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Corruption, Tax Evasion, and Economic Development in Economies with Decentralised Tax Administrative System

ANUM ELLAHI

This theoretical paper looks into joint determination of corruption and development where there is a decentralised bureaucratic setup in a multi-tiered system: tier one bureaucrats and tier two bureaucrats. Corruption takes place at two levels, firstly when tier one bureaucrats collude with households for tax evasion, and secondly when tier one and tier two bureaucrats collude to hide corruption. This paper determines that at high levels of corruption, there is low development, and at a low incidence of corruption, there is high development. This paper postulates that for a developing country like Pakistan, low tax collection due to poor institutional decentralisation leads to low economic growth and development.

JEL Classifications: E02, E26, E42
Keywords: Corruption, Tax Evasion, Economic Growth

1. INTRODUCTION

In the last decade, there has been much concern that corruption in government seems to have a negative impact on economic growth and development. According to Nawaz, Iqbal and Khan (2014) institutions with well-defined mechanisms will curb corruption and promote economic growth and development. Controlling corruption in democratic institutions is growth enhancing (Khan, 1996; Nawaz, Iqbal & Khan, 2014; Iqbal & Daly, 2014). In an economy, institutions are one of the main drivers of investment and economic development (Knack & Keefer, 1995; Mauro, 1995; Rose-Ackerman, 1996; Barro, 1997).

An institution's impact on growth comes from economic development that depends on cultural and social norms, which vary across countries (Alonso & Garcimartin, 2013). Leys (1965) points out that in certain economies (Africa) where public offices are elaborate but inefficient, corruption helps to cut red tape in public projects and may be the only way to speed up the development process.

Well-defined democratic measures (rules, regulation and accountability) are necessary for institutions that are responsible for revenue collection and public expenditure. Tax collection is the main source of revenue collection. Pakistan has a low tax base and revenue collection has shown a fluctuating trend and, at 10 percent, is one of the lowest in the world (Iqbal, Din & Ghani, 2012). The probable reason for low tax

Anum Ellahi <anumelahi@gmail.com> is Senior Teaching Fellow, Lahore School of Economics, Lahore.

collection is (1) an improperly designed tax system, and (2) tax evasion by individuals. Tax evasion when combined with low institutional quality leads to poor accountability of public officials and would increase corruption resulting in low economic development (Wade, 1982; Iqbal, Din & Ghani, 2012).

Fiscal decentralisation, a growing phenomenon in developed and developing economies, is devolution of power between central and provincial governments. The role of the provincial government is revenue collection and provision of public goods and services. In developed economies, fiscal decentralisation is accompanied with well-structured rules and regulations for accountability (U.S.A, Canada, Europe) (Yilmaz, 1999). Pakistan over the years has tried to strengthen fiscal decentralisation (e.g.: Niemeyer Award 1947, Raisman Award 1952, One Unit formula 1961,1965 and NFC Award 1990, 1996, 2006, 2009). According to Iqbal, Din and Ghani (2012) revenue decentralisation has a positive impact on economic growth while expenditure decentralisation has a negative impact.

According to Blackburn, Bose and Haque (2010), the public sector suffers from corruption due to delegation of power from government to bureaucrats (principal-agent relationship). This transference of power allows subordinates to use their judgment in decision-making. In an economy where institutions are weak, such delegation of power gives incentive to bureaucrats to capture economic rents through bribery (Bardhan, 1997; Rose-Ackerman, 1998). Becker and Stigler (1974) state that if government employees are paid a higher wage, it would act as a deterrent to corruption.

Wadho (2009) in his paper states that efficiency wage lowers the level of dishonesty in the public sector. Furthermore, literature on corruption and welfare efficiency focuses on deterring corruption through partial equilibrium in microeconomic environment where the focus has been the cause and repercussion of corruption, (Shleifer & Vishny, 1993; Rose-Ackerman, 1975, 1978, 1999). Evidence in theoretical papers shows that there is a negative relationship between corruption and growth (Shleifer & Vishny, 1993; Barreto & Alm, 2003; and Wadho, 2013). Empirical literature shows that economies with a high incidence of corruption have low economic growth and development (Mauro, 1995, 1997; Mo, 2001).

There is not much literature on the joint determination of corruption and economic growth and development in a decentralised bureaucratic system. This paper aims to form a link between fiscal decentralisation with poor democratic measures of low tax collection, and their impact on capital investment with its repercussions for economic growth and development.

Iqbal, Din and Ghani (2012) state that in fiscal decentralisation the central government can appoint provincial governments to check on public goods and services. However, the problem remains unaddressed if the central government itself is corrupt. Therefore, this paper attempts to fill in the gaps in existing literature by exploring corruption in tax compliance under a decentralised bureaucratic setup, where the tax department has two grades of employees: tier-two bureaucrats (superiors) and tier-one bureaucrats (tax collectors).

Tier-two bureaucrats delegate the responsibility of tax collection from households (private individuals) to tier-one bureaucrats. Tier-one bureaucrats can collude with households to hide their true taxable income or pay less/no tax by receiving a bribe. Tier-

one bureaucrats can also collude with tier-two bureaucrats to hide the corruption (low tax revenue collected) from the government.

The remaining paper is organised as follows:

- Section 2 elaborates on the past empirical theoretical literature.
- Section 3 gives a description of the economy with model setup.
- Section 4 analyses the incentives for corruption.
- Section 5 elaborates on equilibriums of the model.
- Section 6 looks at the two-way relationship between corruption and economic growth and development.
- Section 7 gives comparative statistics.
- Section 8 discusses the finding and conclusion.

2. LITERATURE REVIEW

Disparate institutional quality is the main reason for changing capital accumulation, human capital, and economic development and growth across countries (Hall & Jones, 1997). Institutions with democratic mechanisms have a positive impact on growth. Corruption is defined as misuse of public office for private gains (Shleifer & Vishny, 1993; Barreto, 2000; Banerjee, Mullainathan & Hanna, 2012). Efficient and uncorrupt institutions make sure that labour is employed in productive projects, not wasted in rent seeking activities (North, 1990; Iqbal & Daly, 2014). If the rules and regulations governing institutions are not properly defined, labour becomes involved in low return economic projects, which in turn lowers growth, (Murphy, Shleifer & Vishny, 1993).

According to Nawaz, Iqbal and Khan (2014) as institutional quality improves, corruption decreases and income in the economy increases, and vice versa. The impact of institutions varies across Asian economies depending on the level of economic development. Ades and Di Tella (1999) and Triesman (2000) show by empirical studies that corruption not only affects institutions, but also is intensified by weak institutions.

A corrupt economy has inefficient institutions that appear in the form of weak legislative and judicial systems along with bureaucratic red tape, which dampens economic growth (North, 1990; Mo, 2001; Aidt, 2009). Unequal distribution and misallocated resources in a corrupt economy slow down growth and lower living standards (Blackburn, Bose & Haque, 2010). According to Barreto and Alm (2003), public officials are repeatedly found to be self-seeking, abusing their public position for personal gains. Their actions include demanding bribes to issue licenses, exchange of money for awarding contracts, stealing from the public treasury and selling government owned commodities in the black economy.

Empirical literature focuses on corruption, transparency and economic growth. Studies indicate that countries that have a higher degree of corruption are less transparent fiscally and experience low levels of GDP per capita. Fiscal decentralisation classifies government into tiers where the local government acts as a subordinate tier in a multi-tiered system. This paper uses the definition of fiscal decentralisation from the works of Bjedov and Madies (2010) where decentralisation is *deconcentration:* giving power to agents to exercise in certain boundaries but answerable to a central government,

delegation: transfer of power to the agent to be exercised for certain responsibilities, and *devolution:* transfer of power and responsibility to chosen agents through election.

The principle roles and responsibilities of each tier are clearly defined (Shah & Shah, 2007; Bjedov & Madies, 2010). According to Amagoh and Amin (2012) the classification of government into such tiers improves efficiency levels with economic growth and output. In a corrupt economy, the advantages of decentralisation are overshadowed by the disadvantages of poor accountability and inefficiency. Shleifer and Vishny (1993) point out that delegation of power results in dispersion of government decision-making, which leads to lack of coordination and thus rent extraction.

Enikolopov and Zhuraasvkaya (2003) find that a strong party system is beneficial for decentralisation in less developed economies for better provision of public goods, government quality, and economic growth. According to Iqbal, Din and Ghani (2012) fiscal decentralisation increases accountability and transparency in the political process and lowers corruption. Fan, Lin, and Triesman (2009) find that increased government tiers lead to bribery in government contracts and public services (utilities and customs). Fiscal decentralisation of revenue generation in Pakistan has had a positive impact on growth while the decentralisation of expenditure has had a negative impact (Igbal, Din & Ghani, 2012).

Shleifer and Vishny (1993) elaborate that corruption is expensive. The demand for secrecy shifts the country's investment away from high value projects in health and education, towards potentially low value projects in infrastructure (Mauro, 1997). Mauro (1995) finds that corruption lowers private investment, thereby reducing economic growth. Mo (2001) established that economic growth decreases by 0.72 percent when corruption increases by 1 percent. Corruption reduces sustainable development by reduced growth in genuine wealth (Aidt, 2009). However, Khan (1996) points out rent seeking activities that allow the economic agents to sidestep restrictive monopolies actually improve the welfare of the economy thus leading to economic growth (Leff, 1964; Leys, 2017).

Revenue generation through taxes is one of the main source of infrastructural development in an economy. Barro (1991) states that government services (utility and production) financed by taxes enhance growth. Tax revenue is utilised for public and physical capital investment, which converts raw material into output. Romer (1994) states that as physical capital increases, an economy moves towards high growth. Increased physical capital leads to spillovers, leading to economic growth and development (Solow, 1994).

Tax evasion is a form of corruption, which has a varied impact on economic growth. Lin and Yang (2001) in static model analysis shows that at a low taxation level, the extent of tax evasion is small and growth decreases. Furthermore, the dynamic model showed that an increase in taxation allows tax evasion leading to increased saving, investment, and growth in an economy. Eichhorn (2001) shows that tax evasion is beneficial for growth as households evade taxes only if it is profitable and leads to increased savings. The lack of provision of public goods does not have an impact on growth.

Corruption negatively affects savings, which in turn affects investment. Since Foreign Direct Investment (FDI) is the savings of foreigners in a foreign country, the

corruption in the destination country cannot affect the saving decisions of FDI of host countries. In this case, if FDI is a bigger share of total investment then corruption might have negligible effects on investment. However, literature on FDI and corruption highlights that corrupt economies are not attractive destinations for FDI.[1]

According to Wei (2000) international investors do not find it worthwhile to invest in economies where the corruption index is high. A country's investment environment is measured through its institutional quality, which is an indicator of political institutions, rule of law, property rights, non-transparency and instable economic policies. If the institutional quality of a country were poor, then FDI in that country would be low for it creates operational inefficiencies (Globerman & Shapiro, 2002; Habib & Zurawicki, 2002). Corruption lowers the productivity of public inputs leading to a decrease in the country's locational attractiveness, which is an important factor for foreign investment (Egger & Winner, 2005). The location plays an important role when investors are deciding on host countries from an investment point of view.

Ehrlich and Lui (1999) developed a model where the prospect of corruption in the public sector allows individuals to become a part of government and thus divert economic rents towards rent seeking activities rather than growth enhancing projects. Similarly Sarte (2000) talks about rent seeking individuals that hinder progress in the formal sector's security and property rights, and promote the informal sector with less security.

Blackburn, Bose and Haque (2010) (hereafter BBH) in their neoclassical growth model employ bureaucrats as agents of the government for tax collection. Corruption, as bribery and tax evasion, takes place amongst tax collectors and households. The bribery goes undetected because of poor monitoring by the government. Wadho (2009) uses the endogenous monitoring where corruption by tax collectors can be caught. Corruption takes hold when corrupt tax collectors match corrupt households. In addition, efficiency wage ensures that corruption does not take place. In case corruption does take place because of lower wages then effective auditing will report the corruption to the government.

The population setup and external monitoring is similar to the Wadho model, while the tax collectors and household setup is same as the BBH model, but this paper adds tier-two bureaucrats to the model. The tax administrative department is two tiered; tier-two bureaucrats, as effective auditors, are hired by the government for monitoring tax collection and maintaining a corruption free environment, while the government hires tier-one bureaucrats, known tax collectors, for tax collection from households. Taxes are collected from high-income household at the tax rate determined by the government.

Tier-one and tier-two bureaucrats have the opportunity to be corrupt. The two levels of corruption are: 1) bribes that tier-one bureaucrats receive from households to be reported as low income and to pay low/no taxes. 2) Payoff to tier-two bureaucrats by tier-one bureaucrats during audit, if they are caught. The payoffs amongst the bureaucrats are decided through Nash bargaining, (Cerqueti & Coppier, 2009). The focus of this model is not just tax collection but also the saving of the economy as it leads to economic growth. This model shows that investment in equilibrium with corruption is low compared to investment in equilibrium with no corruption. In addition, public goods are rival and non-excludable and the agents in the economy live for two time periods and two generations.

[1]The actual FDI is lower than the potential FDI.

3. FRAMEWORK

3.1. The Environment-Economy

This paper builds a stylised model using an overlapping generation model where each generation consists of constant population *N*, who lives for two time periods and are risk neutral. A proportion $\theta \in (0,1)$ of agents are corruptible, i.e. they will be corrupt if it pays them to be corrupt and the remaining fraction $(1-\theta)$ is not corruptible, who irrespective of the monetary gains will stay honest. Agents of each generation are divided into three sets; private individuals referred to as *households* of which there is a fixed measure *n*, for the purpose of collecting taxes there is a fixed mass of *m* tax collectors classified as *tier one bureaucrats*. The hiring and overseeing of the tier-one bureaucrats is done by a fixed mass *s* of *tier two bureaucrats* (known as super auditors) where $n>m>s$ and $n+m+s=N$.

In the economy, households are differentiated based on their labour endowment, which determines their relative income and their propensity to be taxed. A fraction $\mu \in (0,1)$, of households are endowed with $\varepsilon > 1$ units of labour (high income bracket) who are liable to pay a proportional tax $\tau \in (0,1)$ which is decided by the government, while the remaining fraction $(1-\mu)$ have labour endowment $\varepsilon = 1$(low income bracket) and they are not liable to pay any taxes.

The government is aware of the total μ without knowing the individual taxes due by households. This paper assumes that both tier-one and tier-two bureaucrats are not liable to pay taxes, i.e. they are low type, whereas tier-two gets a premium $\upsilon < \varepsilon$.[2] The tax is collected by the tier-one bureaucrats from $\frac{2n}{2m}$ households. At the first level, corruption takes place when the tax collector conspires with households to conceal their information about their true income. In this scenario, the tax collector expects a gain in the form of a bribe and households expect gains in the form of tax evasion. There is a fraction $\lambda \in (0,1)$ of tax collectors that are corrupt in this way and the remaining fraction $(1-\lambda)$ are honest (non-corrupt). At the second level, corruption happens during the annual audit when this misreporting is revealed to tier-two bureaucrats. Assuming that if the superior bureaucrat is honest, the corrupt tier-one bureaucrat is reported and punished. When the corrupt tier-one bureaucrat matches up with corruptible tier-two bureaucrats, the tier-two bureaucrat does not reveal this misreporting, and the tax collector pays a share out of total bribes determined through Nash bargaining to superiors.

All agents in the society work (save) during the first time period and consume in the second time period. Firms are responsible for the output production, of which there is continuum of unit mass. The households provide the labour for hiring to the firms and the firms hire the rent capital from all agents of the society. All markets are perfectly competitive.

3.2. Households

Households of generation $i = (1,2)$ at time period t earn income $I_{i,t}$ by supplying their labour to firms in the private market and earn wages, $w_{i,t}$. Each household faces a linear utility function of its expected income. A household which has labour endowment

[2]This is to simplify the model and it does not affect the qualitative results of this model.

ε=1 earns labour income w_i in each time period and are exempted from taxes. Households with labour endowments $\varepsilon > 1$ earn labour income εw_i and pay proportional tax τ to the government. Both the high income and low-income households save their current wages at the prevailing market interest rate for the next time period r_{t+1} that is received in the next period to be consumed with the next period wages. For the time period t+1 the income for the household is I_{it+1} and the wages are $w_{i,t+1}$, as this model will show in the steady state where $w_{i,t} = w_{i,t+1}$.

This paper focuses only on high-income households, as they are the ones who are liable for taxes and could collude with the tax collectors (tier-one bureaucrats) for tax evasion. Honest households do not evade taxes such that their net income equal to $\varepsilon w_{i,t}$ $(1-\tau) + r_{t+1}\ \varepsilon w_{i,t}\ (1-\tau) + \varepsilon w_{i,t+1}\ (1-\tau)$. Since in the steady state $w_{i,t} = w_{i,t+1}$, for the next section onwards this paper uses w without the subscript. For corruptible households, income is uncertain and depends on the bribe that they pay to bureaucrat and the probability of being caught. With probability p their corruption is detected through audit. This model assumes that the effective probability depends on the type of tier two bureaucrats. With probability θ, tax collector matches with a corruptible tier-two bureaucrat. In this case, the tier-two bureaucrat does not reveal this corruption and they bargain on the share of bribes that each of them receives. Given this setup the effective probability of being caught $p(1-\theta) \in (0,1)$. Assuming that when detected, a corrupt household is asked to pay its taxes. Given this, the net income of corruptible household is

$$E(I;b,r) = \begin{cases} \varepsilon w(1-\tau)(2+r_{t+1}), & if\ \ b = 0 \\ \varepsilon w(2+r_{t+1})(1-b_t - p(1-\theta)\tau), & if\ b > 0 \end{cases} \quad \ldots \quad (1)$$

Where $b > 0$ implies that the household is involved in corruption.

3.3. Tax Collectors—Tier One Bureaucrats

Tax collectors differ in their behaviour in public offices. They supply their unit endowment of labour to government inflexibly and earn wages equal to, w_g in each time period. Any bureaucrat (corruptible or non-corruptible) working for a firm, while supplying one labour unit to receive a non-taxable wage equal to the wage paid to households. Therefore, any bureaucrat who is willing to accept a wage less than the stated wage must be expecting to receive compensation through bribery and hence is identified as being corrupt.[3]

Each bureaucrat has $\frac{2\mu n}{2m}$ households under his jurisdiction. Honest bureaucrats do not indulge in corruption and earn a lifetime income, $w_g(2 + r_{t+1})$. Whereas, corruptible tax inspectors can be corrupt if it pays them to be corrupt. Only the households, which are corrupt pays $\frac{2\theta\mu n}{2m}$ to the corrupt tax collector. Further, this model assumes that an honest household even when it encounters a corrupt bureaucrat refuses to collude and declares its true income. Thus, with probability θ, a corruptible tax collector matches with a corruptible household who pays him a bribe (b) and colludes to hide its true income.

A fraction $\lambda \in (0,1)$ of corruptible tax collectors are corrupt and demand bribes to conceal information about households' income. The income of the corrupt bureaucrat is

[3]See Blackburn, Bose and Haque, 2010 for more discussion.

uncertain and depends on chances of being caught. If caught then the fine constitutes the bribe they receive, penalty associated with being corrupt, and the return they get on their investment from the bribe income. They face an effective probability $p(1-\theta)$ of being caught through audit. Particularly, with probability *(1-θ)* tax inspector matches with honest, tier-two superior, who reports his corruption. With probability θ tax inspector matches with corruptible tier two bureaucrats, who demands a share $\varphi \epsilon (0,1)$ from bribe income to conceal his corruption.

Assuming that the tax inspector is willing to pay this share and its value is determined through Nash bargaining. Since, corruption is illegal, tax inspector hides the illegal income, and given the opportunity tax collector will try to utilise it by converting it into black or white money. If the money goes into to the formal sector the chances of being caught are high, as the source income needs to be identified. Therefore, the corrupt tax collector treats the money as black money and invests in the informal market or in those sectors where the probability of being caught is low or zero. To keep up with the growth model money is not left idle. The black money is invested in the market at rate of return which is smaller and is equal to $r_{t+1} - \rho$, where $\rho > 0$.[4]

This paper assumes that when tax inspectors are caught through the audit, their entire income is confiscated which constitutes their earnings and the bribe they have received from the household. Given this the expected net income of a corruptible tax inspector is:

$$E(I;b,r) = \begin{cases} w_g(2+r_{t+1}) & b = 0 \\ [1-p(1-\theta)]\left\{w_g(2+\ r_{t+1}) + (2+r_{t+1}-\rho)\left(\frac{\theta\mu n}{m}\right)\varepsilon w b_t(1-\varphi)\right\}, & b > 0 \end{cases} \quad (2)$$

3.4. Super Auditors—Tier Two Bureaucrats

Tier two bureaucrats supply their labour to the government and earn wages equal to υw_g, where $1< \upsilon < \varepsilon$. This implies that tier two bureaucrats are paid a higher wage than tier one bureaucrat is, whereas, for simplicity this paper assumes that they do not pay taxes. Honest tier two bureaucrats do not collude with tax inspectors and they earn only wage income, whereas, corruptible tier two bureaucrats collude with corrupt tax inspectors and their income is uncertain. The bribe income of tier two bureaucrats depends upon the bribe paid by the corrupt households and the corrupt tax collectors $\left(\frac{2\theta\mu n}{2m}\right)\left(\frac{2\theta m}{2s}\right)$ since $m > s$ there would be $\frac{m}{s}$ tax collectors under tier two bureaucrats. Symmetric to tier one bureaucrat, it is assumed that when tier two bureaucrats are caught being corrupt, their entire income is confiscated, and they invest their bribe income in black market with smaller returns. Given this, the expected net income of tier two bureaucrats is:

$$E(I;b,r) = \begin{cases} \upsilon w_g(2+r_{t+1}), & \varphi\ = 0, b = 0 \\ (1-p)\left[\upsilon w_g(2+r_{t+1}) + (2+r_{t+1}-\rho)\left(\frac{\theta\mu n}{s}\right)\varepsilon w b\varphi\right], & \varphi > 0, b > 0 \end{cases} \quad (3)$$

[4] Assumption for this model.

3.5. Government

The government provides public goods through revenues, which are collected through levying a proportional tax on high-income households, along with the fine that is collected from tier one and tier two bureaucrats when they are caught being corrupt. The government audits the conduct of bureaucrats that costs its resources.

For simplicity, this model assumes that the cost of auditing is equal to revenues collected through successful auditing. The government assigns a fixed proportion, $\Phi \in (0, 1)$ of tax revenue generated on public goods, G_t and the remaining portion to the payment of wages to tier one and tier two bureaucrats. Given that no corruptible bureaucrat would ever reveal himself in the way described above, therefore, to minimise the labour costs the government sets the wages of all bureaucrats equal to the wages households receive from the private firms to ensure complete bureaucratic participation, (Blackburn et.al, 2010).

3.6. Firms

The representative firm produces output according to following Cobb-Douglas production function

$$Y_t = AL_t^{\beta} K_t^{1-\beta} G_t^{\alpha} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

When there is congestion of the public services (Barro & Sala-I-Martin, 1992), such that $G_t = {}^{G}/_{K}$, where G is the quantity of the public services and K is the private capital available to the private firms. Public goods are rival and non-excludable i.e. there is congestion[5]. Given there is congestion of public goods the production function becomes:

$$Y = AL_t^{\beta} K_t^{1-\beta} \left(\frac{G_t}{K_t}\right)^{\alpha} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

Where A>0, $\alpha, \beta \in (0, 1)$, $\beta + \alpha < 1$. Also L_t is the labour of the economy and K_t is the capital of the economy. Firms hire the labour from the households at competitive wage rate w_t and rents capital at competitive rental rate r_t. Profit maximisation implies that:

$$w_t = \beta A L_t^{\beta-1} K_t^{1-\alpha-\beta} G_t^{\alpha} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

$$r_t = (1-\alpha-\beta) A L_t^{\beta} K_t^{-\alpha-\beta} G_t^{\alpha} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

4. THE INCENTIVE TO BE CORRUPT

This paper looks into the behaviour of households, tax collectors and tier two bureaucrats in the environment of tax evasion and bribery[6]. In a two-dimensional problem where tier one bureaucrats decide whether to be corrupt or not and later to decide on the minimum bribe that is acceptable to them while considering the share φ that they would have to give to tier two bureaucrats in order to evade being caught through the effective auditing. The share of bribe φ is decided between tax collector and

[5]Relative congestion: you benefit from the public good if you utilise it, otherwise there is no impact on the non-user utility.

[6]This model looks at the economy in equilibrium such that w_g= w as stated wage to private and public agents is same.

tier two bureaucrats through the Nash bargaining. The point where they will both agree will decide the share.

By including bargaining in this, a tax collector maximises the net benefits from this collusion. If he colludes, the effective probability of being caught is smaller. It is equal to $p(1 - \theta)$ because his corruption can only be revealed if he matches with honest auditor. However, he will have to share the bribe income with a corrupt auditor. Moreover, if he does not collude, he is going to be caught with probability (p) irrespective of who is the auditor. Given this the net gains of colluding for tax collector with tier two bureaucrat are:

$$\Delta B_1 = \left\{p\theta w(2 + r_{t+1}) + (2 + r_{t+1} - \rho)\left(\frac{\theta\mu n}{m}\right)\varepsilon w b([1 - p(1-\theta)] - [1-p])\right\}^{0_1} \quad \ldots \quad (8)$$

Similarly, net gains of tier two bureaucrats from this collusion is:

$$\Delta B_2 = \left\{\left[\upsilon w(2 + r_{t+1}) + (2 + r_{t+1} - \rho)\left(\frac{\theta\mu n}{s}\right)\varepsilon w b\varphi\right] - \upsilon w(2 + r_{t+1})\right\}^{O_2} \quad \ldots \quad (9)$$

$$\varphi^{NB} = \Delta B_2 . \Delta B_1$$

Keeping this in mind following share of bribe is given as:

$$\varphi^{NB} = \left[\frac{O_2}{0_1 + O_2}\right] . \left[\frac{p\theta}{[1-p(1-\theta)]}\right]\left[1 + \frac{(2 + r_{t+1})}{(2 + r_{t+1} - \rho)\left(\frac{\theta\mu n}{m}\right)\varepsilon b}\right] \quad \ldots \quad \ldots \quad \ldots \quad (10)$$

From the above expression, this model establishes the share of bribe tier two bureaucrats demand of the tax collectors. The comparative statistics $\frac{\partial(\varphi^{NB})}{\partial O_2} > 0$, which explains that increase in bargaining power of tier two bureaucrats, increases their share in bribe, by $\frac{\partial(\varphi^{NB})}{\partial 0_1} < 0$ we see that if the bargaining power of the tax collectors increases, the share in bribe of tier two collectors would decrease. The increase in the rate of interest, the bribe and the proportion of corruptible agents have a negative impact on the share of tier two bureaucrats on bribe, $(\frac{\partial(\varphi^{NB})}{\partial\, r_{t+1}} < 0\,,\ \frac{\partial(\varphi^{NB})}{\partial b_t} < 0, \frac{\partial(\varphi^{NB})}{\partial\theta} < 0\,)$. If the probability of being caught were to increase, the share would also increase to cover the risk associated with it, $\frac{\partial(\varphi^{NB})}{\partial p} > 0$.

Tax collectors are corrupt only when the expected utility from getting a bribe leaves them no worse than not getting a bribe. The bribe would be large enough to cover the risk and share of tier two bureaucrats. This model finds that a corruptible tax collector will be corrupt if:

$$b_t^* \geq \frac{p(1-\theta)(2+r_{t+1})}{[1 - p(1-\theta)](2+r_{t+1}-\rho)\left(\frac{\theta\mu n}{m}\right)\varepsilon(1-\varphi)} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (11)$$

The second incidence of corruption happens when the tax collectors and the households collude together to hide the true extent of the household's income. The corrupt high-income households will be willing to pay a bribe as long as it feasible for them, such that expected utility from paying the bribe and the expected utility from not paying is at least equal. Keeping this in mind the optimum bribe rate for the households is calculated through Equation (1) and is estimated to be

$$b_t^* = \left[1 - p(1-\theta)\right]\tau_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (12)$$

Equation 12 states that the households will not pay the tax collectors more than they expect to save from tax evasion. In this model, incidence of corruption happens only when the tax collectors and the households concur on the same bribe such that they simultaneously satisfy one another, this is seen when equation (11) and (12) are solved together:

$$\left[1 - p(1-\theta)\right]\tau_t \geq \frac{p(1-\theta)(2+\mathrm{r}_{t+1})}{[1-p(1-\theta)](2+\mathrm{r}_{t+1}-\rho)\left(\frac{\theta\mu n}{m}\right)\varepsilon(1-\varphi)} \quad \ldots \quad \ldots \quad \ldots \quad (13)$$

The above condition relies on the economy wide variable τ and r_{t+1}. The current tax rate and the future market interest rate are of interest; determined by the current economic situation in the economy. The prevalent economic condition in the economy accounts for corruption in my model. The current statistics show the presence of corruption will provide incentive to the upcoming bureaucrats. The current time period *t* corruption will determine the future corruption, which in return determines the future market interest rate.

The behaviour of the economy is analysed under two scenarios 1) economy where there is no corruption and 2) economy where there is corruption. Furthermore, the model looks into the behaviour of capital in steady state alone such that $Y_{1,t} = Y_{1,t+1}$ *and* $Y_{2,t} = Y_{2,t+1}$ *and* $Y_{1,t} = Y_{1,t+1} = Y_{2,t} = Y_{2,t+1} = Y$ and $K_{1,t} = K_{1,t+1}$ and $K_{2,t} = K_{2,t+1}$ *and* $K_{1,t} = K_{1,t+1} = K_{2,t} = K_{2,t+1} = K$. Solving the equation (3), (4) and (5) current market interest rate and the current wage in the market is calculated. Where $w = \beta L^{-1}\Psi K^{\chi}$ and $r = (1-\alpha-\beta)\Psi K^{\chi-1}$this shows that the economy-wide variable relies on the labour force in the market along with the labour and capital share in the output function. Furthermore, the presence of *K* shows that the current level of the capital in the economy plays a dominant role for the determination of current wage, current market interest rate.

With this in mind, it can be concluded that the presence of future capital K_{t+1} would determine future market interest rate r_{t+1} that would be accounted as the investment of the economy for the economic growth. In this model, the fixed proportion for the government services is such that $G_t = \Phi Y_t$, thus when in equilibrium it is see that that the total labour supply $L = [(1-\mu) + \varepsilon\mu]\, n$, which is the sum of total labour supply of high income households $\varepsilon\mu n$ and labour supply of low income households $(1-\mu)n$.[7] This model finds the government share in the economy through $G = \Psi K^{\chi}\Phi$ where $\Psi = \left[A(\Phi)^{\alpha}L^{\beta}\right]^{1/1-\alpha}$ and $\chi = \frac{1-\alpha-\beta}{1-\alpha}$.

The economy follows balanced budget condition *tax revenues = G+(mw+svw)* and replacing the values of *G* and *w* gives the following relation:

$$Tax\ revenue = \Psi[\Phi + \beta(m + s\upsilon)]K^{\chi}$$

According to growth theory, the presence of physical capital translates into investment of the economy; accumulation of physical capital comes from saving of the economy. The savings in an economy comes:

[7] This holds true when there is equilibrium in the labour market.

Households

Low-income HH = $(1-\mu)nw$

High-income HH (honest) = $\mu n\varepsilon w(1-\theta)(1-\tau)$

High-income (HH)(dishonest)= $\theta\lambda\mu n\varepsilon w(1-b-p(1-\theta)\tau), (1-\lambda)\theta\mu n\varepsilon w(1-\tau)$

Tax Collectors (Tier One Bureaucrats)

B_1 Honest = $[(1-\theta)+\theta(1-\lambda)]mw$

B_1 Dishonest/ Corruptible = $\theta\lambda\mu mw\left\{[1-p(1-\theta)][w(2+r_{t+1})+(2+r_{t+1}-\rho)(\frac{\theta\mu n}{m})\,\varepsilon wb(1-\varphi)]\right\}$

Super Auditors (Tier two Bureaucrats)

B_2 Honest = $(1-\theta)s\upsilon w$

B_2 Dishonest/ Corruptible = $(1-\lambda)s\upsilon w, \lambda\theta s\left\{(1-p)\left[\upsilon w+\left(\frac{\mu n}{s}\right)\theta\varepsilon wb\varphi\right]\right\}$

Where saving equal future capital:

$$s_t = K_{t+1}$$

5. GENERAL EQUILIBRIUM

5.1. Equilibrium with No Corruption

In equilibrium with no corruption, total tax revenue collected in the economy is $\hat{\tau}\mu n\varepsilon w$, which is used for payment of wages of tier one and tier two bureaucrats *mw* and *sw* respectively, and to provide public good and services G, which is utilised by the private firms.

Given that the government runs a balanced budget, tax rate without corruption is:

$$\hat{\tau}_t = \frac{G+\mathrm{w}(m+s\upsilon)}{\mu n\varepsilon w} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (14)$$

$$\hat{\tau}_t = \left[\frac{L\Phi+\beta(m+s\upsilon)}{\beta\mu n\varepsilon}\right] \equiv \hat{\tau} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (15)$$

Looking at this tax level the optimum tax rate, household's willingness to pay the bribe would be $\widehat{b_t} = \left[1 - p(1-\theta)\right]\hat{\tau}_t$ (from equation (12)).

In equilibrium with no corruption $\lambda=0$, total savings of the economy come from the honest low-income individuals $(1-\mu)nw$ and honest high-income households $\mu n\varepsilon w\,(1-\hat{\tau})$. The savings of the tier one and tier two bureaucrats is mw and $s\upsilon w$ respectively. Combining all these expressions together and replacing the values of $\hat{\tau}$ and algebraic manipulation gives:

$$wL - G = \widehat{K}_{t+1} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (16)$$

Using Equation (16) and replacing $G = \Psi K^{\chi}\Phi$ and $w = \beta L^{-1}\Psi K^{\chi}$ I get the following expression for the future accumulation of the physical capital:

$$\widehat{K}_{t+1} = \Psi K_t^{\chi}[\beta - \Phi] \equiv \widehat{K}(K_t) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (17)$$

As already established that $\hat{r}_t = (1-\alpha-\beta)\Psi\widehat{K}_t^{\chi-1}$, then from this it is determined $\hat{r}_{t+1} = (1-\alpha-\beta)\Psi\widehat{K}_{t+1}^{\chi-1}$, combing this relationship with equation (17) following relation is attained:

$$\hat{R}_{t+1} = (1-\alpha-\beta)\Psi\,[\beta-\Phi]^{\chi-1}.\hat{K}_{t+1}^{\chi(\chi-1)} \equiv \hat{R}(K) \quad \ldots \quad \ldots \quad (18)$$

From ICC constraint:

$$\hat{R}(K_t) \geq \frac{2\,\bar{Z}-(2-\rho)\hat{\tau}}{(\hat{\tau}-\bar{Z})} \equiv \widehat{W} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (19)$$

5.2. Equilibrium with Corruption

In equilibrium with corruption, *λ=1*. The total tax receipts come only from honest high-income households. Corruption happens when corrupt households meet with a corrupt tax collector. With probability $(1-\theta)[(1-\theta)+\theta(1-\lambda)]$ honest households meet up with honest tax collectors, with probability $(1-\theta)\,\lambda\theta$ honest households meet up with corrupt tax collectors, corrupt households match with honest tax collector with probability $\theta[(1-\theta)+\theta(1-\lambda)]$. Combing all these three cases the total tax receipts submitted to the government equal $\tilde{\tau}\mu n\varepsilon w$ $((1-\theta^2)$. When a corrupt household meets with corrupt tax collector with probability θ^2 and no tax receipts are submitted.

A corrupt tax collector is caught with probability *p (1-θ).* He loses his corrupt income and is fined the amount that he has gained as illegal income. Once caught the corrupt tax collector has to pay the tax difference. Thus the revenues for the government coming from tax collector being caught is $p\tilde{\tau}\mu n\theta^2\lambda$ and $(p\,(1-\theta))[w(2+\,r_{t+1})+(2+r_{t+1}-\rho)(\frac{\mu n}{m})\,\theta\varepsilon wb]$. The cost of the effective audit is $c\eta\tilde{\tau}\mu n$ and for external audit is $c\sigma\tilde{\tau}\mu n$. The cost is covered by the fine collected. The total cost and the fine are taken equal such that the government does not spend extra. Keeping all this in view, optimal tax expression is:

$$\tilde{\tau}_t = \frac{G+\mathrm{w}(m+s\upsilon)}{(1-\theta^2)\mu n\varepsilon w} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (20)$$

$$\tilde{\tau}_t = \left[\frac{\Phi L+\beta(m+s\upsilon)}{(1-\theta^2)\mu n\varepsilon\beta}\right] \equiv \tilde{\tau} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (21)$$

The optimum level of bribe that households are willing to pay and the tax collectors are willing to accept is $\tilde{b}_t = \left[1-\,p\,(1-\theta)\right]\tilde{\tau}_t$ (from equation (13)). The total saving in such an economy comes from the corrupt as well as the honest agents.

Combing all the savings expression of honest and dishonest households, tax collectors and tier two bureaucrats; replacing the value of $\hat{\tau}$ and algebraic manipulation gives the following relation:

$$\begin{aligned} &Lw + mw[1-p\theta(1-\theta)] + s\upsilon w\frac{(1-\theta)}{(1-\theta^2)}[G+\mathrm{w}(m+s\upsilon)][1+\theta p] \\ &\quad -\theta\mu n\varepsilon\mathrm{w}\tilde{b}_t\{1-\theta\varphi-[1-p(1-\theta)\theta(1-\varphi)]\} = \tilde{K}_{t+1} \quad \ldots \quad \ldots \quad (22) \end{aligned}$$

Working with equation (22) and replacing $\widehat{b_t} = \left[1-\,p(1-\theta)\right]\hat{\tau}_t$, $G = \Psi K^{\chi}\Phi$ and $w = \beta L^{-1}\Psi K^{\chi}$ following capital accumulation exists in equilibrium with corruption:

$$\begin{aligned} \tilde{K}_{t+1} = \Psi K_t^{\chi}[&\beta + \frac{\beta}{L}m[1-p\theta(1-\theta)] + \frac{\beta}{L}s\upsilon(1-\theta p) \\ &-\frac{(1-\theta)}{(1-\theta^2)}\left[\Phi + \frac{\beta}{L}(m+s\upsilon)\right][1+\theta p] \\ &-\frac{\theta\mu n\varepsilon\beta\tilde{\tau}}{L}\left[1-\,p(1-\theta)\right]\{1-\theta\varphi-[1-p(1-\theta)\theta(1-\varphi)]\}] \quad \ldots \quad (23) \end{aligned}$$

As $\tilde{r_t} = (1-\alpha-\beta)\Psi\tilde{K}_t^{\chi-1}$, then from this it can derived that $\tilde{r}_{t+1} = (1-\alpha-\beta)\Psi\tilde{K}_{t+1}^{\chi-1}$, combining this relationship with equation (23) this model gets the following relation:

$$\tilde{R}_{t+1} = (1-\alpha-\beta)\Psi\left[\Psi\left[\beta+\frac{\beta}{L}m[1-p\theta(1-\theta)]+\frac{\beta}{L}s\upsilon-\frac{(1-\theta)}{(1-\theta^2)}\left[\Phi+\frac{\beta}{L}(m+ s\upsilon)\right][1+\theta p]-\frac{\theta\mu n\varepsilon\beta\tilde{\tau}}{L}\left[1-p(1-\theta)\right]\{1-\theta\varphi-[1-p(1-\theta)\theta(1-\varphi)]\}\right]\right]^{\chi-1}$$
$$.K_{t+1}^{\chi(\chi-1)} \equiv \tilde{R}(K_t) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (24)$$

From ICC constraint:

$$\tilde{R}(K) \geq \frac{2\bar{Z}-(2-\rho)\tilde{\tau}}{(\tilde{\tau}-\bar{Z})} \equiv \widetilde{W} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (25)$$

6. CORRUPTION AND DEVELOPMENT

6.1. From Low Development to Corruption

This model solidifies the relationship of corruption, capital accumulation and economic development already discussed in literature. What is of interest is to see whether at the equilibrium level, there is corruption or not, and what level of capital there is high growth, or low growth, in the economy, and if these levels are the same for both the equilibrium with and without corruption.

From the Equations (18 and 26) this paper finds that $\tilde{R}(K)$ and $\hat{R}(K)$ have monotonically downward function with respect to K. From equation (18), (19), (24) and (25) it is established that $\tilde{R}(K_t) > \hat{R}(K_t)$ and $\widetilde{W} < \widehat{W}$ for all values of K_t. Intuitively speaking this model says that future rate of return, as a function of K in a corrupt economy would be higher compared to the rate of return as a function of K in an economy with no corruption. Furthermore, $\widetilde{W}$ and $\widehat{W}$ are not a function of K but depend upon the bargaining power of the bureaucrats, audit probability and corruption probability.

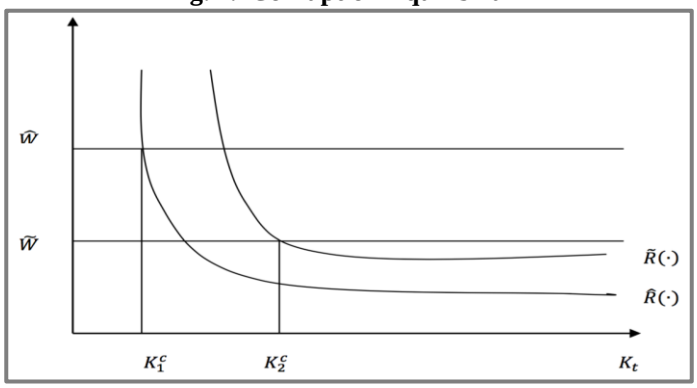
As already pointed out in literature these three components are dependent on the institutional quality and vice versa. Keeping this view in mind, this model concludes that in the presence of corruption with the increase in probability of being caught or increase in bargaining power it would reduce $\widetilde{W}$ and it increase $\widehat{W}$.

This paper find the optimum level of K_t, which defines a point in economy there is high growth. I define K_1^C and K_2^C around that can defined as K_t at which where they may be growth, low growth or multiple growth level. For all $K_t < K_1^C$, $\hat{R}(K_t) > \widehat{W}$ and for all $K_t > K_1^C$, $\hat{R}(K_t) < \widehat{W}$. Similarly, for all $K_t < K_2^C$, $\tilde{R}(K_t) > \widetilde{W}$ and for all $K_t > K_2^C$, $\tilde{R}(K_t) < \widetilde{W}$. Where $K_1^C < K_2^C$.[8]

Proposition 1: For $\forall\, K_t < K_1^C$, there is a unique equilibrium where all corruptible bureaucrats are corrupt. For $\forall\, K_t > K_2^C$, there is a unique equilibrium where no corruptible bureaucrat is corrupt. For $\forall\, K_1^C < K_t \leq K_2^C$ there is multiple equilibrium.

[8] See Figure 1.

Fig. 1. Corruption Equilibrium



Where

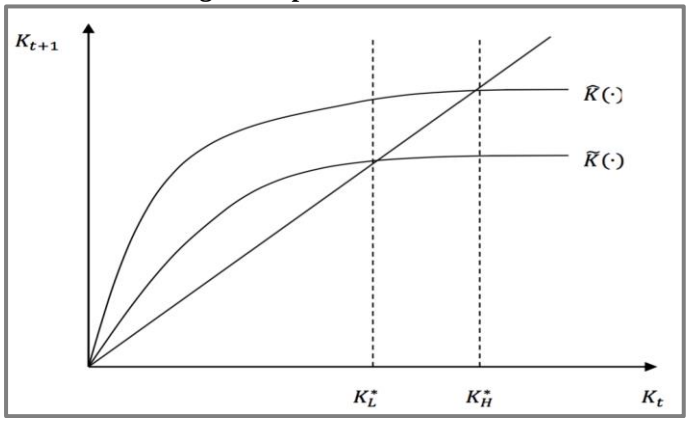
$$K_1^C \geq \left[\frac{\bar{S}(\tilde{\tau}_t - \bar{Z})}{2\bar{Z} - (2-\rho)\tilde{\tau}_t}\right]^{\chi(\chi-1)}$$

$$K_2^C \geq \left[\frac{\bar{V}(\tilde{\tau}_t - \bar{Z})}{2\bar{Z} - (2-\rho)\tilde{\tau}_t}\right]^{\chi(\chi-1)}$$

6.2. From Corruption to Low Development

Two paths of capital accumulation has been identified one for equilibrium where there is no corruption and one for where there is corruption, $\widehat{K}^*$ and $\widetilde{K}^*$. In equilibrium where there is no corruption, the economy moves on higher development path K (·) and thus has a high level of steady state equilibrium $\widehat{K}_H = \{\Psi[\beta - \phi]\}^{1-\chi}$ (from equation 17). Whereas in equilibrium where there is corruption the economy moves on lower development path K (·) so there is low level of steady state: $\widetilde{K}_L = \left[\Psi\left[\beta + \frac{\beta}{L}m[1 - p\theta(1-\theta)] + \frac{\beta}{L}sv - \frac{(1-\theta)}{(1-\theta^2)}\left\{\phi + \frac{\beta}{L}(m+sv)\right\}(1+\theta p) - \frac{\theta\mu n\varepsilon\beta\tilde{\tau}}{L}[1-p(1-\theta)]\{1 - \theta\varphi - [1-p(1-\theta)]\theta(1-\varphi)\}\right]\right]^{1-\chi}$ (from Equation 23)

Fig. 2. Capital Accumulation



Intuition

In an economy with equilibrium with corruption, and as the probability of being caught increases $\left(\frac{\partial \tilde{K}_L}{\partial p} > 0\right)$, capital accumulation increases $\left(\frac{\partial \tilde{K}_L}{\partial \theta} < 0\right)$. As the proportion of the corrupt individual increases, capital accumulation in a corrupt economy decreases. Furthermore, in an economy with corruption $\tilde{K}^*$ is not true indicator of capital accumulation, as a large amount of the income has not become part of the economy and not contribution towards economic growth and development. Figure 2 identifies K_L^* as a low level of capital accumulation and is found on the capital accumulation path of the economy with corruption. Where as K_H^* is the high capital accumulation level and is found on the capital accumulation path of economy with no corruption.

7. COMPARATIVE STATICS

For a given level of physical capital K_t in an equilibrium with or without corruption satisfy, $\tilde{\tau} > \hat{\tau}, \tilde{r} > \hat{r}$. For a given level of physical capital K the optimum tax rate of the corrupt economy is higher than that of the equilibrium with no corruption, $\tilde{\tau}_t > \hat{\tau}_t$as seen from equation (15) and (21), as of which $\tilde{b}_t > \hat{b}_t$. Intuitively, this holds true for the government's need to run a balanced budget, the revenues collected in equilibrium with corruption are lower than the expenditure. The government raises taxes to overcome the shortage.

Similarly from Equation (17) and (23) I see that $\widetilde{K}_{t+1} < \widehat{K}_{t+1}$and Equations (18) and (24) clearly show that $\tilde{r}_{t+1} < \hat{r}_{t+1}$. Together this establishes that in equilibrium with corruption the level of taxes is high because of which the cost of concealment in the shape of bribe is also high. Furthermore, the accumulation of the physical capital is lower compared to the equilibrium with no corruption, and the rate of interest is also high. In equilibrium with corruption, the level of taxes is high due to which households pay a large bribe to evade taxes, which leads to low saving and capital accumulation. In equilibrium with no corruption, the taxes are not high such that all households pay the taxes. Their savings are high enough for capital accumulation and economic growth. When the rate of capital accumulation is high the rate of interest associated with it is low, this is due to diminishing marginal returns to capital.

8. CONCLUSION

This paper adds to the existing literature on how corruption in weak decentralised institutions affects economic growth and development through tax evasion and capital accumulation.

The basic setup for the corrupt bureaucrat is the same but the model introduced in this paper introduces a multi-level tax administrative system, where tier two bureaucrats and tax collectors are both involved in double incidences of corruption. Furthermore, this model shows that the households bribe the tax collector, who in turn offer bribes to their tier two bureaucrats. The transfer of resources creates illegal income, which is not included in savings. The reduced savings result in lower capital investment of economy.

This paper treats legal income differently from corruption income. Corruption creates unfavourable conditions for investment in physical capital and thus growth. Blackburn, et al. (2010) and Wadho (2009) look at a single public office tier. This model is a further extension of the model discussed in Blackburn, et al. (2010) and Wadho (2009) with two government tiers, which implies that the share of the bureaucrats has decreased while the proportion of the illegal income is same. There is fixed value of bribes that are shared among the bureaucrats. If the number of bureaucrats were to increase, then the share of each bureaucrat would decrease, as now the bribe would have to be divided into more shares. Increase in the number of bureaucrats could lead to both negative and positive effects.

Taking the multiple tiers may also increase the size of the bribe. This could be done when the tier two bureaucrats ask a particular percentage of bribes from tax collectors who in return will ask for higher bribes from households by framing them. If there were 'n' number of tiers, the negative effect will appear in the form of a smaller share in the bribe. The positive effect will appear because when there are more corrupt bureaucrats, there would be framing and extortion. There might be optimal level of 'n'. This paper does not focus on the number of tiers but rather on how corruption affects economic development through savings and physical capital investment.

Low investment in capital becomes visible as low economic growth and development. This paper explains how corruption accompanies low growth and development, and how low development accompanies high corruption. Although this paper has tried to explain the corruption and economic growth relationship through theoretical models, further research will be helpful. Pakistan, as a developing country, needs to direct its resources to strengthen its rules and regulation for better accountability and efficiency. This paper tries to give a clearer explanation for the reasons why the tax revenue for an economy like Pakistan is low.

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