Corruption Re-examined *

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According to a conventional hypothesis, corruption declines with economic development. Recent data indicates that the universal applicability of this hypothesis is in considerable doubt. This paper tries to fashion plausible theoretical constructs and models which are consistent with corruption increasing as economic development proceeds; and demonstrates how the same model(s) can give rise to cases of positive association between per capita income and corruption and negative association between the two. Important pegs on which such models rest are complementarity of commodities (which actually serve to enhance the marginal utility of income at enhanced values of consumption) or product variety.

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1. Introduction

Economic development is traditionally believed to result in a decline in corruption [Bardhan (1997)]. There are significant reasons why this hypothesis is of importance to human welfare. First, it is comforting in the sense that it means that with development, corruption will decrease to comfortable levels. Thus, the casual attitude towards corruption in many countries of the world, especially by government officials and politicians, is justified to an extent by this hypothesis. However, if it is not true, then rapid institutional changes and cleansing programmes are called for in many developing countries of the world where corruption has reached critical levels. In other words, time might not be the ultimate healer as far as corruption is concerned.

An earlier paper by the same author [Mitra (2006)] concludes that the mentioned hypothesis has been negated in many instances by actual data as many rapidly developing countries have actually shown an increase in corruption over time. Mitra’s study is inconsistent with conclusions reached by earlier studies which conclude, on the basis of a negative correlation between per capita income and corruption at a point of time for cross-country data, that economic development would lead to a decline in corruption [Mauro (1995)]. The logic

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employed by such studies leaves room for doubt – if corruption is largely a result of institutions (rules of the game), then the conclusions of these studies hold only if there is a unique correspondence between corruption inhibiting institutional change and economic development.

Other studies support Mitra (2006). For example, Easterly (1999) used panel data covering a total of four time points (1960, 1970, 1980, 1990) to separate out country-specific effects in deducing the pure impact of per capita income on corruption and found the impact to be positive.

While both the accuracy of available data on corruption and their use in drawing out a relationship between corruption and economic development might be questioned, this paper looks at whether plausible theoretical constructs and models allow corruption to increase as economic development proceeds and distinguishes between cases of positive association between per capita income and corruption and negative association between the two. Important pegs on which such models rest are complementarity of commodities (which actually serve to enhance the marginal utility of income at enhanced values of consumption following an increase in income) or product variety (with the same implications). In Section II we construct a model in which the relationship between corruption and economic development is driven by complementarity among commodities whereas in Section III the constructed model rests on the empirically observed relationship between product variety and economic development. Section IV concludes.

2. Product Complementarity, Corruption and Economic Development

We assume that the process of economic development is accompanied by a tax financed increase in the salaries of government servants. An increase in salaries leads to an increase in consumption of all commodities, assuming that these are all normal\(^1\). Note that in equilibrium the marginal utility of income will be the equalized marginal utility from each product, assuming that a unit of each product is defined as the amount of the product realised from one unit of income.

Now consider a process of economic development which is devoid of any change in prices\(^2\). While this is a theoretical abstraction from reality (where economic development might be

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1 Note that products can be suitably defined so that all of these are normal. For example, even if some varieties of food grains are inferior they can be clubbed together with other non-inferior food grains under the label of ‘foodgrains’ which can then be classified as a normal product.

2 This assumption ensures that there is no change in the definition of a unit of any commodity over time – one unit is given by the amount of the commodity which can be bought using one unit of money, which assuming unchanged prices, is also unchanged.
accompanied by inflation as well as change in relative prices) it helps us to focus on the phenomenon of interest – the increase in real income which leads to increased consumption of the various normal goods. The increase in consumption of all commodities will have two effects on the marginal utility of a product in equilibrium and therefore on the marginal utility of income - (a) a positive effect due to an increase in consumption of other products and (b) a negative effect due to an increase in consumption of the product itself. Note that effect (a) will exist only if there is some complementarity in the utility derived from products. If we consider an additive utility function there will be no such complementarity.

If the negative effect is overwhelmed by the positive effect then the marginal utility of income increases with income. As tax financed salaries increase with economic development the utility of a given income gain from corruption should then be larger for all officials. Given the disutility of performing a corrupt act (these might be in the form of psychic costs, expected utility losses such as those resulting from probable shame or punishment when caught etc) the consistently higher direct utility gains from the income proceeds from corruption that higher economic development would bring about in this case for all bureaucrats would overwhelm the mentioned disutility, if that is assumed to follow a given distribution for the entire population, for a larger number of officials. Thus, the number of corrupt officials would increase.

To illustrate, consider a utility function of a typical bureaucrat of the form:

\[ U_i = z_i y_i - D_i d_i \]  \hspace{1cm} (1)

where, \( D_i = 1 \) when bureaucrat \( i \) is corrupt (but 0 otherwise) and therefore experiences the disutility of performing a corrupt act, given by \( d_i \). Variables \( z_i \) and \( y_i \) are respectively the amounts of two commodities, \( z \) and \( y \), consumed by bureaucrat \( i \). We assume that \( d_i \) is distributed over a certain range \([a, b]\). Thus, at any stage of economic development, \( t \), officials with values of \( d_i \) that fall in the range \([a, c_t]\), where \( a < c_t < b \), are corrupt. The logic is that it is easier to be corrupt if you anticipate lower costs, psychic or otherwise, in performing a corrupt act.

This utility function is maximised subject to a budget constraint \( S + D_i r = x + y \) where \( r \) is the income from a corrupt act and \( S \) is the salary of a typical bureaucrat. For each bureaucrat, utility maximisation involves two processes: a) hypothetical maximisation of his utility under the assumption that he performs a corrupt act; b) hypothetical maximisation of his utility when he does not perform such an act; and c) comparison of the maximized values of utility (the indirect utilities) under a) and b) to decide whether he should be corrupt or not. Once he chooses among these two options the utility maximising choices of \( x \) and \( y \) follow.
For an individual to choose to be corrupt the following condition should hold:

\[
(S + r)^2 - 4d_i \geq S^2
\]

\[
\Rightarrow d_i \leq \frac{(S + r)^2 - S^2}{4} = \frac{r^2 + 2rS}{4}
\]

The above inequality says that an individual will choose to be corrupt if his net utility from being corrupt (indirect utility from spending his income, both from salary and corruption, less the disutility from performing a corrupt act) is more than his utility from being clean (indirect utility obtained from spending his salary). Note that the value of \(d_i\) which satisfies the above equation with perfect equality equals the value of \(c_i\) for that period. If \(S\) increases with the passage of time due to economic development (this happens in most countries as the salaries of government officials are indexed in a rough manner to the per capita income of that country) then \(c_i\) increases and therefore the proportion of corrupt officials increases.

3. Product Variety as the Driver of the Relationship between Economic Development and Corruption

The above section assumes that economic development does not see a change in the number of products. However, empirical evidence (Ruhdwe del and Funke, 1999) shows that economic development results in greater product variety. This should motivate us to construct models where product variety increases with economic development. Consider the utility function

\[
U = \sum_i U_i(X_i); \forall i U'_i > 0; U''_i < 0
\]  

(2)

Note that here we have done away with the assumption of complementarity. Our endeavour is to see whether even in a world where utility is additive the assumption of greater product variety would result in corruption increasing following an increase in salaries induced by economic development. It is easy to see that this might happen. When economic development takes place with \(n\), the number of commodities, frozen the associated increase in salaries would cause an increase in consumption of all commodities (we can suitably construct commodity groups such that these are all normal) and a corresponding decline in marginal utility of income. However, if \(n\) increases, this implies that the government official consumes more varieties; at the same time, the average consumption of any given variety might decline or increase.

As variety increases, the equalized marginal utility of product consumption (the marginal utility
of income) would tend to increase. Thus, as economic development proceeds and salaries increase, there could be forces which would tend to enhance the marginal utility of additional income from corruption for the government official and others which could either do exactly the opposite or strengthen the positive effect on marginal utility of income (for example, if increase in varieties is accompanied by a reduction in the amount of each variety consumed). In the case of opposing tendencies, depending on which tendency is stronger, the incidence of corruption might increase or decrease. In the case of tendencies which are in the same direction (they both enhance the marginal utility of income) corruption would surely increase.

We now go onto give further flesh to this framework of determination of corruption by developing a model that relates economic development to corruption in the context of endogenous product variety. The model is based on previous work by Krugman (1980) on product variety.

3.1 Assumptions

Government officials and private labour each constitute a continuous mass normalized to unity where the former perform the task of maintaining law and order. We use the continuous version of the discrete case where each private labourer has to apply for a permit from a bureaucrat who might turn to be clean or corrupt. Thus, we have four classes: clean and corrupt bureaucrats; unexploited and exploited labour (numbered as 1, 2, 3 and 4 respectively). Moreover, given the mentioned assumption (where a private labourer gets mapped to a unique bureaucrat and vice-versa), the proportion of corrupt bureaucrats and the proportion of exploited labourers are identical.

Each good is produced using labour as the only input. Further, the production function for each good is the same and is given by $l_i = \alpha + \beta X_i$ where $l_i$ denotes the amount of labour used in the production of good $i$ and $X_i$ is the actual production of good $i$. Note that production technologies are uniform across all goods -- a fixed labour cost, $\alpha$ is needed to produce a variety $i$ but the labour cost associated with marginal production is the same at $\beta$, irrespective of the level of output. The number of goods is denoted by $n$ and is determined endogenously in the model. Thus, $n$ is obviously increasing in product variety. We assume $n$ to be a continuous variable.

We assume labour to be the numeraire, i.e. we assume the wage rate to be equal to unity and derive all prices in terms of this wage rate. We assume that an ad-valorem tax equal to $t < 1$ is levied on each good. The proceeds from taxes are used to pay the salaries of government officials. The $n$ goods are consumed by the government officials as well as the private labourers.
3.2 Utility Maximization

The utility of a government official/labourer is given by

\[ U = \int_0^\theta x_i^\theta \, di - Dh; \, 0 < \theta < 1 \]  

(3)

where \( x_i \) is the amount consumed of commodity \( i \), \( D = 0 \) for all government officials who opt to be clean and all workers; and \( D = 1 \) for officials who opt to be corrupt. We can assume that \( h \) is uniformly distributed over the interval \([0, 1]\) for the uniform mass of officials, who have the option to be clean or corrupt, and could be interpreted as a measure of the psychic cost of turning corrupt.

3.3 Determination of price, product variety, product output and national income.

We assume a given proportion of workers (labourers) that are corrupt (exploited). Utility maximisation would give rise to the following condition for the \( k \)-th class and the \( i \)-th commodity,

\[ \theta x_{ik}^{\theta - 1} = \lambda_k p_i \]  

(4)

where \( p_i \) refers to the consumer price (inclusive of ad-valorem tax) for the \( i \)-th commodity and \( \lambda_k \) refers to the marginal utility of income of the \( k \)-th class. Given that the mass of labour and government officials has been normalized to unity, the total demand for commodity \( i \) from the \( k \)-th class is,

\[ X_{ik} = (1 - c) \theta^{\frac{1}{\theta}} \frac{1}{\lambda_k} \frac{1}{p_i^{\theta - 1}} \]  

for \( k = 1, 3 \)

\[ X_{ik} = c \theta^{1-\theta} \frac{1}{\lambda_k^{\theta - 1}} \frac{1}{p_i^{\theta - 1}} \]  

for \( k = 2, 4 \)

The total demand for the \( i \)-th commodity is given by

\[ X_i = \{ \theta^{1-\theta} (1 - c)[\lambda_1^{\theta - 1} + \lambda_3^{\theta - 1}] + \theta^{1-\theta} c[\lambda_2^{\theta - 1} + \lambda_4^{\theta - 1}] \} \frac{1}{p_i^{\theta - 1}} = Ap_i^{\theta - 1} \]

In other words, the term contained inside the curly brackets is referred to as A. Therefore, profits are given by the following expression,
Each firm will maximise this profit function with respect to $p_i$ (which is the same for all $i$ because production functions are identical and can therefore be denoted by $p$) to obtain

$$(1-t)\theta - \frac{\beta}{p} = 0 \Rightarrow p = \frac{\beta}{(1-t)\theta}$$

Note here that following Krugman (1980) we make the implicit assumption that because the number of firms is very large, the pricing decision of any single firm will not have any impact on the marginal utility of income for any of the four classes of population. However, in the long run profits will be equal to zero because of free entry. Thus,

$$X_i = \frac{\alpha}{p - \beta} = \frac{\alpha(1-t)\theta}{\beta[1-(1-t)\theta]}$$

The level of output of a typical commodity is decreasing in $t$, increasing in $\alpha$ and declining in $\beta$. Further, given that the mass of labour is unity the full employment condition solves for,

$$n\alpha + \frac{n\alpha(1-t)\theta}{[1-(1-t)\theta]} = 1 \Rightarrow n = \frac{1-(1-t)\theta}{\alpha}$$

Thus, as the fixed labour cost, $\alpha$, declines, the product variety, $n$, increases. Changes in tax rate are not of primary interest in our analysis. However, it deserves mention that an increase in tax rate will enhance product variety.

In the above context, the real national income is given by

$$nX = \frac{(1-t)\theta}{\beta}$$

Thus, in our model economic development or a higher level of income occurs through a lower
level of tax or a higher efficiency of labour i.e. a lower level of $\beta$. Neither the product variety nor the level of national income is influenced by the proportion of corrupt government officials.

The official real wage of the government officials will be given by $w_G = \frac{t(1-t)\theta}{\beta}$. Given the symmetric nature of the utility function and identical prices across commodities, the consumption of each good by a clean government official equals $\frac{\alpha t(1-t)\theta}{\beta[1-(1-t)\theta]}$. Thus, utility in terms of the original parameters is given by

$$V_0 = \frac{1-(1-t)\theta}{\alpha} \left[ \frac{\alpha t(1-t)\theta}{\beta[1-(1-t)\theta]} \right]^\theta \Rightarrow V_0 = \frac{\alpha^{\theta-1}}{\beta^\theta}[1-(1-t)\theta]^{1-\theta}[t(1-t)\theta]^\theta$$

Let us assume that the real returns from performing a corrupt act remains unchanged with economic development at $r$. In that case the total income of a government employee is given by

$$w_G = \frac{t(1-t)\theta}{\beta} + r$$

On the other hand, the consumption of each good by a corrupt official is given by,

$$\frac{\alpha t(1-t)\theta}{\beta[1-(1-t)\theta]} + \frac{r}{1-(1-t)\theta} = \frac{\alpha t(1-t)\theta + \beta r}{\beta[1-(1-t)\theta]}$$

Thus utility in terms of the original parameters for an official of type $i$ (here type is derived from the level of psychic cost experienced) is given by,

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3 In reality, $r$ might increase with economic development. This adds to the chance of corruption increasing with economic development as an increased $r$ implies more benefits from corruption and adds to the number of officials who find it worthwhile to perform a corrupt act, given the distribution of officials in regard to psychic costs. In our model we focus on increased product variety as a correlate of economic development and do not consider the effect of an increase in $r$, which will never diminish the set of possibilities of corruption increasing with economic development emerging out of a model where $r$ is held constant.
The proportion of corrupt officials is that level of psychic cost (given that officials are uniformly distributed over the range of psychic costs, [0,1]) which equates $V_c$ to $V_o$. Let this be given by $c^*$. Thus,

$$c^* = \frac{\alpha^{\beta-1}}{\beta^\theta} [1 -(1-t)\theta]^\theta \{[t(1-t)\theta + \beta r]^\theta - [t(1-t)\theta]^\theta \} = \frac{\alpha^{\beta-1}}{\beta^\theta} E$$

where $E$ has been appropriately defined. In this case

$$\frac{\partial c^*}{\partial \alpha} = \frac{(\theta-1)\alpha^{\beta-2} E}{\beta^\theta} < 0$$

Thus, with economic development, as $n$ increases due to decline in $\alpha$, $c^*$ or the proportion of corrupt officials tends to increase. As mentioned earlier, it has been established empirically that enhanced product variety is a correlate of economic development. This can also be deduced from casual empiricism. As civilization has prospered so has gadgetry, modes of mobility and types of food. Some entirely new categories of commodities (for example, computer software, video games and the internet, not to mention holiday and rejuvenation packages) have entered the ambit of human consumption.

A decline in $\alpha$ might take place through learning by doing or the proliferation of joint production i.e. in producing one commodity man suddenly discovers ways to jointly manufacture a different one (for example, sugar and molasses from sugarcane). But a decline in $\alpha$ is at best a correlate of economic development in our model, not its cause. Given $t$ and $\theta$, economic development in our model would take place through a reduction in $\beta$ -- labour cost incurred at the margin to produce an additional unit of output.

Possibly nobody can argue that economic development over time has taken place through a reduction in labour costs per additional unit of output i.e. efficiency of labour (for substantiation, see Lipsy and Carlaw, 2004). This could be observed during the industrial revolution where division of labour and mechanisation of production enhanced the efficiency of labour and gave rise to economic growth. To that extent our model allows us to capture this
important driver of economic development. To determine the net impact of economic development on corruption, the impact of a reduction in $\beta$ on corruption has to be weighed against the impact of a reduction in $\alpha$, associated with economic development, on corruption.

The impact of a reduction in $\beta$ on the proportion of corrupt government workers would be given by

$$\frac{\partial c^*}{\partial \beta} = -\frac{\theta \alpha^{\theta-1} [1 - (1-t)\theta]^{1-\theta} t(1-t)\theta [t(1-t)\theta + \beta r_i]^{\theta-1} - [t(1-t)\theta_i]^{\theta-1}}{\beta^{\theta}} > 0$$

Thus, as $\beta$ declines for a given $t$ and $\theta$, salaries financed by taxes would increase and the proportion of corrupt officials would tend to decrease. But this tendency might be overwhelmed by the corruption enhancing effect of a decline in $\alpha$. The strength of the former depressing effect on the incidence of corruption would depend not only on the pace of decline of $\beta$ with time (which would be positively correlated with the rate of economic growth) but also $r$, the real returns from corruption, with a higher value of $r$ increasing the magnitude of this depressing effect. The strength of the latter effect would depend on the pace of increase in product variety with time and again would be positively impacted by $r$. The net effect of economic development on corruption would depend on the relative strength of the opposing effects produced by a decline in $\beta$ and (the product variety enhancing) decline in $\alpha$.

In terms of the discussion in the previous section we might explain our conclusion as follows. When economic development takes place through a decline in $\beta$ more of each product would tend to get produced. But with a decline in fixed costs of production there is a countervailing effect as the existing labour would get spread over a higher product variety and a tendency would be generated to produce less of each product. Given that the marginal utility of real income is identical to the equalised utility of product consumption that is possible from unit income, which is declining in the level of product consumption itself, it is possible that the process of economic development might be accompanied by an increase in the marginal utility of income from corruption of government officials. This might then lead to an enhanced level of corruption.

4. Conclusion

The major determinants of corruption as economic development proceeds through an increase in
the efficiency of labour are (i) the efficiency of labour itself (negative effect); (ii) the empirically observed increase in product variety associated with increase in the fixed labour costs required to produce a given product (positive effect) and (iii) the real returns from corruption per bureaucrat (which we have assumed to be unchanged with time), a greater magnitude of which amplifies both effects (i) and (ii).

Thus, both net positive and negative impacts of economic development on corruption are possible. Slow (fast) increase in efficiency of labour in regard to output expansion (a very slow (fast) rate of economic growth) accompanied by a relatively fast (slow) enhancement of product variety via decline in fixed labour costs might lead to a net increase (decrease) in corruption. The relative rates of decline in the mentioned efficiency of labour and fixed costs would depend on culture etc: it is easy to see that when learning by doing results in innovation and new products rather than only greater efficiency in producing the same range of products, an increase in corruption is probable with economic development.

A major drawback of the model presented here is that we consider a closed economy. But we can imagine what would happen to corruption in a country which imports freely from other parts of the world. For example, an African country might experience very slow increase in its national income and therefore in the salaries of government officials due to a very slow increase in the efficiency of labour but might yet experience a very fast increase in product variety. In that case one would experience corruption to increase as marginal utility of additional income from corruption would tend to rise very fast.

Note, therefore, that the cases of corruption increasing with economic development seem highly probable even in cases where commodities are not complements i.e. the marginal utility from a product is independent of the consumption of the other products. Complementarity itself, as we have demonstrated, can be a pathway for corruption increasing with economic development. In the real world we would expect complementarity to co-exist with a positive correlation between the level of economic development and product variety. This further enhances the possibilities of corruption increasing with economic development.

References

