites should be used by the aid donor countries, the IMF and the World Bank to pressure developing countries with numerical targets to reduce dishonor points. Anti-corruption work needs greater moral and financial support from the international community, which is now feasible by using the Internet. Though corruption has existed for thousands of years, for the first time in human history, the Internet is providing us with an opportunity to reduce the heavy burden of corruption on a global scale.

Some support from the international courts and professional legal advice are necessary to develop international standards for corruption web pages. These pages should refer to verifiable solid documentary evidence of corruption, which will stand up in a court of law. This means availability of supporting documents, videos, taped testimonies, etc. Some information can be from anonymous sources and some will have to be archived in secure places. We need standards and accreditation methods to decide what is appropriate information for the web. The web sites should be malice-free and take extra precaution to be as fair as possible to the accused. Status reports on on-going prosecutions of corrupt entities, names of responsible prosecutors when no action is taken, etc. also belong on the web pages. When prosecutors themselves are transferred or when the relevant information changes, regular updating of web pages is essential. Such web sites can provide moral support to prosecutors and expose the higher-ups if they interfere with prosecutions.

## **8.1 Red and White Dishonor points**

In this subsection, I discuss the libel problem and suggest two levels of dishonor points to allow decentralization on the Internet. Only carefully constructed official web pages created with legal advice to expose corruption should be authorized to award the most serious “red dishonor points.” These awards may require hearings in

front of retired judges (say) or an international tribunal proposed in Section 6. Even without full powers to fine or jail the corrupt, the tribunal and web can be a useful deterrent.

One serious problem with my proposal is that the proposed web sites may face lawsuits and libel claims. The corrupt entities who are willing to seriously hurt the informants will not hesitate to use libel laws to avoid being exposed on the web pages. International cooperation is needed to immunize the “good faith” informants and web pages from libel claims. Section 6 suggests that the power to punish maliciously false accusers can be transferred from local courts to the international tribunal.

A temporary solution to the libel problem is to hide behind the press freedoms and publish on the web only those stories which have already appeared in newspapers. Then the proposed web pages will merely give longer shelf-life and wider reach to corruption stories, sort them, compile them with some accounting of dishonor points and international comparisons. This is a good start, but we need to do more.

To partially solve the libel problem, I propose creation of less formal “white dishonor points” awarded by locally accredited web sites. The web pages should have prominent disclaimers that these are tentative dishonor points, thereby avoiding libel claims. Further use of white dishonor points is in exposing less firm evidence of corruption. The salaries of public officials are often known and their potential net worth can be easily computed. In poor countries it is often obvious that the net worth of corrupt officials far exceeds several times (100 times) the annual salary. Therefore, corruption evidence can be in the form of documents showing proof of ownership (deeds) of land, buildings or other property. Such evidence is easier to establish and will earn the corrupt official only ‘white dishonor points.’ Of course, if the official can somehow explain the discrepancy in his net worth, the white dishonor points should be promptly removed.

Another tentative proof of corruption is conspicuous consumption, (fancy cars, parties, travel, jewelry, etc.) whose worth can be proved to equal several times the annual salary of the corrupt official. In general, the ‘white dishonor points’ awarded for corruption may use several sources of information including police press releases and newspaper articles. The web pages should clarify that the white dishonor points simply make a *prima facie* case for corruption—not final proof. The highest objectivity and international credibility is reserved for the ‘red dishonor points,’ supported by evidence of corruption beyond a reasonable doubt.

I propose experimenting with grass root level financial assistance to Journalism

(say) departments of selected universities to develop anti-corruption web pages. Similar ideas are needed to get the younger generation in developing countries directly involved in fighting corruption. Since the young do learn navigating the web rather fast, we should exploit this fact as an opportunity to fight corruption.

## 9 Conclusion

I use available studies and international cross sectional interdisciplinary data on corruption and fifteen related variables for seventy eight countries. I estimate that costs of corruption are huge. In many developing countries a dollar's worth of corruption causes a \$1.67 worth of a burden on the economy. Neoclassical economic growth theory is used in Sections 2 and 3 to show that this burden of corruption *compounds* over time to become rather large. Thus, even a small reduction in corruption has a significant payoff for economic development. Since corruption in poor countries is rising in recent years, Section 6 discusses incentive failures and some novel legal tools for fighting corruption.

Using simple, as well as, 5% to 20% trimmed correlation coefficients I determine which variables are related to corruption. I also use information theoretic and statistical criteria (AIC and Cp) to suggest an optimal subset of regressor variables for explaining international variation in corruption. After combining the results of correlation and regression analysis the top five actions recommended for reducing corruption in order of importance are: (1) reduce red tape, (2) increase efficiency of the judiciary, (3) increase per capita GNP, (4) increase economic freedom and schooling, and (5) reduce income inequality.

Mere dissemination of information about human rights abuses such as torture of political dissidents or child labor has helped reduce the abuses in recent years. The taxpayers in developed countries who help give the foreign aid and shareowners of multinational corporations operating in developing countries need to be made more aware of the rampant corrupt practices. Technical assistance in fighting corruption in the form of a brain trust discussed in Section 7 can be an effective use of foreign aid funds. Section 8 includes details about my main proposal to use the web to expose corruption and increase the probability of removal of a corrupt entity from power.

I also propose a new incentive scheme involving honor points to encourage informants to provide solid evidence of corruption to be placed on the Internet. The proposed dishonor points can provide headlines for local newspapers reporting on

corrupt entities. The proposal needs a subsidy to cover the cost of internationally monitored anti-corruption web pages. The cost of this subsidy is minuscule and will decline over time, while the long term benefits of competitive politics, active media, informed civil society and better economic allocations are large and compounded over time.

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